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A BIBLIOMETRIC ANALYSIS OF MATHEMATICAL LITERACY RESEARCH BASED ON THE SCOPUS DATABASE (2005–2025)

Abstract. Mathematical literacy is one of the most relevant research areas in the field of modern mathematical education. The aim of the article is to conduct a bibliometric analysis of the development trends, structure and thematic features of scientific publications on mathematical literacy indexed in the Scopus database for the period 2005-2025. The research data were selected using the keywords “mathematical” and “literacy”, and a total of 2276 scientific works were analyzed. The data were exported in BibTeX format and processed in RStudio using Bibliometrix and Biblioshiny tools. The analysis revealed the dynamics of publications over time, leading authors and sources, patterns of scientific collaboration between countries, citation structure, as well as the main thematic areas in the field of mathematical literacy and their evolution. The results show a significant increase in the number of studies on mathematical literacy after 2015.Thematic analyses reveal that while the research initially focused on cognitive and methodological issues, in later years it has increasingly focused on educational practice, assessment and modeling, and applied contexts. Overall, this study provides a comprehensive overview of the long-term development trends in the field of mathematical literacy research and identifies relevant areas for future research.

Keywords: mathematical literacy, mathematics education, bibliometric analysis, Scopus, PISA

Introduction

In modern educational research, mathematical literacy is considered one of the main scientific concepts that characterizes the ability of students to effectively apply mathematical knowledge in everyday life situations. This concept is associated with the understanding of mathematics not only as a set of formal knowledge, but also as an applied tool aimed at solving real social, professional and everyday problems. In this sense, mathematical literacy is becoming an important theoretical and practical category in assessing educational outcomes and updating the content of education (Stacey, 2011).

The importance of mathematical literacy is also widely recognized at the international level. In particular, in the international PISA studies carried out within the framework of the OECD, mathematical literacy is considered one of the key competencies of students. This assessment is aimed at determining the level of application of mathematical knowledge in life situations and is an important basis for improving educational policies and curricula in many countries (OECD, 2019; OECD, 2022). In this regard, the concept of "mathematical literacy" is developing in close connection with international criteria for assessing the quality of education.

In the scientific literature, mathematical literacy is closely linked to students' cognitive abilities, numeracy skills, and academic achievement. A number of empirical studies show that early mathematical and numeracy skills have a significant impact on later academic outcomes. This supports the view that mathematical literacy is a long-term developmental process (LeFevre et al., 2009; Krajewski & Schneider, 2009).

In recent years, separate review articles and bibliometric studies on the topic of mathematical literacy have also begun to be published. For example, Indonesian researchers analyzed the development trends of mathematical literacy in mathematics education from 2011 to 2024 using the Scopus database using a bibliometric method (Adjis et al., 2025). In addition, Kazakh researchers

Kappassova et al. (2025) examined the factors influencing mathematical literacy from the perspective of a systematic literature review based on empirical studies from 2015 to 2024. However, the first of these works covered a relatively short period of time and a limited corpus of publications, while the second did not aim at quantitative bibliometric mapping and thematic structure analysis.

In this regard, there is a clear need for bibliometric studies that comprehensively describe the dynamics of the development, thematic structure and conceptual evolution of scientific publications in the field of mathematical literacy over a long period of time and based on a large-scale data set. This issue is especially relevant in the Kazakhstani scientific space, since bibliometric analyses based on large international databases on this topic are still not sufficiently presented. The aim of the study is to conduct a bibliometric analysis of scientific publications indexed in the Scopus database for the keyword “mathematical literacy” from 2005 to 2025.

Methods

This study used bibliometric analysis methods to describe the dynamics of the development, thematic structure, and conceptual evolution of scientific publications in the field of mathematical literacy. The bibliometric method allows for a systematic quantitative analysis of a mass of scientific publications and is widely used to describe the educational structure, research directions, and intellectual evolution of a particular scientific field (Pritchard, 1969; Aria & Cuccurullo, 2017).

The Scopus database, which contains a wide range of international scientific publications, was used as the source of the study. During data collection, the keyword “mathematical” AND “literacy” was used in the TITLE-ABS-KEY fields of the Scopus database. This was chosen because it represents the internationally established term for mathematical literacy and to ensure conceptual consistency. Since similar terms were not used, the study results were interpreted within this limitation.

The search initially identified 2,449 records. In order to refine the scope of the study, a publication year restriction of 2005–2025 was applied, and 2,276 scientific records corresponding to this period were selected. Since data collection was carried out in January 2026, available publications up to 2025 were included.

The resulting bibliographic data was exported in BibTeX format and processed using the Bibliometrix package running in the RStudio software environment. During data preprocessing, duplicate entries were removed, different versions of author names were aligned, and incomplete or technically inconsistent metadata was filtered. The final dataset formed after these processing stages was used for bibliometric analysis.

Bibliometric analysis was carried out using the Biblioshiny web interface. The study analyzed the dynamics of publications over time, author and country co-authorship networks, as well as thematic and conceptual structures. For this purpose, co-word analysis, thematic mapping, factorial analysis, and collaboration network analysis methods were used. These methods allowed us to comprehensively describe the evolution of research directions in the field of mathematical literacy, their conceptual organization, and the network structure of international scientific collaboration.

Findings

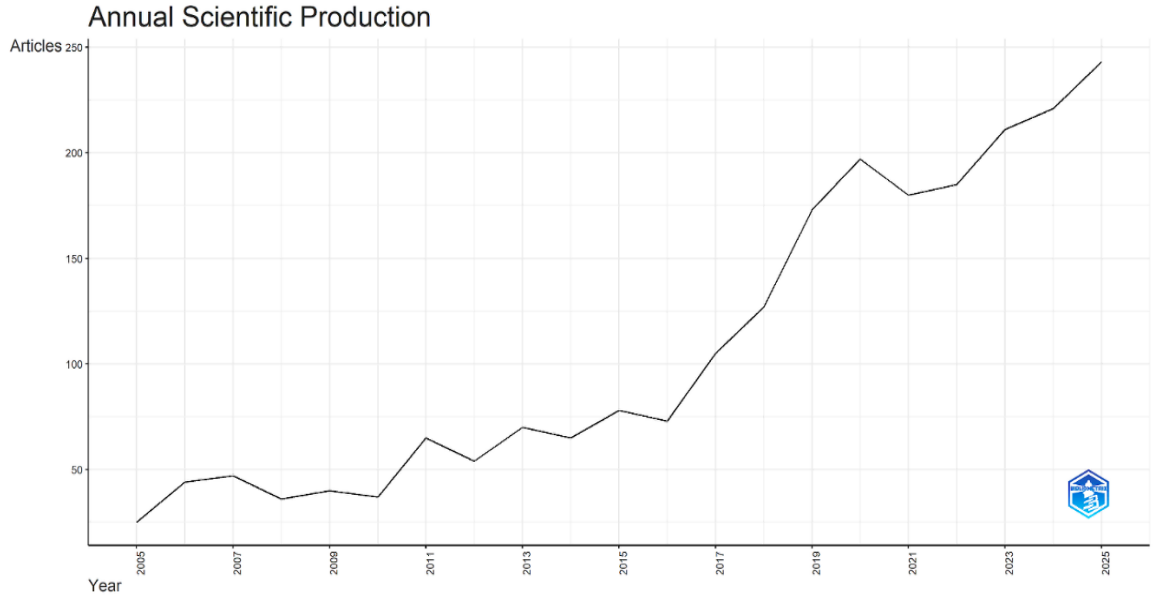
The bibliometric dataset obtained from the SCOPUS database for the keyword “mathematical” AND “literacy” covers the period 2005–2025 and includes a total of 2,276 scientific publications. These publications were published in 812 different sources (journals, conference proceedings, book chapters, etc.). The average annual growth rate of publications on the topic under study is 12.04%. The average age of the documents is 7.27 years, which indicates that the dataset is dominated by works published in recent years. A total of 5,605 authors are registered, with an average number of authors per publication of 3.07. The number of single-authored works is 474, and the share of international co-authorship is 12.79%. By publication type, scientific articles dominate (n = 1,363), followed by conference papers (n = 528), book chapters (n = 195), and review articles (n = 61). The average number of citations per publication is 13.39. In addition, the dataset contains 4,872 units of author keywords and 5,349 terms from Keywords Plus.

The change in the number of publications on the topic of mathematical literacy in the period from 2005 to 2025 is characterized by uneven, but generally increasing dynamics. In the period from 2005 to 2010, the number of annual publications varied from 25 to 37, remaining at a relatively low level. Since 2011, there has been a gradual increase in the number of publications: in 2011, 65 articles were published, while in 2013 this figure reached 70. In the period from 2015 to 2017, the number of publications fluctuated between 73 and 105, and a period of clear growth began in 2018. In particular, 127 publications were registered in 2018, 173 in 2019, and 197 in 2020. In the period from 2021 to 2023, the number of annual publications remained within 180–211, reaching a peak of 221 in 2024. Although data for 2025 is partially included, 243 publications were registered (Figure 1).

Figure 1

Annual scientific production

Source: Generated by the author through bibliometrix software



In the analysis of the dynamics of scientific publications by year, annual and cumulative publication data were described using a logistic growth model. The annual number of publications was approximated by a logistic function, and the change in the cumulative number of publications over time was presented as an S-shaped curve. The cumulative growth curve shows the nature of the change in the number of publications over time. According to the parameters of the logistic model, the inflection point is 2029. This point corresponds to the highest value of the growth rate in the model.

The carrying capacity of the accumulated publications based on the model was determined to be 6681.63 documents. This value describes the asymptotic level of the logistic function. The model's fit indicators are characterized by the following values: the coefficient of determination $R^2 = 0.958$, and the root mean square error (RMSE) is 14.53 (Figure 2a). The differences between the observed data and the model curve for annual publications were quantitatively described by these indicators (Figure 2b). The results obtained allow us to describe the process of accumulation of scientific publications over time based on the logistic growth model.

Figure 2a

Life cycle – Annual production

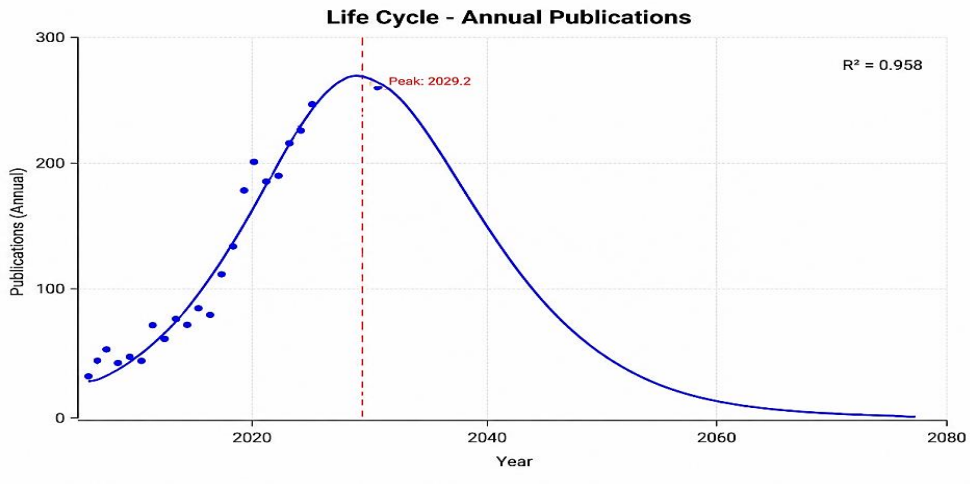
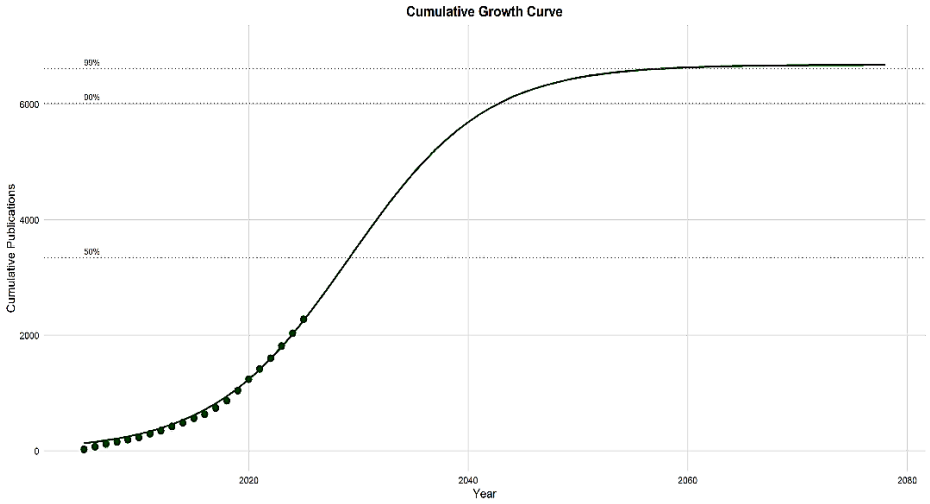


Figure 2b

Cumuluative growth curve

Source: Generated by the author through bibliometrix software

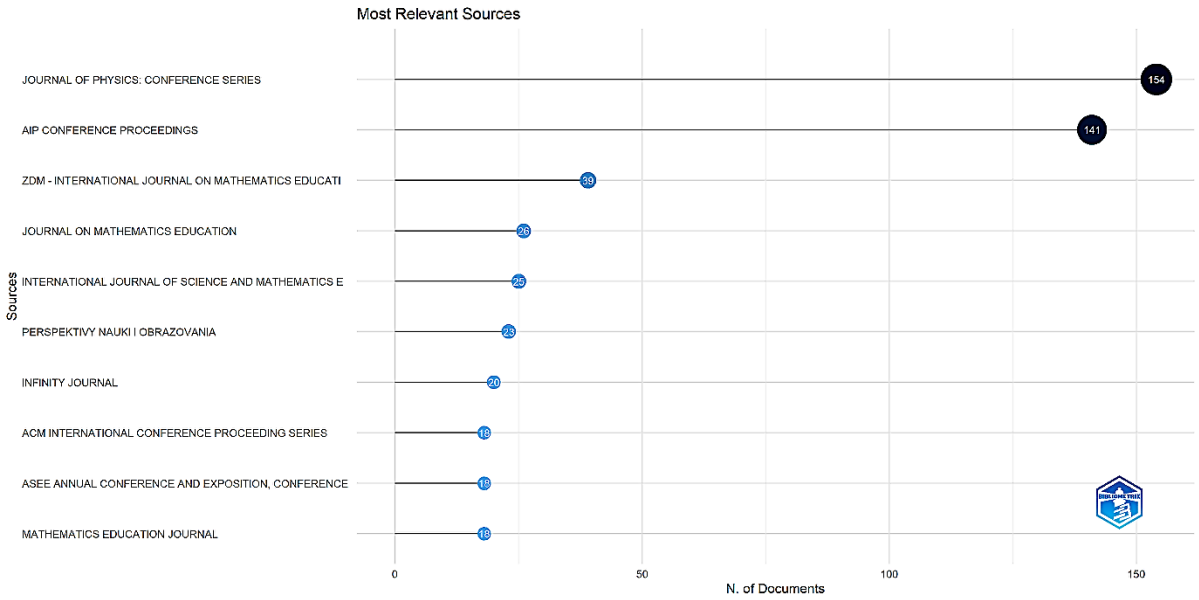


Publications on the topic of mathematical literacy from the SCOPUS database are concentrated in several main sources. The highest share in terms of the number of publications belongs to the Journal of Physics: Conference Series, where 154 papers were published. This is followed by the AIP Conference Proceedings collection with 141 publications. Among scientific journals, ZDM – International Journal on Mathematics Education published 39 articles, Journal on Mathematics Education 26 articles, and International Journal of Science and Mathematics Education 25 articles. In addition, 23 papers were registered in the journal Perspektivy Nauki i Obrazovania, and 20 papers were registered in Infinity Journal. Among the conference series, 18 publications were identified in each of the ACM International Conference Proceeding Series, ASEE Annual Conference and Exposition, and Mathematics Education Journal (Figure 3).

Figure 3

Top 10 sources on mathematical literacy (2005–2025)

Source: Generated by the author through bibliometrix software

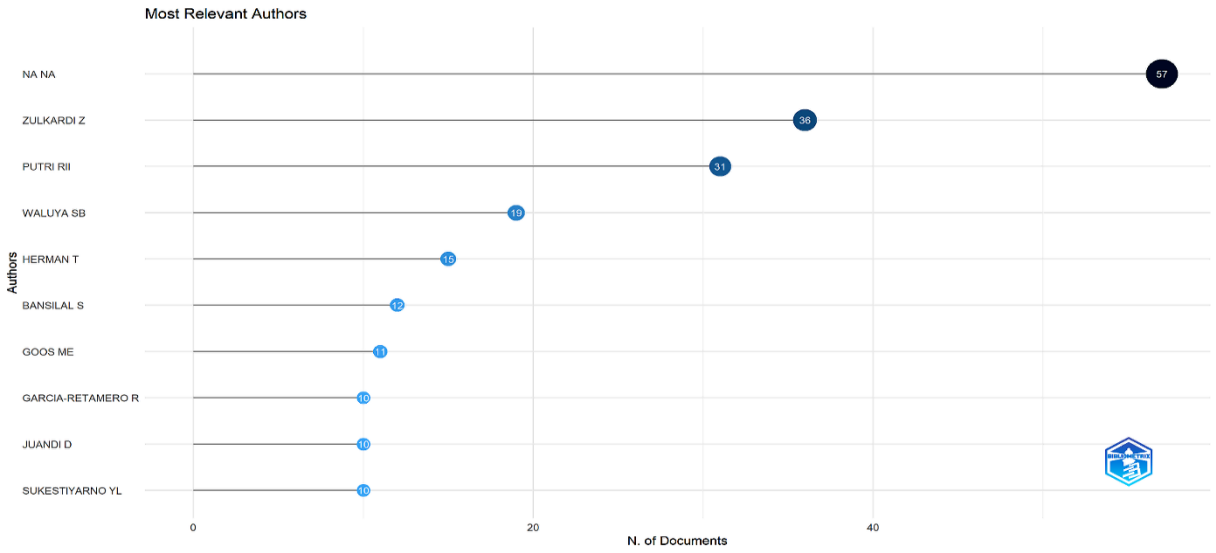


The highest number of publications corresponds to records marked as NA (57 documents), indicating that the dataset contains records with no or non-standardized author names. Among the clearly indicated authors, Zulkardi Z – 36 and Putri RII – 31 publications are in the lead. Waluya SB has 19 and Herman T has 15 documents. Bansilal S – 12, Goos ME – 11 publications are also indicated. Garcia-Retamero R, Juandi D and Sukestiyarno YL have 10 publications each (Figure 4).

Figure 4

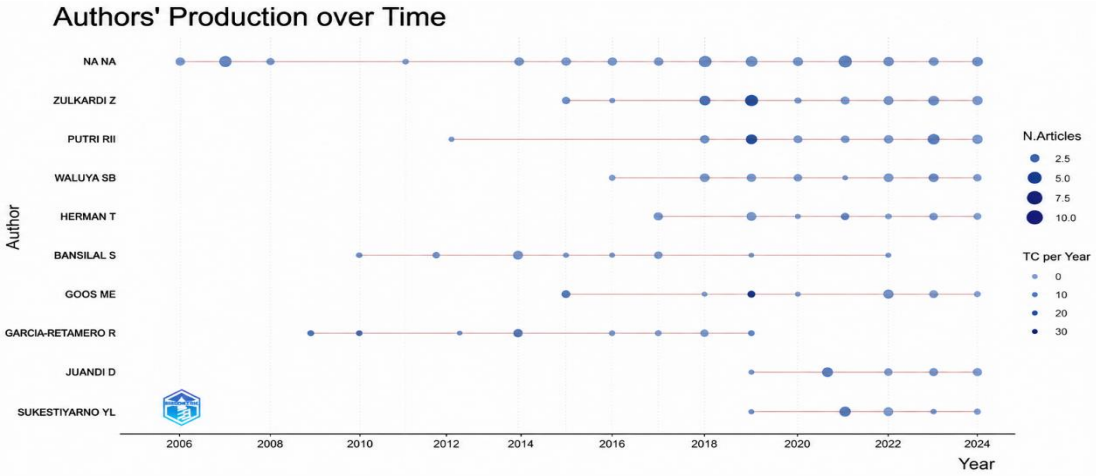
Most relevant authors

Source: Generated by the author through bibliometrix software



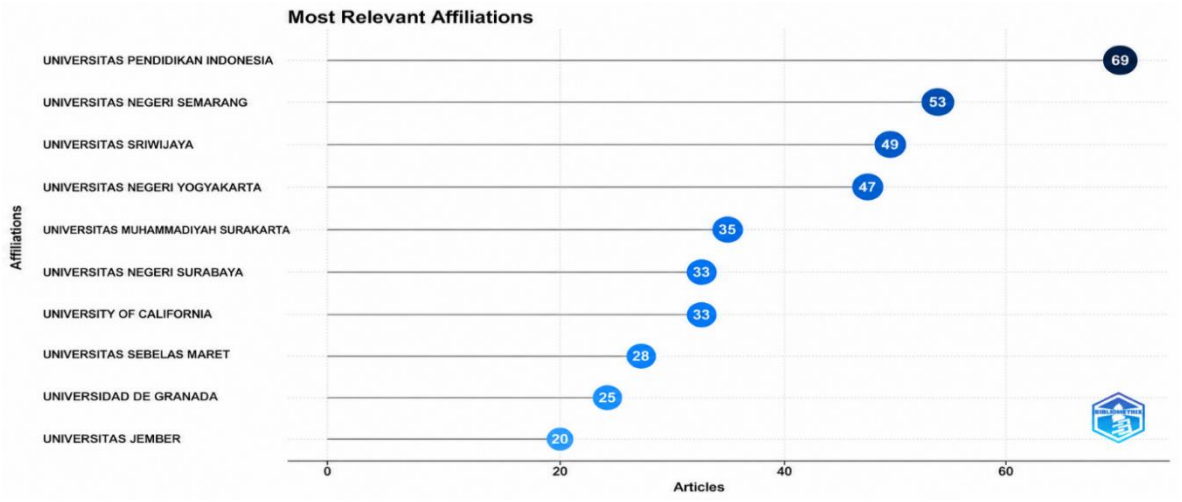
The diagram shows the temporal distribution of the publication activity of the most productive authors for the period 2005–2025. It can be seen that the publications of individual authors are concentrated in certain years and continue in subsequent periods. The works of the authors Zulkardi Z and Putri RII appear regularly since the mid-2010s, and several repeated publications are recorded between 2018–2024. The publications of the authors Waluya SB and Herman T are observed in the period after 2016 and continue uninterruptedly in the following years. The publications of the authors Bansilal S and Goos ME appear from earlier periods and are evenly distributed over time. The works of the author Garcia-Retamero R are recorded between 2010–2018. In recent years, the publications of the authors Juandi D and Sukestiyarno YL mainly correspond to the period after 2019. The size of the dots shown in the diagram indicates the number of publications in a year, and the color saturation indicates the level of the number of citations in that year (Figure 5).

Figure 5
Authors' Production over Time
Source: Generated by the author through bibliometrix software



The highest number of publications belongs to Universitas Pendidikan Indonesia, where 69 articles are registered. This is followed by Universitas Negeri Semarang – 53 and Universitas Sriwijaya – 49 publications. The affiliation of Universitas Negeri Yogyakarta is 47 documents. Next in line are Universitas Muhammadiyah Surakarta – 35, Universitas Negeri Surabaya – 33 and University of California – 33 publications. In addition, Universitas Sebelas Maret – 28, Universidad de Granada – 25 and Universitas Jember – 20 documents (Figure 6).

Figure 6
Most relevant affiliations
Source: Generated by the author through bibliometrix software



The highest global citation rate is attributed to Metzger (2007), which received 865 citations. This is followed by Fagerlin (2007) with 769 and Schwendicke (2020) with 751 citations. Lefevre (2009) received 530 citations, and Krajewski (2009) received 384 citations. In addition, Shaffer (2006) received 370 citations, Coecke (2017) received 353 citations, Galesic (2011) received 309 citations, and Puntambekar (2005) received 296 citations. Baumert (2013) received 280 global citations. These papers were published in different years and are characterized by high citation rates (Table 1).

Table 1
Most global cited documents

Paper	Article Title	Total Citations	TC per Year	Normalized TC
Metzger (2007)	Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research	865	43.25	14.12
Fagerlin et al. (2007)	Measuring numeracy without a math test: Development of the Subjective Numeracy Scale	769	38.45	12.55
Schwendicke et al. (2020)	Artificial Intelligence in Dentistry: Chances and Challenges	751	107.29	47.80
LeFevre et al. (2009)	Pathways to Mathematics: Longitudinal Predictors of Performance	530	29.44	10.31
Krajewski & Schneider (2009)	Exploring the impact of early numerical competencies on mathematics achievement	384	21.33	7.47
Shaffer (2006)	Epistemic frames for epistemic games	370	17.62	14.21
Coecke (2017)	Picturing Quantum Processes	353	35.30	18.63
Galesic & Garcia-Retamero (2011)	Graph literacy: A cross-cultural comparison	309	19.31	13.37
Puntambekar & Kolodner (2005)	Toward implementing distributed scaffolding	296	13.45	11.65
Baumert (2013)	Cognitive activation in the mathematics classroom and professional competence of teachers	280	20.00	13.08

Source: Generated by the author through bibliometrix software

The TreeMap chart shows the frequency distribution of Keywords Plus terms used in publications. The highest share in the chart belongs to the NA category (434 records, 9%). The NA label indicates records for which the exact value is not specified in the keywords field, is not standardized, or was not automatically detected when loading data from SCOPUS.

Among the content keywords, the terms students (319), mathematical literacy (304) and human (293) are the most frequently used. In addition, the keywords humans (232), article (226), female (182), literacy (181) and male (179) have a high frequency. The terms mathematics (139), teaching (134), education (130), adult (110), child (108) and mathematics education (102) are widely used in the field of education and mathematics. The keywords health literacy (94), numeracy (97), problem solving (67), curricula (79) and controlled study (78) are registered in the context of applied and interdisciplinary research. Also, terms such as reading (73), learning (59), financial literacy (58), PISA (60), e-learning (48), preschool (48), adolescent (45), and technology (39) appeared with relatively low frequency (Figure 7).

Figure 7

TreeMap

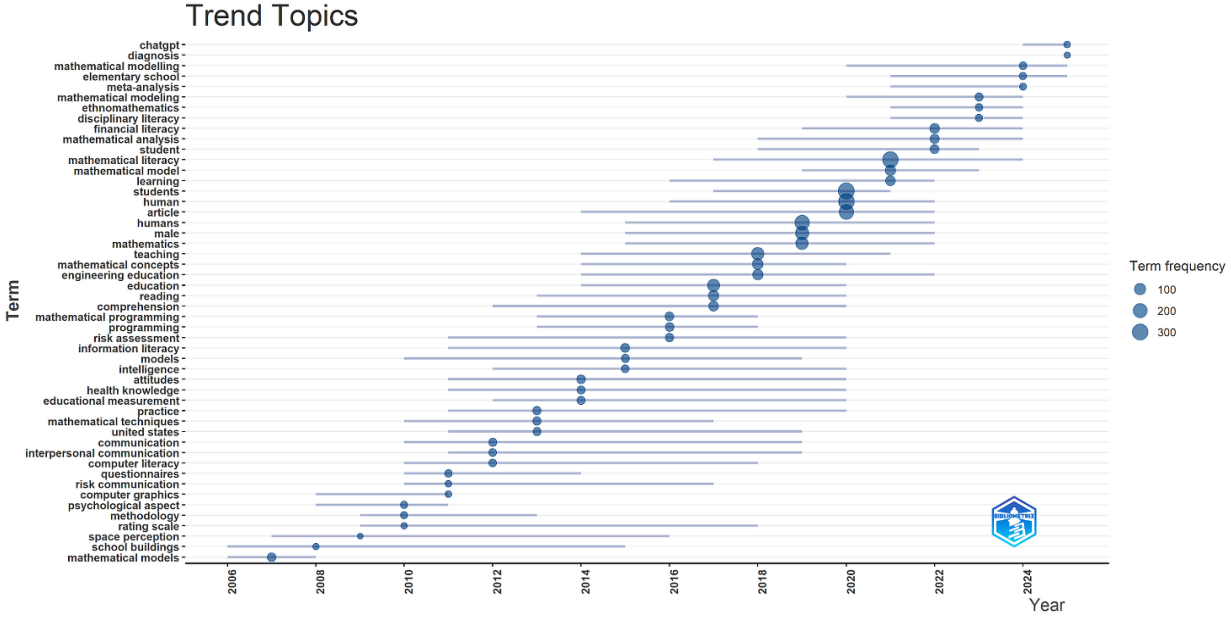
Source: Generated by the author through bibliometrix software

The trend topics chart shows the change in the three main keywords with the highest median frequency in publications from 2006 to 2024. In the early period (2006–2010), general methodological and theoretical terms such as mathematical models, methodology, psychological aspect, space perception were registered as trending topics. In the period from 2011 to 2017, computer literacy, information literacy, programming, health knowledge, as well as education, mathematics, teaching, students, learning, related to the field of education, began to appear in the trending topics. In 2018–2022, the keywords mathematics, education, teaching, students, learning, mathematical literacy and mathematical model were consistently among the annual trending topics. The term meta-analysis was also registered for several years during this period. In 2024, the term ChatGPT was identified among the trending topics for the first time. The data shown in the chart describes the change in keywords over time and the most frequently used topics in each year (Figure 8).

Figure 8

Trend topics

Source: Generated by the author through bibliometrix software

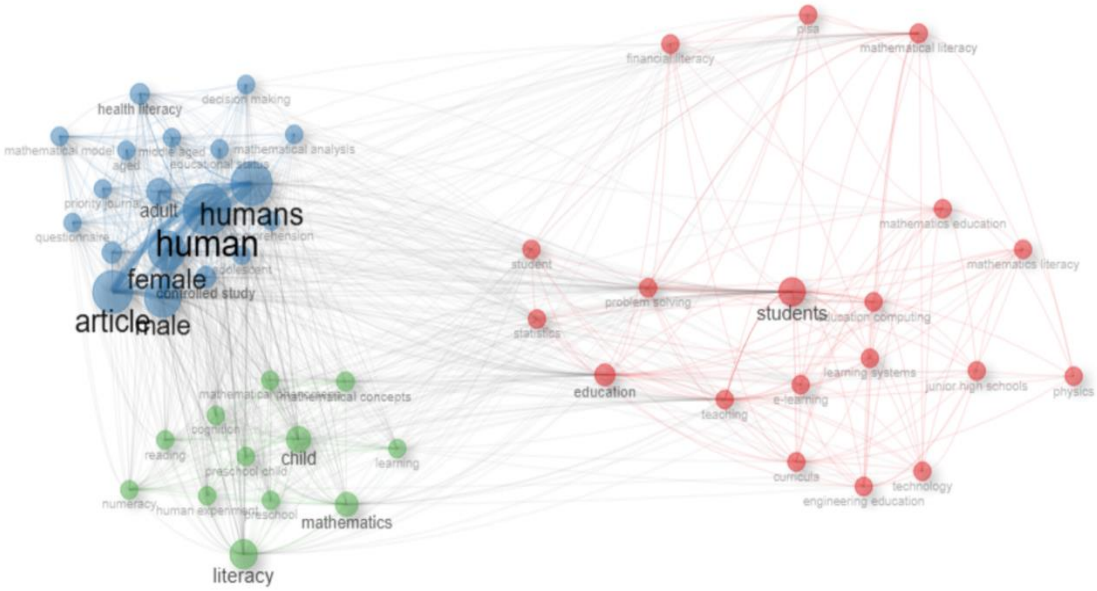


The keyword co-occurrence network shows three thematic clusters. The clusters are marked in a unique color on the network and each consists of keywords that occur together. The first thematic cluster contains the keywords human, humans, female, male, adult, aged, adolescent. This cluster also contains the terms health literacy, decision making, controlled study, questionnaire, mathematical model, and mathematical analysis. The second thematic cluster contains the keywords literacy, mathematics, child, and numeracy. This cluster also contains the terms reading, learning, cognition, preschool child, human experiment, and mathematical concepts. The third thematic cluster contains the keywords students, education, mathematical literacy, mathematics education, and problem solving. This cluster contains the terms teaching, curricula, e-learning, technology, learning systems, engineering education, PISA, statistics, and education computing (Figure 9).

Figure 9

Co-occurrence network

Source: Generated by the author through bibliometrix software

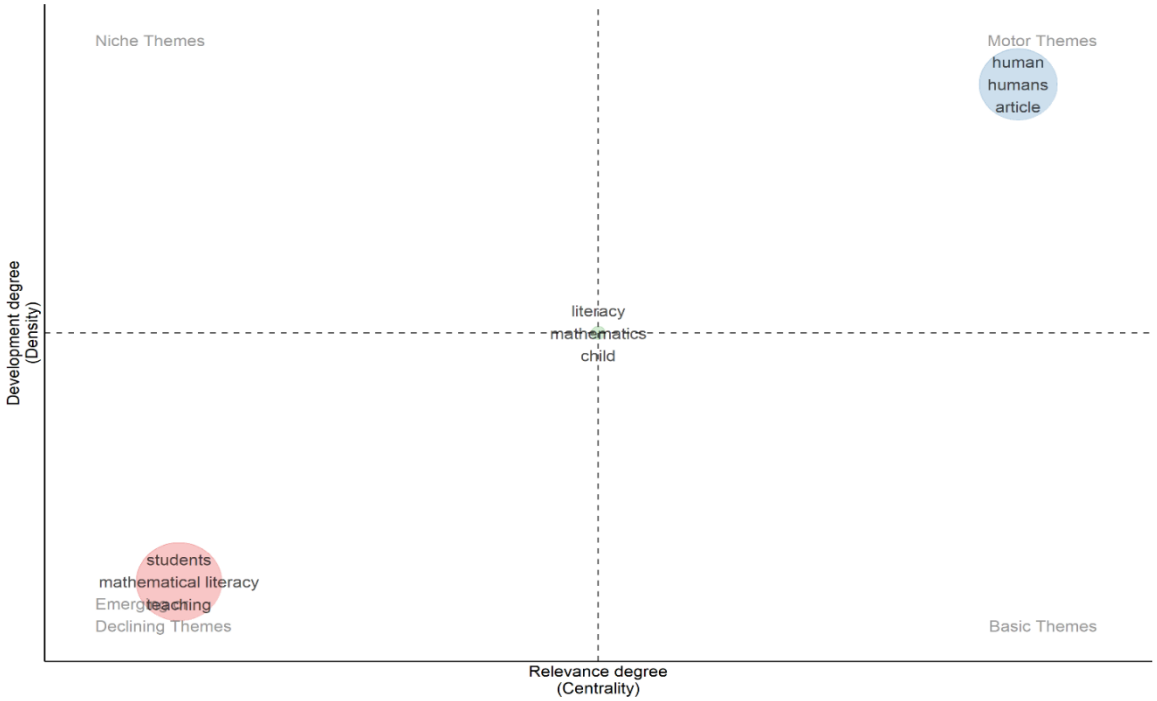


Thematic map shows the co-occurrence structure of keywords and is divided into four themes based on centrality and density. In the high centrality and high density themes, there is a cluster consisting of keywords human – humans – article. This cluster is shown in this region on the map. In the low centrality and low density themes, there is a cluster consisting of keywords students – mathematical literacy – teaching. This cluster is located in the lower left part of the map. In the themes near the center of the map, a small cluster consisting of keywords literacy – mathematics – child is shown. This cluster is located in the theme corresponding to the average values of centrality and density (Figure 10).

Figure 10

Thematic map

Source: Generated by the author through bibliometrix software



As a result of factorial analysis, two main dimensions were identified. The first dimension (Dim 1) explains 89.43% of the total variance, and the second dimension (Dim 2) explains 5.37%. Together, the two dimensions account for the majority of the variation in the co-occurrence structure of keywords.

In Dim 1, keywords related to education and applied literacy (mathematical literacy, education, teaching, problem solving) are located in one region, while terms related to human development and empirical research contexts (child, preschool, adult, health literacy, questionnaire) are concentrated in the opposite region.

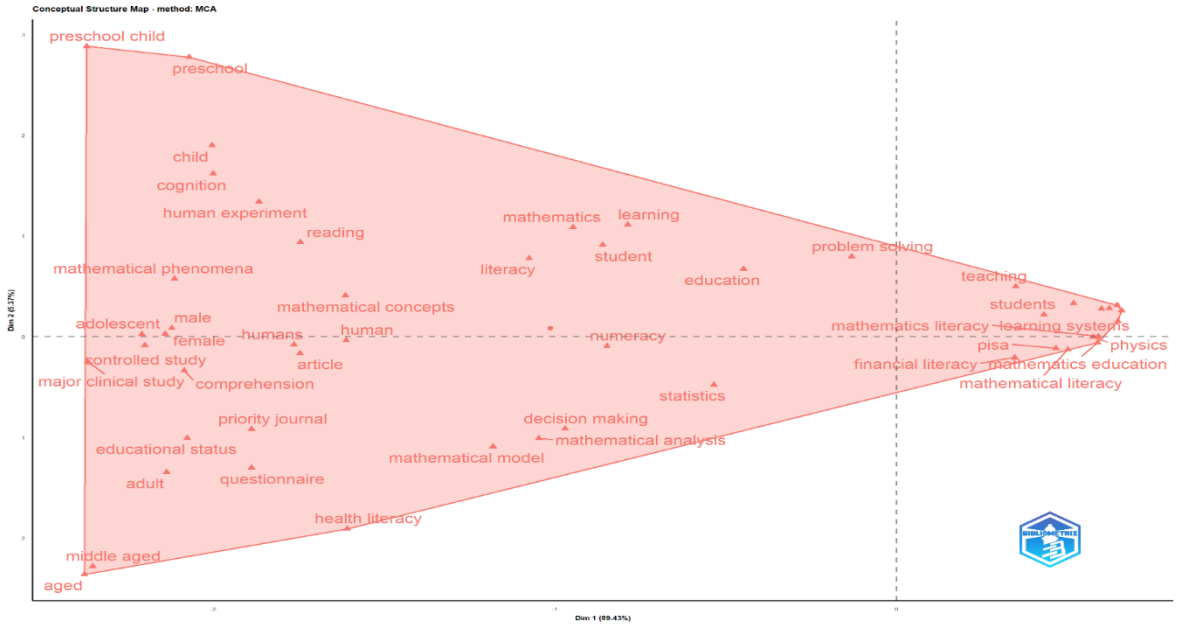
Dim 2 distinguishes between keywords related to early childhood (preschool, child, reading) and terms related to adults and social and health contexts (adult, health literacy, decision making).

The area near the center of the map contains keywords such as numeracy, mathematics, literacy, learning, and statistics, indicating that they occur together in different thematic areas (Figure 11).

Figure 11

Factorial analysis

Source: Generated by the author through bibliometrix software



The countries' collaboration world map shows the geographical distribution of scientific publications based on SCOPUS data and co-authorship relationships between countries. The color saturation of countries indicates the number of publications with at least one author from that country, while lines between countries indicate the presence of international co-authorship.

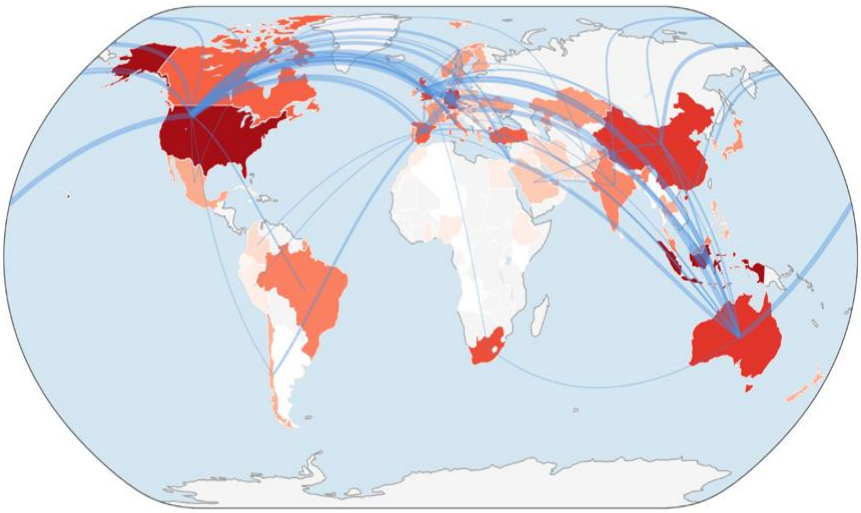
The map clearly shows the US and Canada in North America, the UK, Germany, France, Spain, Italy and the Netherlands in Europe, China, India, Japan and South Korea in Asia, as well as Australia as countries with high scientific productivity. Brazil in South America and South Africa in Africa stand out at the regional level. Some regions show low publication rates.

International networks of collaboration are particularly evident between North America and Western Europe. The United States is connected through collaborative research with many regions, including Europe, Asia, Oceania, and South America. In the Asia-Pacific region, China's collaboration with the United States, Europe, Japan, South Korea, India, and Australia is evident. There are also domestic scientific linkages among European countries (Figure 12).

Figure 12

Countries' collaboration world map

Source: Generated by the author through bibliometrix software



Discussion

The bibliometric analysis conducted shows that between 2005 and 2025, mathematical literacy gradually emerged as an independent scientific direction and later became one of the dominant topics in educational research. The increase in the number of publications over time indicates that mathematical literacy is beginning to be viewed as a comprehensive concept that describes not only the level of subject knowledge, but also the ability of students to apply mathematical knowledge in real-life situations. This understanding is consistent with the statements that describe mathematical literacy as one of the key competencies in the education system (Stacey, 2011).

The logistic nature of the dynamics of the development of publications might indicate that scientific productivity in the field of mathematical literacy goes through a certain development cycle. While the slow growth in the initial period indicates that this concept has not yet been fully established in the scientific community, the rapid growth in recent years indicates that mathematical literacy has become widely accepted in educational practice and scientific research. Such dynamics indicate the need to move from quantitative growth to substantive and methodological depth, that is, in future studies, it might be more relevant to strengthen their theoretical basis than the number of publications.

The results of thematic evolution may indicate that the content of mathematical literacy research has changed over time. While in the early stages, research focused mainly on cognitive and methodological issues, in recent years, education, teaching, the learning process and student achievement have become the main objects of research. This change is explained by the results of

empirical studies that show a close relationship between mathematical literacy and quantitative and cognitive abilities (LeFevre et al., 2009). In addition, the emergence of terms related to digital tools and technologies indicates that mathematical literacy is being reconsidered in the context of modern education and its content is expanding.

Cluster analysis based on the co-occurrence of keywords reveals that mathematical literacy is multifaceted and interdisciplinary. The identification of clusters that cover socio-applied areas, including health care and decision-making contexts, suggests that mathematical literacy is beginning to have applied significance outside the educational sphere. This finding is consistent with previous empirical research that suggests that mathematical literacy, especially the components of understanding and interpreting numerical information, also plays an important role in decision-making contexts outside the educational sphere (Garcia-Retamero & Galesic, 2010).

The results of the thematic map and factor analysis show that mathematical literacy research is organized into several meaningful directions. While the centrality of research focused on educational and applied contexts emphasizes the pedagogical importance of this area, the relatively peripheral location of directions based on human development and empirical approaches suggests that these directions require in-depth research in the future. The concepts located in the center of the factor map are seen as key categories that connect different directions of mathematical literacy research, which indicates that it is formed as both a pedagogical and socio-applied phenomenon.

Overall, this study demonstrates that mathematical literacy has become a research area that has expanded in content and become more structurally complex over the past two decades. The results are substantively consistent with recent review and bibliometric studies on mathematical literacy and complement them from a broader temporal and thematic perspective.

Conclusion

The results of this study allowed us to systematize the existing scientific literature in the field of mathematical literacy from a bibliometric perspective and describe the general picture of the research space. Bibliometric analysis made it possible to identify the dynamics of the development of publications, key sources and influential works, as well as the evolution of research topics. The results obtained showed that scientific research on mathematical literacy has been developing rapidly in recent years.

The study identified key journals, highly cited papers, and active authors in the field of mathematical literacy. This data provides important information that can be used as a theoretical and methodological basis for scholars studying mathematical literacy. In addition, the results of the analysis of publications by country showed that mathematical literacy research is actively developing in some countries, especially Indonesia. The experience of this country can serve as a guide for comparative studies in terms of introducing mathematical literacy into the education system.

The analysis of keywords and thematic structures allowed us to identify research trends and identify promising directions for future research. The results of the study indicate that research in the field of mathematical literacy is expanding in content, covering educational practices and applied contexts in addition to cognitive aspects. These trends can serve as an important guide in choosing research topics in the future.

Since the sources of this study were limited to the Scopus database, the presented bibliometric view was also formed within this database. In future studies, there is a possibility to expand the obtained results by using different combinations of keywords, as well as using alternative databases such as Web of Science, ERIC.

Overall, this study provides a methodological framework aimed at systematizing scientific publications in the field of mathematical literacy, identifying research directions, and providing guidance for future scientific research. The identified research gaps and processes allow for new research in this area and contribute to the development of mathematical literacy.

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SCOPUS ДЕРЕКТЕР БАЗАСЫ НЕГІЗІНДЕ МАТЕМАТИКАЛЫҚ САУАТТЫЛЫҚ БОЙЫНША ЗЕРТТЕУЛЕРГЕ БИБЛИОМЕТРИЯЛЫҚ ТАЛДАУ (2005–2025)

Аңдатпа. Математикалық сауаттылық қазіргі математикалық білім беру саласындағы ең өзекті зерттеу бағыттарының бірі болып табылады. Мақаланың мақсаты – 2005–2025 жылдар аралығында Scopus деректер базасында индекстелген математикалық сауаттылыққа қатысты ғылыми жарияланымдардың даму үрдістеріне, құрылымына және тақырыптық ерекшеліктеріне библиометриялық талдау жүргізу. Зерттеу деректері “mathematical” және “literacy” кілт сөздері арқылы іріктеліп, жалпы саны 2276 ғылыми еңбек талданды. Деректер BibTeX форматында экспортталып, RStudio бағдарламасында Bibliometrix және Biblioshiny құралдары арқылы өңделді.Талдау нәтижесінде жарияланымдардың уақыт бойынша динамикасы, жетекші авторлар мен дереккөздер, елдер арасындағы ғылыми ынтымақтастық құрылымы, дәйексөздік байланыстар, сондай-ақ математикалық сауаттылық саласындағы негізгі тақырыптық бағыттар мен олардың эволюциясы анықталды. Нәтижелер 2015 жылдан кейін математикалық сауаттылыққа қатысты зерттеулер санының айтарлықтай артқанын көрсетті.Тақырыптық талдау бастапқы кезеңде зерттеулердің когнитивтік және әдістемелік мәселелерге бағытталғанын, ал кейінгі жылдары білім беру практикасына, бағалауға, модельдеуге және қолданбалы контекстерге көбірек назар аударылғанын айқындайды. Жалпы алғанда, бұл зерттеу математикалық сауаттылық саласындағы ұзақ мерзімді даму үрдістеріне кешенді шолу жасап, болашақ зерттеулер үшін өзекті бағыттарды анықтауға мүмкіндік береді.

Түйін сөздер: математикалық сауаттылық, математикалық білім беру, библиометриялық талдау, Scopus, PISA

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БИБЛИОМЕТРИЧЕСКИЙ АНАЛИЗ ИССЛЕДОВАНИЙ ПО МАТЕМАТИЧЕСКОЙ ГРАМОТНОСТИ НА ОСНОВЕ БАЗЫ ДАННЫХ SCOPUS (2005–2025)

Аннотация. Математическая грамотность является одним из наиболее актуальных направлений исследований в области современного математического образования. Цель статьи заключается в проведении библиометрического анализа тенденций развития, структуры и тематических особенностей научных публикаций по математической грамотности, индексированных в базе данных Scopus за период 2005–2025 гг. Данные исследования были отобраны с использованием ключевых слов «mathematical» и «literacy», всего было проанализировано 2276 научных работ. Данные были экспортированы в формате BibTeX и обработаны в среде RStudio с использованием инструментов Bibliometrix и Biblioshiny.Анализ позволил выявить динамику публикаций во времени, ведущих авторов и источники, особенности научного сотрудничества между странами, структуру цитирования, а также основные тематические направления в области математической грамотности и их эволюцию. Результаты показывают значительный рост числа исследований по математической грамотности после 2015 года.Тематический анализ показывает, что если на начальном этапе исследования были сосредоточены преимущественно на когнитивных и методологических аспектах, то в последующие годы наблюдается усиление внимания к образовательной практике, оцениванию, моделированию и прикладным контекстам. В целом данное исследование предоставляет комплексный обзор долгосрочных тенденций развития

исследований в области математической грамотности и определяет актуальные направления для будущих исследований.

Ключевые слова: математическая грамотность, математическое образование, библиометрический анализ, Scopus, PISA

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