

Mapping global trends in early literacy development research for third-grade primary school students: a bibliometric analysis



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ABSTRACT

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This study aims to analyze the development and research trends of early reading and writing instruction for third-grade primary school students through a bibliometric approach. The research is grounded in the urgency to strengthen early literacy as the foundation of lifelong learning, as international assessments such as PIRLS 2021 show that Indonesian students' reading comprehension remains below the global average. Using a quantitative descriptive design with bibliometric analysis, 141 relevant articles published between 2016 and 2025 were retrieved from the Scopus database. VOSviewer was used to visualize publication trends, author productivity, and keyword co-occurrence networks. The findings indicate a steady increase in research productivity since 2020, reflecting growing global attention to foundational literacy. Keyword mapping revealed four dominant thematic clusters: (1) basic literacy and reading-writing instruction; (2) instructional interventions and reading comprehension; (3) language development and phonological awareness; and (4) emerging empirical and evidence-based studies. These patterns signify a conceptual shift from descriptive studies toward more systematic, data-driven approaches. The scientific contribution of this study lies in providing the first comprehensive global mapping specifically focused on early reading and writing research for third-grade students, identifying thematic structures, revealing research gaps, and offering a replicable bibliometric framework for future literacy studies. Additionally, the findings provide evidence-based insights that can inform literacy policy development and strengthen instructional practices in Indonesia's primary education context.



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1. Introduction

Early literacy represents a fundamental skill that forms the foundation for children's cognitive, social, and academic development in primary education. It serves as the cornerstone for building lifelong learning competencies and supporting broader intellectual growth [1]. Early literacy encompasses not only the technical ability to read and write but also phonological awareness, vocabulary mastery, comprehension, and written expression [2], [3]. These integrated abilities ensure that students can understand, interpret, and communicate ideas effectively in both oral and written forms, which are crucial for future learning success. UNESCO [4] emphasizes that literacy is a fundamental human right and a key indicator of achieving Sustainable Development Goal 4 on quality education. Children who fail to master literacy at an early age often face long-term learning difficulties, reduced academic performance, and a higher risk of school dropout. Likewise, the OECD [5] reports that limited literacy competence in the

early years has long-term implications for employment opportunities, social participation, and overall well-being. Given the central role of early literacy in shaping students' long-term learning trajectories, it is essential to systematically examine how global research has addressed early reading and writing instruction for third-grade students, a critical transition stage, through a comprehensive bibliometric analysis.

In Indonesia, challenges in early literacy remain significant. The National Assessment conducted by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) [6]–[8] shows that many students can recognize explicit information in texts but struggle to infer implicit meanings. The results of the Progress in International Reading Literacy Study (PIRLS, 2021) [9]–[11] indicate that Indonesian students' reading literacy remains below the international average. Similarly, the Early Grade Reading Assessment (EGRA) found that around 16.77% of students were unable to answer any listening comprehension questions, even though most could recognize letters and read simple words. These findings reflect persistent literacy difficulties that hinder students' learning continuity.

Various studies show that early literacy challenges occur not only at the national level, but also in various studies examining early reading and writing skills in lower grades. Various approaches have been used, such as phonics, multisensory learning, and traditional literacy-based games [12], [13]. Although these studies have made a significant contribution to the understanding of early literacy learning practices, most of them are still local, descriptive, and limited to specific contexts. To date, there has been no comprehensive mapping of how early literacy research, particularly on third-grade students as an important transitional stage, has developed at the global level. The absence of this global mapping creates a research gap in understanding trends, publication patterns, thematic directions, and conceptual developments in the field of early literacy. Therefore, a data-based analytical approach, such as bibliometrics, is needed to reveal how the structure of early literacy knowledge is formed, how its themes evolve, and where the opportunities for further research lie.

Bibliometric analysis is a relevant approach to address the needs of this study. Donthu *et al.* [14] explain that bibliometric methods enable quantitative mapping of knowledge structures through the analysis of publications, citations, and keyword networks. This method helps identify the evolution of themes, research clusters, influential publications, and research gaps in a scientific field. Therefore, this study aims to analyze global trends and research directions in early reading and writing learning among third-grade students through a bibliometric approach. The findings of this study are expected to provide a comprehensive overview of the global landscape of early literacy research and support evidence-based strategies to strengthen reading and writing learning in elementary schools. Specifically, this study contributes by presenting the first global mapping that systematically reviews early literacy research on third-grade students, identifies dominant thematic clusters, highlights emerging research directions, and reveals research gaps that have not been addressed in previous studies.

2. Method

2.1. Type of Research

This study applied a bibliometric analysis using a descriptive quantitative design to map global trends in early reading and writing research among third-grade primary school students. Bibliometric analysis was selected because it quantitatively identifies publication patterns, author productivity, and thematic relationships within a body of literature [15]. It also enables the visualization of research structures and the evolution of knowledge in a particular domain [16]. This design was appropriate since the purpose of the study was to describe patterns and directions rather than to test causal relationships.

2.2. Population and Sample

The population of this study consisted of all scientific articles indexed in the Scopus database that discussed early literacy, beginning reading, or beginning writing in the context of primary education. The search was conducted using the query: *TITLE-ABS-KEY ("early reading" OR "beginning reading" OR "early writing" OR "initial reading and writing" OR "early literacy" OR "reading readiness" OR "writing readiness" AND "primary school" OR "elementary school" OR "grade 3") AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))*. This query generated a total of 5,041 documents. After a multi-stage screening process, 141 articles were

identified as relevant and included in the analysis. The inclusion criteria were: (1) publication between 2016 and 2025; (2) written in English; (3) accessible in full text; and (4) directly related to early literacy or beginning reading and writing instruction. Articles that did not meet these criteria were excluded from the dataset.

2.3. Research Variables

This study focused on two main bibliometric variables consistent with the research objectives. The first variable was publication productivity, which examined the number of articles published per year, the distribution of journals, and author contributions to reveal the trend of publication growth from 2016 to 2025. The second variable was keyword co-occurrence, which analyzed the relationships among keywords to identify thematic clusters and conceptual directions in early literacy research. These two variables correspond to the formulated research problems regarding publication trends and thematic mapping in beginning reading and writing studies.

2.4. Instruments and Data Validity

The main instruments used in this study were VOSviewer for bibliometric visualization and Mendeley for managing bibliographic data. Supporting tools included Microsoft Excel for organizing numerical data and coding publication information. Data validity was ensured through three stages: (1) verifying the authenticity and accuracy of metadata retrieved from Scopus; (2) removing duplicate and irrelevant documents; and (3) manually cross-checking keywords and abstracts to confirm their relevance to early literacy. These procedures ensured that the dataset accurately represented research on beginning reading and writing instruction in primary education.

2.5. Data Collection Procedure

The data collection followed the PRISMA framework (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [17], which involves four main stages: identification, screening, eligibility, and inclusion; (1) Identification: All relevant documents were retrieved from the Scopus database using the defined keywords; (2) Screening: Duplicates and non-article documents (such as conference papers and book chapters) were excluded; (3) Eligibility: Titles and abstracts were reviewed to ensure relevance to early reading and writing; and (4) Inclusion: The final dataset of 141 articles was compiled for bibliometric analysis. All selected articles were exported in RIS format and imported into Mendeley for organization before analysis. The PRISMA flow diagram (Fig. 1) illustrates the selection process from initial retrieval to final inclusion.

2.6. Data Analysis

Data were analyzed through two main dimensions. The first dimension focused on publication trends, including annual growth, author productivity, and journal distribution. The second dimension examined keyword co-occurrence networks to identify conceptual clusters and research themes. Using VOSviewer, the analysis visualized bibliometric maps based on the frequency and strength of keyword relationships. Each node represented a keyword, while link strength showed the degree of association among terms. The resulting network visualization provided an overview of the research structure, dominant themes, and the evolution of early literacy studies from 2016 to 2025.

2.7. Validity

The validity of this study was maintained through both technical and conceptual validation. Technically, the data cleaning process ensured that every record was unique, accurate, and relevant. Conceptually, the interpretations derived from bibliometric mapping were compared with prior studies in similar domains [18]–[21], ensuring consistency and alignment with established research findings. These validation steps enhanced the reliability, transparency, and reproducibility of the analysis, ensuring that the conclusions drawn reflected actual global research patterns in early literacy.

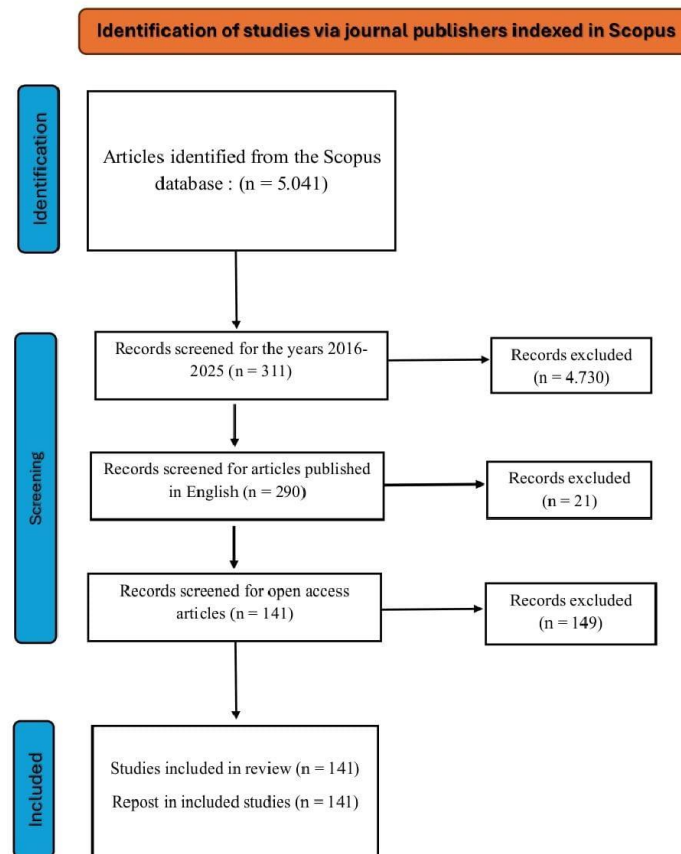


Fig. 1. Research Flow Chart

3. Results and Discussion

3.1 Publication Trends and Identification of the Most Productive Authors

The bibliometric analysis of research on beginning reading and writing among grade 3 elementary school students reveals an interesting dynamic in the growth of publications, research distribution, and academic attention to early literacy over the past decade. Bibliometric analysis shows that the productivity of researchers in the field of early reading and writing literacy in third-grade elementary school students is evenly distributed without the dominance of any particular individual or group. As shown in Fig. 2, the three most productive authors, Bremholm, J., Bundsgaard, J., and Kabel, K. Each contributed three publications during the 2016-2025 period. Seven other researchers: Agustin, M., Albuquerque, A., Becker-Mrotzek, M., Capellini, S. A., Cramman, H., Fitriangsih, A., and Fitriyana, N. Each produced two publications, while the other authors contributed one publication each. This relatively flat distribution pattern shows that early literacy research does not yet have a single “star” or center of authority, but is supported by the collective participation of international academics. This phenomenon is typical of fields that are still emerging or undergoing rapid diversification [22]–[24]. The absence of dominant authors reflects the interdisciplinary nature of early reading and writing literacy, which involves experts in education, psychology, linguistics, cognitive science, and special education [25]–[27]. In addition, most publications involve more than one author, confirming that a collaborative and multidisciplinary approach has become a key feature of this field. The participation of researchers from various countries also shows that early reading and writing literacy is a global concern, in line with Sustainable Development Goal 4 on improving the quality of basic education and foundational literacy skills (UNESCO, 2023). Overall, the absence of dominant authors and the high level of cross-country collaboration indicate that research on early reading and writing literacy at the elementary school level is at a very healthy and promising stage. This condition opens up ample space for methodological innovation, contextual perspective enrichment, and the development of more inclusive and effective evidence-based interventions. This evenly distributed productivity pattern not only

strengthens the scientific foundation of early literacy but also offers great hope for achieving global foundational literacy targets (SDG 4) through increasingly integrated and sustainable scientific cooperation.

Documents by author

Compare the document counts for up to 15 authors.

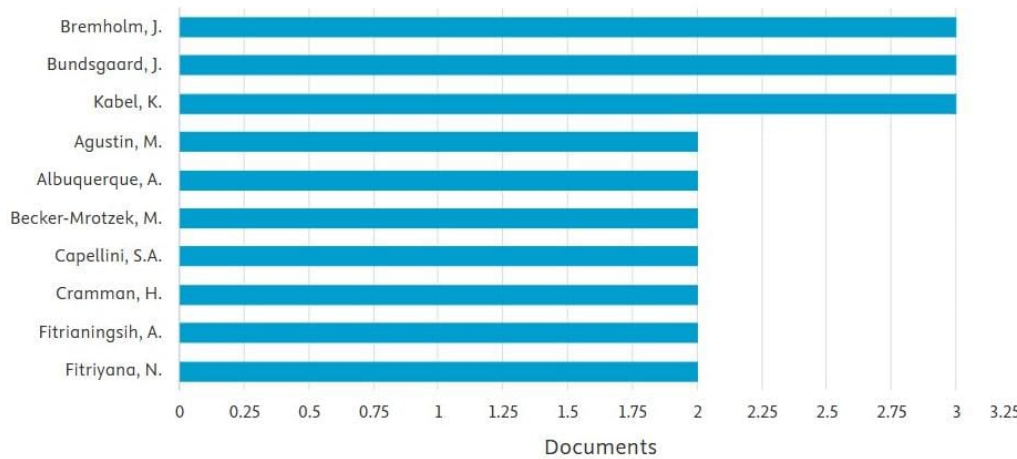


Fig. 2. Authors Productivity

The bibliometric analysis of research publications on beginning reading and writing among grade 3 elementary school students in the Scopus database for the 2016-2025 period reveals a dynamic and fluctuating developmental pattern. As shown in Fig. 3, the number of publications experienced a significant increase in 2020, reaching 22 documents, following a fluctuating trend and a sharp decline in 2018 (5 documents). The sharp rise in 2020 is presumed to be influenced by heightened academic attention to foundational literacy learning during the COVID-19 pandemic, when many studies focused on adapting reading and writing instruction to online learning environments. After peaking in 2020, the number of publications slightly decreased in 2021-2022 but remained relatively stable, averaging 16-18 publications per year.

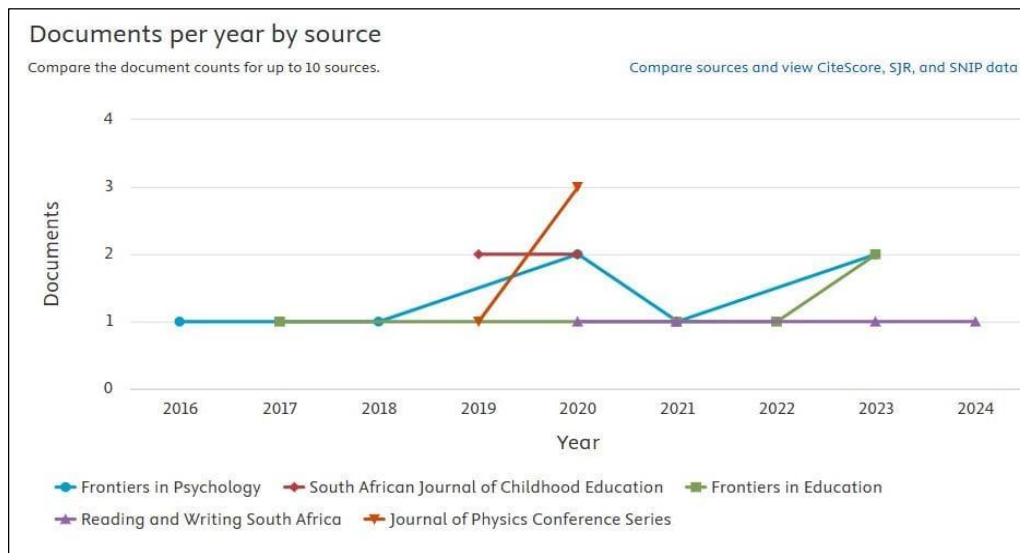


Fig. 3. Distribution Patterns of Journal Publications in the Scopus Database

Interestingly, in 2023 and 2024, the trend rose again with 20 documents before declining in 2025. This pattern illustrates that early literacy remains an important and relevant issue in the global discourse of primary education, reflecting the continuity of research despite changes in post-pandemic educational contexts. When viewed from the distribution of journal

publications, as illustrated in Fig. 4, it is evident that research on early literacy is not concentrated in a single publication outlet but is spread across multiple reputable international journals. Some of the most influential journals include *Frontiers in Psychology*, *South African Journal of Childhood Education*, *Frontiers in Education*, *Reading and Writing-South Africa*, and the *Journal of Physics Conference Series*. This dispersion indicates that research on beginning reading and writing possesses an interdisciplinary nature, as it is published not only in education journals but also in those related to psychology, linguistics, and even cross-disciplinary scientific forums.

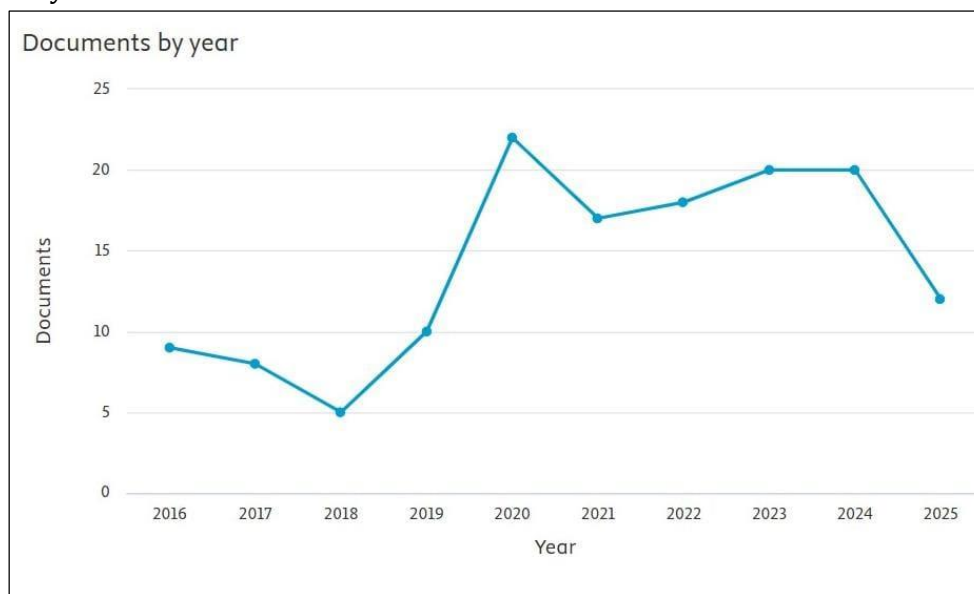


Fig. 4. Annual Distribution of Publications

The consistent contributions of journals such as *Frontiers in Psychology* and the *South African Journal of Childhood Education* further demonstrate that approaches to early literacy have become increasingly broad and integrated between pedagogical and psychological dimensions. This reinforces the understanding that beginning reading and writing skills are not limited to language acquisition but are also closely related to children's cognitive, social, and emotional development. Overall, the analysis indicates that research on beginning reading and writing at the elementary level has evolved with several defining characteristics: (1) the involvement of diverse international journals as key publication platforms; (2) an increase in research volume during specific periods despite fluctuations; (3) interdisciplinary contributions that enrich the scientific perspectives; and (4) opportunities for further research development within the context of improving the quality of basic literacy. For Indonesia, these findings are particularly significant given that the PIRLS 2021 results show that Indonesian students' reading literacy achievement remains below the international average. Therefore, early literacy research not only strengthens global scientific contributions but also serves as a strategic foundation for designing policies and instructional models in beginning reading and writing that align with the national educational context.

3.2 Trends in Research Topics Through Keyword Co-Occurrence Analysis

The visualization of keyword co-occurrence presented in Fig. 5 provides a comprehensive overview of the conceptual structure of research on early reading and writing instruction in elementary schools. This analysis was conducted using VOSviewer through the overlay visualization feature, which illustrates the temporal evolution of research themes. In the visualization, blue represents earlier themes (around 2020-2021), green indicates topics that developed in the mid-period (2021-2022), and yellow marks relatively new and emerging research themes (2022-2023). The map not only displays the relationships among keywords based on their frequency of occurrence but also demonstrates how research focus has evolved over time. The size of the circles (nodes) represents the frequency of each keyword, while the thickness of the connecting lines (link strength) indicates the strength of their thematic relationships. The larger the node and the thicker the link, the stronger the co-occurrence.

between keywords implying a closer conceptual connection. Based on the analysis, four major thematic clusters were identified, each representing an interconnected dimension of early literacy research. The first cluster, Core Literacy and Reading-Writing Instruction. This cluster includes the keywords “literacy,” “reading,” “writing,” “education,” and “primary school.” It is dominated by blue to green nodes, indicating that these topics formed the foundation of early literacy research and have been studied since the beginning of the analysis period. Studies in this cluster focus on the importance of reading and writing as fundamental skills in primary education and their relationship to academic success. Research in this group generally explores conventional teaching strategies, reading skill development, and literacy curriculum implementation in lower-grade classrooms. Because of its central position in the network, this cluster functions as the conceptual core linking all other areas of early literacy research.

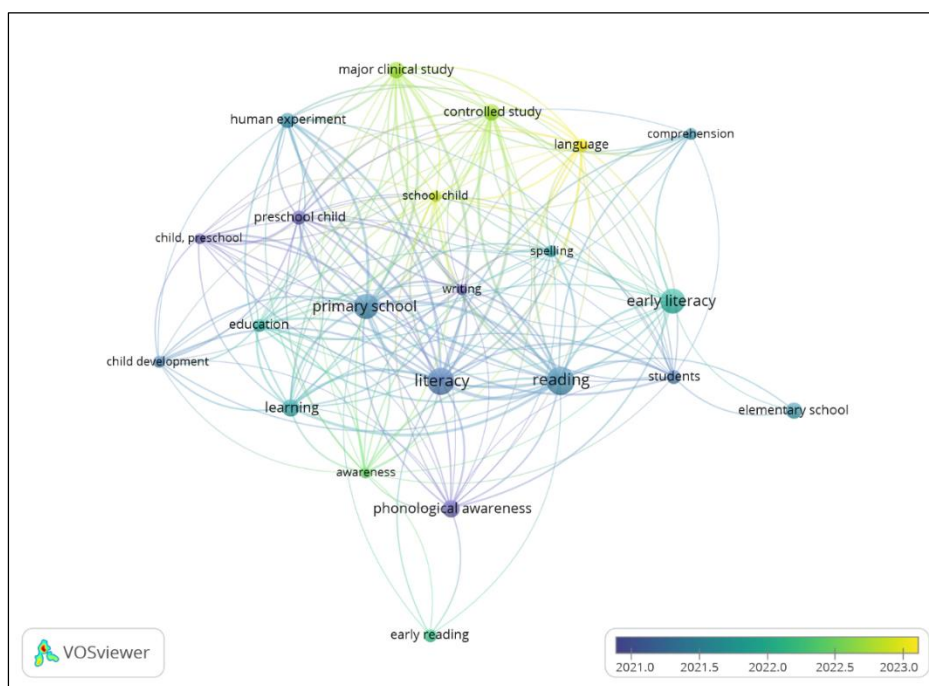


Fig. 5. Research Trends

The second cluster, Instructional Interventions and Reading Comprehension. This cluster consists of the keywords “early literacy,” “students,” “intervention,” “comprehension,” and “learning outcomes.” Its green-to-yellow color gradient suggests that the topic gained significant attention in the middle to later stages of the research period (2021–2023). The focus is on implementing instructional strategies and intervention programs to improve reading comprehension and learning outcomes among elementary students. Many studies in this group employ experimental or quasi-experimental designs to test the effectiveness of various teaching methods, including phonics-based instruction, interactive reading strategies, and contextual writing approaches. This cluster highlights a shift toward evidence-based and practice-oriented research in early literacy education. The third cluster, Linguistic Foundations and Phonological Awareness. This cluster features keywords such as “language,” “phonological awareness,” “child development,” and “preschool child.” Dominated by green tones with some yellow nodes, it serves as a bridge between foundational and emerging research trends. The primary focus lies in the relationship between language development, phonological awareness, and children’s reading readiness. Studies emphasize that the ability to recognize and manipulate the sound structure of language is a crucial foundation for early literacy success. This cluster also underscores the importance of early language stimulation during preschool years as a key factor influencing reading development in the lower elementary grades. The fourth cluster, Emerging Trends Empirical and Evidence-Based Approaches. Characterized by bright yellow nodes, this cluster represents the most recent developments in the field (2022–2023).

The dominant keywords include “controlled study,” “major clinical study,” “assessment,” and “school child.” These indicate a transition toward more empirical, data-driven, and systematic research approaches. Studies in this group focus on evaluating the effectiveness of instructional

interventions using rigorous designs such as randomized controlled trials (RCTs) and longitudinal analyses. This cluster demonstrates the growing maturity of early literacy research, where conceptual and descriptive work is increasingly complemented by measurable, evidence-based investigations. Overall, the keyword map reveals that early literacy research has undergone a dynamic and progressive evolution. Foundational themes such as literacy, reading, and writing (blue) have laid the conceptual groundwork, followed by a growing focus on instructional interventions (green-yellow), and culminating in empirical, evidence-based studies (yellow). The color transitions in the map reflect a paradigm shift from descriptive studies toward experimental and data-informed pedagogical practices. This trend indicates that research on early reading and writing instruction in elementary schools has become increasingly interdisciplinary, integrating insights from linguistics, educational psychology, and pedagogy. Beyond enriching early literacy theory, recent research directions contribute significantly to improving literacy instruction quality across diverse educational contexts. In the Indonesian context, these findings are particularly relevant given the PIRLS 2021 results, which highlight the urgent need to strengthen early literacy practices in lower-grade classrooms so they align with global research developments and improve students' reading.

4. Conclusion

The bibliometric analysis of 141 articles indexed in Scopus from 2016 to 2025 demonstrates that research on early reading and writing instruction among third-grade primary school students has developed dynamically and has increasingly gained global attention. Three key findings emerged from this study. First, the publication trend has significantly increased since 2020, especially during the COVID-19 pandemic, indicating a rising awareness of the urgency of strengthening foundational literacy. Second, the distribution of authorship shows that research productivity in this field is not dominated by specific scholars but is instead characterized by collaborative, interdisciplinary contributions across countries and academic disciplines. Third, keyword co-occurrence analysis reveals four major thematic clusters that reflect a shift from descriptive studies toward more empirical, data-driven, and evidence-based approaches. The scientific contribution of this study is threefold; (1) Theoretically, this study provides a comprehensive global mapping of the conceptual structure of early reading and writing research for third-grade students, offering a clearer understanding of how thematic focuses such as phonological awareness, reading comprehension, and instructional interventions have evolved over time; (2) Methodologically, this research contributes by applying a systematic bibliometric approach incorporating performance analysis and science mapping, thereby establishing a replicable analytical model that can be used by future literacy researchers; and (3) Practically, the study highlights global research gaps and emerging themes that can inform the development of literacy policies, instructional models, and teacher training programs, particularly in countries where early literacy challenges persist, such as Indonesia. In the Indonesian context, these findings provide empirical evidence supporting the urgent need to enhance reading and writing instruction at the early primary level, especially considering that PIRLS 2021 results show that students' reading literacy remains below the international average. Future research is encouraged to expand the scope of bibliometric analysis using advanced techniques such as thematic evolution analysis, co-citation mapping, or structural topic modeling to capture deeper conceptual shifts in early literacy scholarship. Overall, this study not only maps global trends and research directions but also offers explicit theoretical, methodological, and practical contributions that strengthen the scientific foundation for improving literacy instruction and educational policy in Indonesia.

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- Conflict of interest** : The authors declare no conflict of interest.
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