

Mapping the intellectual structure of early reading development research: A bibliometric analysis

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Abstract

Early reading development has become an increasingly important area of research in literacy and language education due to its significant contribution to children's academic achievement and lifelong learning. This study aimed to map the intellectual structure, publication trends, dominant themes, influential publications, and emerging research directions in early reading development research published between 2020 and 2026. The study employed a bibliometric research design using data retrieved from Google Scholar through Publish or Perish. A total of 500 publications were collected and analyzed using VOSviewer to generate network, overlay, and density visualizations based on co-occurrence analysis. The findings revealed a fluctuating yet generally positive publication trend, with the highest number of publications recorded in 2025 (102 publications; 20.44%) and the lowest among completed publication years in 2023 (63 publications; 12.63%). The co-occurrence analysis identified several dominant themes, including literacy skill, oral language ability, phonological awareness, language comprehension, early literacy skill, and home literacy environment. In addition, the results demonstrated that early reading development research has evolved into an interdisciplinary field integrating literacy education, psychology, linguistics, and educational technology. Emerging themes such as digital literacy, inclusive literacy education, and technology-assisted literacy learning further indicate the shifting direction of contemporary literacy research. Overall, this study provides a comprehensive overview of the intellectual landscape of early reading development research and offers important implications for future literacy and language education studies.

Keywords: early reading development, literacy skill, oral language ability, language comprehension, literacy education

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Contribution to Literature: This study contributes to the expand current understanding of the intellectual structure of literacy research and offer important directions for future studies in literacy education, oral language development, and reading intervention.

1. Introduction

Reading development has become one of the most essential foundations of educational success and lifelong learning in contemporary education systems. Early reading ability enables children to acquire knowledge, develop critical thinking, and actively participate in social and academic environments. Conversely, difficulties in reading acquisition may hinder children's academic achievement and broader cognitive development across educational stages (Robles & Navarro, 2013; Rodríguez Gallardo, 2007). In this regard, literacy competence is not merely associated with school performance but also reflects children's opportunities for future participation in society and knowledge construction. International organizations such as United Nations Educational, Scientific and Cultural Organization have repeatedly reported alarming literacy conditions worldwide, emphasizing that millions of children still fail to achieve minimum reading proficiency levels (UNESCO, 2017). Similarly, global educational assessments have demonstrated persistent concerns regarding reading achievement, particularly among students in developing countries, where literacy disparities remain highly visible (Márquez Jiménez, 2017).

The growing concern regarding literacy achievement has encouraged researchers to investigate the fundamental components contributing to successful reading development. Previous studies have consistently highlighted that reading acquisition is strongly influenced by multiple linguistic and cognitive factors, including oral language skills, phonological awareness, vocabulary knowledge, syntax, decoding abilities, and letter knowledge (Kendeou et al., 2009; Muter et al., 2004; Whitehurst & Lonigan, 1998). Among these variables, oral language skills have received substantial scholarly attention because they function as the foundation for literacy development and reading comprehension. Oral communication competence supports children's ability to recognize sounds, understand vocabulary, interpret meaning, and construct linguistic relationships necessary for decoding written texts (Lepola et al., 2016; Owens, 2012). Furthermore, deficits in oral language development have been associated with delayed reading achievement and limited literacy acquisition among elementary school students (Gutiérrez Fresneda & Díez Mediavilla, 2018; Holopainen et al., 2001).

In addition to oral language competence, letter knowledge has also been widely recognized as a strong predictor of reading success. Several longitudinal and developmental studies have emphasized that children's ability to identify and discriminate letters significantly contributes to reading fluency, decoding skills, and comprehension abilities in later educational stages (Lonigan et al., 2000; Schatschneider et al., 2004; Snowling & Hulme, 2012). Likewise, Leppänen et al. (2008) argued that letter knowledge not only predicts early reading acquisition but also influences long-term reading comprehension and fluency development. Existing evidence further suggests that oral language skills and letter knowledge are interconnected dimensions that collectively shape children's literacy trajectories (Blaklock, 2004; Kendeou et al., 2009). Consequently, contemporary literacy research increasingly views reading development as a multidimensional process involving complex interactions among linguistic, cognitive, and educational factors.

The importance of reading development research has become even more significant following the educational disruptions caused by the COVID-19 pandemic. Recent reports revealed that school closures affected the learning processes of millions of children

worldwide, resulting in substantial literacy learning loss and increasing the number of children below minimum reading proficiency levels (United Nations, 2021; UNESCO, 2020). In many educational contexts, particularly in low- and middle-income countries, the pandemic intensified pre-existing literacy inequalities and created additional challenges for reading instruction and intervention programs. These conditions have stimulated an increasing volume of scholarly publications investigating literacy learning, early reading intervention, emergent literacy, and language development across diverse educational settings.

As research on early reading development continues to expand, the field has become increasingly interdisciplinary, incorporating perspectives from language education, cognitive psychology, literacy studies, educational assessment, and special education. Numerous empirical studies have examined predictors of reading ability, intervention strategies, phonological awareness, oral language development, and literacy instruction practices (Lepola et al., 2016; Muter et al., 2004; Snowling & Hulme, 2012). However, despite the growing body of literature, limited attention has been given to systematically mapping the intellectual structure and thematic evolution of early reading development research itself. Existing studies predominantly focus on empirical findings within specific educational contexts, while comprehensive bibliometric investigations identifying publication trends, influential authors, collaboration networks, thematic clusters, and emerging research directions remain relatively scarce.

Bibliometric analysis provides an important methodological approach for examining the development and knowledge structure of a scientific field through quantitative mapping techniques. Through co-occurrence analysis, co-citation networks, thematic evolution, and scientific collaboration mapping, bibliometric studies enable researchers to identify dominant themes, influential publications, conceptual relationships, and future research opportunities within a discipline. In literacy and language education research, bibliometric approaches can offer a broader understanding of how early reading development studies have evolved over time and how different research themes are interconnected across scholarly communities.

Therefore, this study aims to map the intellectual structure of early reading development research through a bibliometric analysis of scholarly publications indexed in international databases. Specifically, the study seeks to identify publication trends, influential authors and journals, dominant research themes, collaboration patterns, and emerging topics shaping the future direction of early reading development research within the fields of literacy and language education.

2. Literature Review

Early reading development has become one of the most widely discussed topics in literacy and language education research due to its strong relationship with children's academic achievement and long-term educational success. Reading is not merely a technical skill of decoding written symbols, but rather a multidimensional process involving linguistic, cognitive, and communicative competencies (Owens, 2012; Whitehurst & Lonigan, 1998). Consequently, researchers have continuously explored various factors influencing reading acquisition, including oral language skills, phonological awareness, vocabulary knowledge, syntax, decoding ability, and letter knowledge (Kendeou et al., 2009; Muter et al., 2004). These components are considered fundamental because they shape children's ability to interpret meaning, recognize linguistic structures, and comprehend written texts effectively.

Numerous studies have emphasized the significant role of oral language skills in reading development. Oral communication competence contributes to vocabulary growth,

phonological processing, grammatical understanding, and narrative comprehension, all of which are essential for literacy acquisition (Lepola et al., 2016; Gutiérrez Fresneda & Diez Mediavilla, 2018). Similarly, previous research has demonstrated that children with stronger oral language foundations tend to achieve better reading fluency and comprehension performance than those with limited linguistic abilities (Holopainen et al., 2001; Muter et al., 2004). In this context, oral language development is frequently viewed as the foundation of emergent literacy and early reading success.

In addition to oral communication competence, letter knowledge has consistently emerged as one of the strongest predictors of reading achievement. Studies conducted by Lonigan et al. (2000), Schatschneider et al. (2004), and Snowling & Hulme (2012) revealed that children's ability to identify and discriminate letters significantly influences decoding skills and reading comprehension. Furthermore, Leppänen et al. (2008) argued that letter knowledge contributes not only to early literacy acquisition but also to long-term reading fluency. These findings indicate that reading development is influenced by interconnected linguistic components rather than isolated skills.

Table 1 presents selected previous studies related to early reading development, literacy, and bibliometric research. The studies demonstrate that scholarly attention has been directed toward various aspects of literacy development, including oral language development, research trend analysis, and knowledge mapping. For instance, Reed and Lee (2020) emphasized the importance of oral language development in supporting young learners' literacy acquisition, while Wang et al. (2024) examined the evolution of early reading research through dynamic topic modeling to identify changing research trajectories over time. From a bibliometric perspective, McManus et al. (2024) mapped the intellectual structure and knowledge base of food literacy research, whereas Elmiati et al. (2025) conducted a scientometric and bibliometric investigation of phoneme–grapheme recognition in early EFL literacy development. Although these studies provide valuable insights into literacy-related research trends and specific literacy domains, comprehensive bibliometric studies focusing on the intellectual structure, thematic evolution, influential publications, collaboration networks, and emerging topics in early reading development research remain limited. Therefore, a bibliometric approach is needed to provide a broader understanding of the development of this field and to identify future research directions.

Table 1. Previous studies related to early reading development research.

No	Title	Reference
1	Mapping the intellectual structure and knowledge base of food literacy research: A bibliometric analysis	McManus et al. (2024)
2	The importance of oral language development in young literacy learners: Children need to be seen and heard	Reed & Lee (2020)
3	Dynamic insights into research trends and trajectories in early reading: an analytical exploration via dynamic topic modeling	Wang et al. (2024)
4	Phoneme–grapheme recognition in early EFL literacy development: A scientometric and bibliometric mapping study	Elmiati et al. (2025)

3. Research Method

3.1. Research Design

This study employed a bibliometric research design to map the intellectual structure and research trends in early reading development studies. Bibliometric analysis is widely used to evaluate scientific publications quantitatively and systematically through citation analysis, co-occurrence mapping, and network visualization. This approach enables

researchers to identify influential publications, dominant themes, collaboration patterns, and emerging topics within a specific research field. In the context of this study, bibliometric analysis was utilized to explore the development of research related to early reading development, literacy, oral language skills, and reading ability.

3.2.Data Sources

The data sources used in this study were scholarly publications indexed in the Google Scholar database. The data retrieval process was conducted using Publish or Perish software, which facilitates citation-based searches and bibliometric data extraction from various academic databases. The search process focused on publications related to early reading development and associated literacy topics published between 2020 and 2026. The selected time range was intended to capture recent developments and emerging research trends in literacy and language education studies following the increasing global attention to reading development and literacy intervention programs.

3.3.Procedure of Data Collection

The search procedure employed several keywords associated with the topic of early reading development, including “early reading development”, “reading ability”, “emergent literacy”, “oral language skills”, and “reading comprehension”. The search was conducted systematically using Publish or Perish, resulting in a total of 499 publications. After the retrieval process, the data were screened and organized based on relevance to the study topic. Subsequently, the twenty most-cited articles were selected for further analysis because highly cited publications are generally considered influential contributions that shape the intellectual foundation of a research field.

3.4.Data Analysis

The collected bibliographic data were then exported in RIS and CSV formats for visualization and mapping analysis. The analysis process utilized VOSviewer to generate bibliometric network visualizations. VOSviewer was employed to analyze keyword co-occurrence, citation relationships, and thematic clusters within early reading development research. Through network visualization, overlay visualization, and density visualization, this study identified dominant research themes, conceptual relationships, and emerging trends in the field. In addition, descriptive bibliometric indicators such as publication trends, citation frequency, and influential authors were analyzed to provide a comprehensive overview of the development of early reading development research from 2020 to 2026.

4. Results and Discussion

4.1.Intellectual Structure of Early Reading Development Research (2020- 2026)

As presented in Table 2 and visualized in Figure 1, publication activity related to early reading development research exhibited a fluctuating yet generally positive pattern between 2020 and 2026. In 2020, the field recorded 77 publications (15.43%), indicating substantial scholarly attention to topics such as early literacy, oral language development, and reading acquisition. A slight decline was observed in 2021, with 67 publications (13.43%), although research productivity remained relatively strong during this period.

Research output increased again in 2022, reaching 74 publications (14.83%), reflecting renewed scholarly interest in literacy development, phonological awareness, and reading comprehension. However, publication activity declined slightly in 2023 to 63 publications (12.63%), representing the lowest annual output among the completed publication years included in this study. Despite this decrease, the overall trajectory of

research remained stable and continued to demonstrate sustained academic engagement with early reading development.

A notable increase occurred in 2024, with publication output rising to 82 publications (16.43%). This upward trend continued in 2025, which recorded 102 publications (20.44%), representing the highest publication output during the observation period. The substantial growth in these two years suggests increasing global attention to literacy development, oral language competence, reading intervention, and evidence-based literacy instruction. The expansion of research output may also reflect heightened interest in addressing literacy challenges and learning recovery efforts following the educational disruptions experienced during and after the COVID-19 pandemic.

In contrast, 2026 recorded 34 publications (6.81%), representing the lowest proportion within the dataset. This figure should be interpreted cautiously because the year was still in progress at the time of data collection, meaning that additional publications are likely to be indexed and included in future database updates. Therefore, the lower publication count for 2026 does not necessarily indicate a decline in scholarly interest but rather reflects the incomplete coverage of the publication year.

Overall, the findings demonstrate that early reading development has emerged as a dynamic and expanding research area within literacy and language education. Although annual publication output experienced several fluctuations, the overall trend indicates growing scholarly recognition of the importance of literacy development, oral language skills, reading comprehension, and early intervention in supporting children's educational success and lifelong learning.

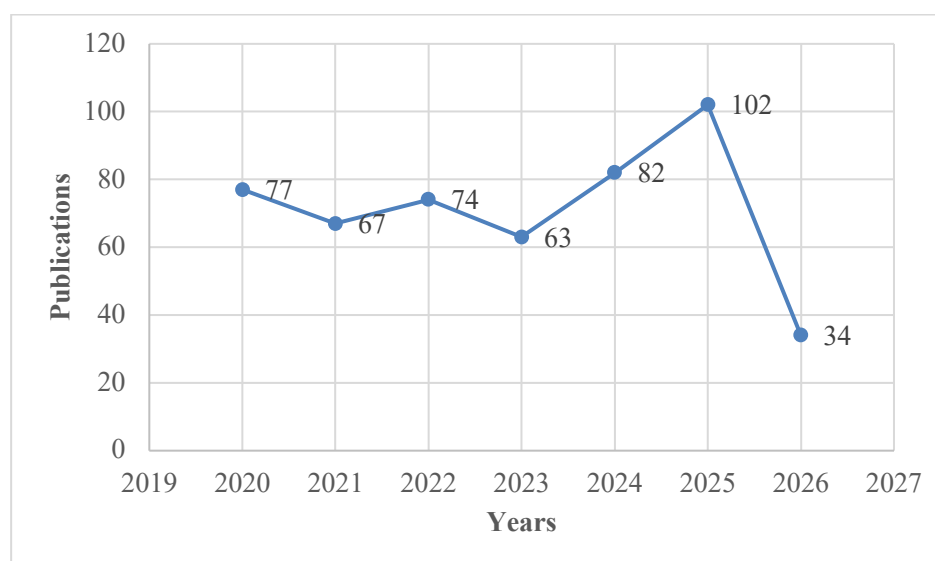


Figure 1. Annual report of publications.

Table 2. Annual report on intellectual structure of early reading development research.

Years	Publications	% of Publications
2020	77	15,43%
2021	67	13,43%
2022	74	14,83%
2023	63	12,63%
2024	82	16,43%
2025	102	20,44%
2026	34	6,81%
Total	499	100 %

4.2. Most Influential and Highly Cited Publications

Citation analysis was conducted to identify the most influential publications contributing to the development of early reading development research between 2020 and 2026. Highly cited publications generally indicate strong scholarly influence and play an important role in shaping theoretical perspectives, conceptual frameworks, and research directions within a scientific field. In bibliometric studies, citation frequency is commonly used to measure the academic impact and visibility of publications across scholarly communities.

As presented in Table 3, the most highly cited publication was Hierarchical and Dynamic Relations of Language and Cognitive Skills to Reading Comprehension: Testing the Direct and Indirect Effects Model of Reading (DIER) by Kim (2020), which received 311 citations with an average of 51.83 citations per year. This study significantly contributed to the understanding of how language and cognitive skills interact dynamically in reading comprehension processes. The second most cited article was How Morphology Impacts Reading and Spelling: Advancing the Role of Morphology in Models of Literacy Development by Levesque et al. (2021), with 301 citations, highlighting the growing scholarly interest in morphology and literacy development.

Several influential studies were also dominated by themes related to oral language competence, dyslexia, reading comprehension, literacy intervention, and emergent literacy development. For example, studies by Snowling et al. (2020) and colleagues consistently appeared among the most cited publications, emphasizing the critical importance of oral language in reading disorders and literacy acquisition. Likewise, highly cited publications discussing storytelling, dialogic reading, digital literacy, and e-book reading suggest that recent literacy research has increasingly integrated technological and interactive approaches into reading development studies.

The citation patterns further demonstrate that early reading development research is strongly connected to interdisciplinary themes involving cognitive psychology, linguistics, literacy education, educational technology, and special education. Topics such as developmental language disorder (DLD), dyslexia, speech sound disorder, and reading comprehension emerged as highly influential research areas, indicating the growing attention toward inclusive literacy education and intervention-based studies. Moreover, the presence of studies focusing on social robots, digital storytelling, and e-book reading reflects an emerging shift toward technology-enhanced literacy instruction and digital learning environments.

Overall, the findings reveal that influential publications in early reading development research predominantly focus on the interaction between oral language skills, cognitive processes, literacy acquisition, and reading comprehension. The dominance of these themes indicates that contemporary literacy research increasingly emphasizes multidimensional and integrative approaches to understanding reading development. Furthermore, the citation trends suggest that future studies are likely to continue exploring innovative literacy interventions, technology-assisted reading instruction, and inclusive approaches to literacy development across diverse educational contexts.

Table 3. Most cited articles on intellectual structure of early reading development research.

No	Cites	Title	Year	Cites Per Year	Ref.
1	311	Hierarchical and dynamic relations of language and cognitive skills to reading comprehension: Testing the direct and indirect effects model of reading (DIER)	2020	51.83	Kim (2020)

No	Cites	Title	Year	Cites Per Year	Ref.
2	301	How morphology impacts reading and spelling: Advancing the role of morphology in models of literacy development	2021	60.20.00	Levesque et al. (2021)
3	289	Preschool teachers' perceptions about read-alouds as a means to support children's early literacy and language development	2021	57.80	Alatalo & Westlund (2021)
4	285	Dyslexia and developmental language disorder: Comorbid disorders with distinct effects on reading comprehension	2020	47.50.00	Snowling et al. (2020)
5	253	Investigating the comprehension iceberg: Developing empirical benchmarks for early-grade reading in agglutinating African languages	2020	42.17.00	Spaull et al. (2020)
6	244	Annual Research Review: Reading disorders revisited—the critical importance of oral language	2021	48.80	Snowling & Hulme (2021)
7	233	Improving reading comprehension, science domain knowledge, and reading engagement through a first-grade content literacy intervention.	2021	46.60	Kim et al. (2021)
8	223	Toward integrative reading science: The direct and indirect effects model of reading	2020	37.17.00	Kim (2020b)
9	219	A cumulative risk and resilience model of dyslexia	2022	54.75	Catts & Petscher (2022)
10	196	The impact of e-book reading on young children's emergent literacy skills: An analytical review	2021	39.20.00	López-Escribano et al. (2021)
11	164	Enhancing storytelling activities to support early (digital) literacy development in early childhood education	2020	27.33.00	Maureen et al. (2020)
12	162	The perceived challenges in reading of learners: Basis for school reading programs	2021	32.40.00	Tomas et al. (2021)
13	157	Reading risk in children with speech sound disorder: Prevalence, persistence, and predictors	2020	26.17.00	Tambyraja et al. (2020)
14	146	Expanding the Direct and Indirect Effects Model of Writing (DIEW): Reading–writing relations, and dynamic relations as a function of measurement/dimensions of written composition	2022	36.50.00	Kim & Graham (2022)
15	144	The story so far: A systematic review of the dialogic reading literature	2022	36.00.00	Pillinger & Vardy (2022)
16	142	The relation between time spent reading and reading comprehension throughout the life course	2020	1,004861 11	Locher & Pfof (2020)

No	Cites	Title	Year	Cites Per Year	Ref.
17	137	Social robots and young children's early language and literacy learning	2020	0,97430556	Neumann (2020)
18	136	Language and reading progress of young deaf and hard-of-hearing children	2020	0,96319444	Antia et al. (2020)
19	132	Language, literacy and cognitive skills of young adults with developmental language disorder (DLD)	2020	22.00	Botting (2020)
20	123	Early literacy research, 2006–2015: A decade of measured progress	2020	20.50	Teale et al. (2020)

4.3. Visualization of Research Data Mapping of Intellectual Structure of Early Reading Development Research

The bibliometric mapping analysis was conducted using VOSviewer to visualize the co-occurrence relationships among terms extracted from the selected publications. The minimum number of occurrences of a term was set at 10. Out of 2,534 identified terms, 71 terms met the threshold requirement, and 43 terms were finally selected for network visualization analysis. The mapping results demonstrate the conceptual structure and thematic relationships within early reading development research from 2020 to 2026.

As illustrated in Figure 2, the co-occurrence network reveals a structured distribution of interconnected themes, resulting in the identification of five major clusters, each representing dominant research focuses within the field of early reading development research. The visualization further indicates that the terms are strongly interconnected, suggesting that literacy development studies are highly interdisciplinary and involve multiple dimensions of language learning, literacy acquisition, cognitive development, and educational intervention.

The first cluster (red), consisting of 12 items, includes children, comprehension skill, early reading development, English, learner, oral language development, oral language proficiency, strategy, student, teacher, text, and writing. This cluster primarily reflects literacy instruction and classroom-oriented literacy practices, emphasizing reading comprehension, learner engagement, oral language competence, and instructional strategies within language learning environments. The prominence of terms such as student, teacher, and writing indicates that literacy development research strongly focuses on pedagogical practices and learner-centered literacy instruction.

The second cluster (green), comprising 8 items, includes early childhood, evidence, foundation, kindergarten, language development, literacy development, oral language ability, and spoken language. This cluster represents foundational literacy and early childhood language acquisition studies. The appearance of terms such as kindergarten, spoken language, and oral language ability suggests that early literacy development is closely associated with oral communication competence and foundational language skills during early childhood education stages.

The third cluster (blue), consisting of 8 items, includes developmental language disorder, early literacy skill, influence, language comprehension, predictor, preschooler, and time. This cluster highlights research related to literacy predictors, developmental language disorders, and longitudinal literacy development. The strong linkage between language comprehension, predictor, and early literacy skill indicates that researchers increasingly examine factors influencing children's reading success and literacy achievement over time.

The fourth cluster (yellow), containing 8 items, includes assessment, code, importance, literacy skill, research, risk, systematic review, and year. This cluster mainly

reflects methodological and evaluative dimensions of literacy studies. The presence of terms such as assessment, risk, and systematic review indicates growing scholarly attention toward evidence-based literacy assessment, literacy risk identification, and review-based investigations in reading development research.

The fifth cluster (purple), with 7 items, includes contribution, fluency, home literacy environment, impact, phonological awareness, relationship, and young child. This cluster represents literacy environment and phonological development studies, emphasizing the relationship between home literacy practices, phonological awareness, and children's reading fluency. The emergence of home literacy environment as a connected term suggests increasing recognition of family and environmental influences on literacy acquisition and reading development.

Overall, the network visualization demonstrates that early reading development research is dominated by interconnected themes involving oral language competence, literacy instruction, reading comprehension, phonological awareness, developmental language disorders, and literacy environments. The strong interconnectivity among clusters further indicates that literacy development is increasingly viewed as a multidimensional and interdisciplinary research area integrating educational, linguistic, psychological, and social perspectives.

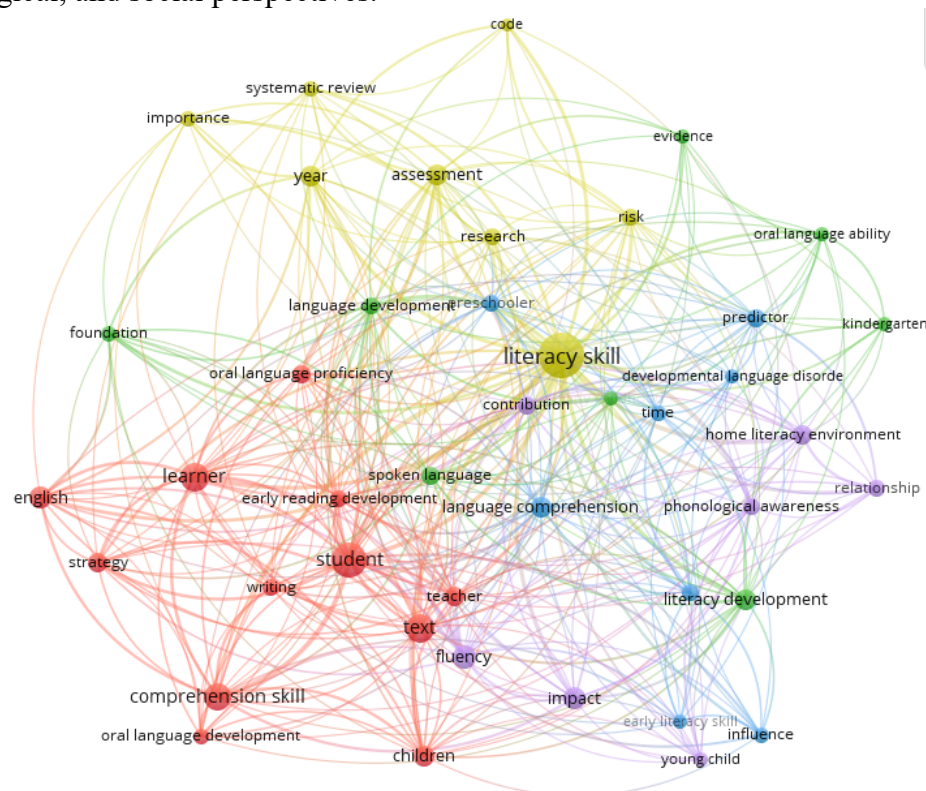


Figure 2. Network visualization based on co-occurrence of terms.

Figure 3 presents the overlay visualization of co-occurrence terms, illustrating the temporal evolution of research themes in early reading development studies. The color variation from dark blue to yellow represents the progression of publication trends over time, where darker colors indicate earlier research attention and brighter colors indicate more recent and emerging topics. Based on the visualization, earlier studies tended to focus on fundamental themes such as English, strategy, assessment, and year, reflecting the initial concentration on literacy instruction and foundational reading practices.

More recent studies increasingly emphasize themes such as literacy skill, phonological awareness, home literacy environment, influence, and impact. The

emergence of these terms suggests a shift toward more comprehensive literacy perspectives involving environmental, cognitive, and developmental dimensions. In addition, themes related to language comprehension, oral language proficiency, and early literacy skill indicate growing scholarly interest in examining the interaction between oral language competence and reading achievement. The overlay visualization further demonstrates that current literacy research increasingly integrates multidimensional approaches involving early childhood education, language development, literacy assessment, and educational intervention.

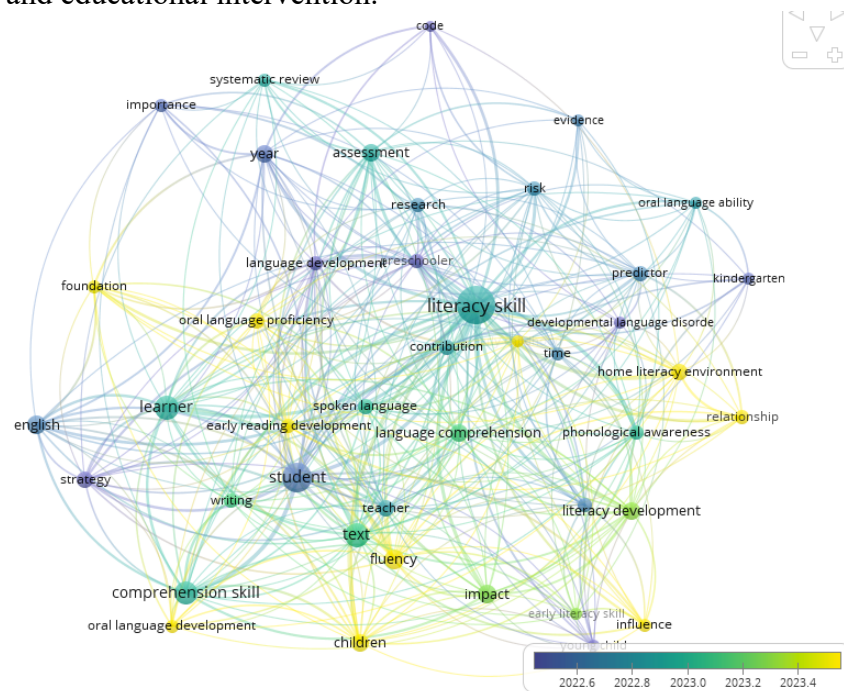


Figure 3. Overlay visualization based on co-occurrence of terms.

Figure 4 illustrates the density visualization of co-occurrence terms within early reading development research. In this visualization, brighter colors indicate terms with higher occurrence frequency and stronger relational intensity, whereas darker colors represent less dominant themes. The term literacy skill appears as the most dominant and central theme, indicating that literacy competence remains the primary focus within early reading development research. Other highly prominent terms include student, learner, text, fluency, and comprehension skill, reflecting strong scholarly attention toward reading comprehension, learner literacy performance, and instructional literacy practices.

Furthermore, terms such as oral language proficiency, language comprehension, phonological awareness, and literacy development also appear with relatively high density, suggesting that oral language and cognitive-linguistic factors play substantial roles in literacy acquisition studies. The visualization additionally highlights emerging themes such as home literacy environment, developmental language disorder, and oral language ability, which indicate increasing research interest in inclusive literacy education and environmental influences on reading development. Overall, the density visualization confirms that early reading development research has evolved into a broad interdisciplinary field emphasizing literacy competence, oral language development, reading comprehension, and evidence-based educational intervention.



Figure 4. Density visualization based on the co-occurrence of terms.

Further analysis was conducted to examine the specific relational networks surrounding several dominant terms within early reading development research, namely *early reading development*, *oral language ability*, and *literacy skill*. These focused visualizations provide a deeper understanding of how particular themes are conceptually connected to other research topics and how they contribute to the broader intellectual structure of the field.

As illustrated in Figure 5, the network visualization based on *early reading development* demonstrates strong connections with terms such as *student*, *learner*, *teacher*, *writing*, *comprehension skill*, *oral language development*, and *text*. The visualization indicates that early reading development research is closely associated with classroom literacy practices, instructional strategies, and learner-centered approaches. In particular, the close relationship between *early reading development* and *comprehension skill* suggests that reading acquisition is not limited to decoding ability but also involves higher-order comprehension processes and language understanding. Furthermore, the linkage with *teacher* and *student* highlights the important role of instructional interaction and educational support in fostering literacy development among young learners.

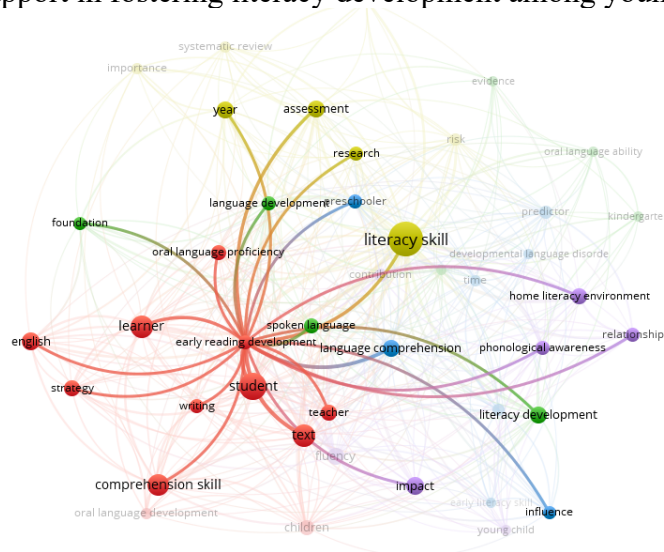


Figure 5. Network visualization based on early reading development.

Figure 6 presents the network visualization centered on *oral language ability*. The visualization reveals strong relationships between oral language ability and terms such as *kindergarten*, *spoken language*, *predictor*, *language comprehension*, *literacy development*, and *phonological awareness*. These connections indicate that oral language competence functions as a foundational component in literacy acquisition and early reading achievement. The association with *predictor* further suggests that oral language ability is frequently examined as an important variable influencing reading fluency, comprehension, and literacy success. Moreover, the strong linkage between *oral language ability* and *kindergarten* reflects the substantial scholarly attention devoted to early childhood language development as a basis for literacy learning.

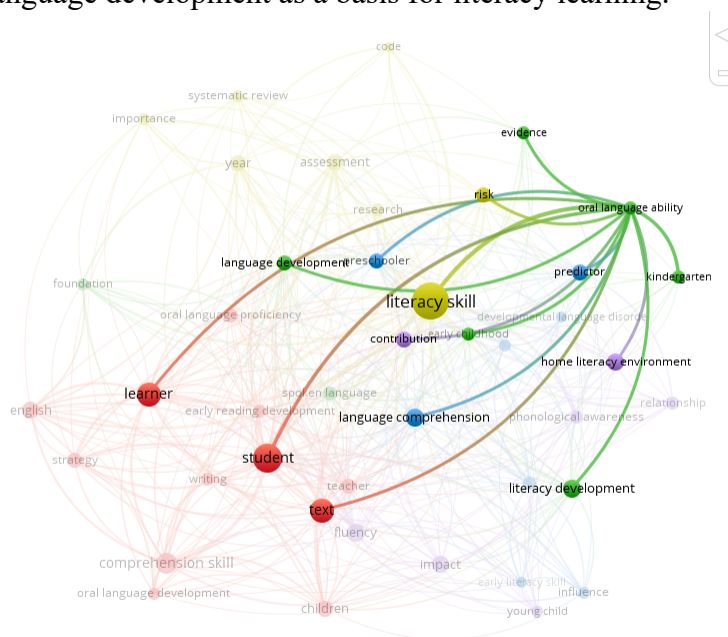


Figure 6. Network visualization based on oral language ability.

Meanwhile, Figure 7 illustrates the network visualization based on *literacy skill*, which appears as one of the most central and dominant terms in the bibliometric mapping. The visualization demonstrates that *literacy skill* is strongly interconnected with terms such as *assessment*, *research*, *language comprehension*, *fluency*, *impact*, *home literacy environment*, and *phonological awareness*. This finding indicates that literacy skill research encompasses multidimensional perspectives involving cognitive processes, environmental influences, literacy assessment, and educational intervention. The strong connection between *literacy skill* and *phonological awareness* further confirms the continuing importance of phonological competence in literacy acquisition studies, while the linkage with *home literacy environment* highlights the role of family literacy practices in supporting children's reading development.

Overall, these focused network visualizations demonstrate that early reading development research is characterized by complex conceptual relationships among literacy competence, oral language ability, instructional practices, cognitive-linguistic development, and environmental influences. The findings further reinforce the view that literacy acquisition is a multidimensional process requiring integrative approaches across language education, psychology, literacy studies, and early childhood education.

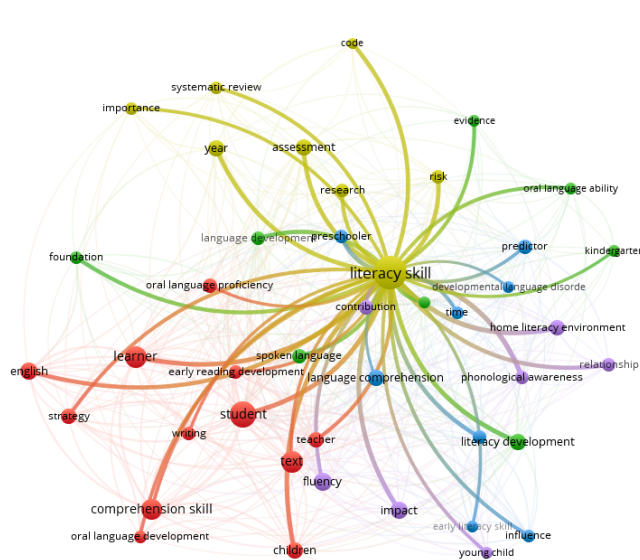


Figure 7. Network visualization based on literacy skill.

4.4. Synthesis and Implications

The findings of this bibliometric study indicate that early reading development research has evolved into a multidimensional and interdisciplinary field integrating literacy education, oral language development, cognitive psychology, phonological awareness, and educational intervention. The dominance of themes such as literacy skill, oral language ability, language comprehension, and phonological awareness demonstrates that reading acquisition is increasingly understood as a complex process influenced by interconnected linguistic and cognitive factors. These findings are consistent with previous studies emphasizing that oral language competence, vocabulary knowledge, and phonological processing significantly contribute to reading comprehension and literacy achievement (Kendeou et al., 2009; Muter et al., 2004; Whitehurst & Lonigan, 1998). Similarly, the strong relational networks surrounding oral language ability and literacy skill support earlier findings that oral communication competence and foundational literacy skills function as important predictors of reading success among young learners (Lepola et al., 2016; Snowling & Hulme, 2012).

Furthermore, the visualization analysis reveals an increasing scholarly focus on literacy environments, inclusive literacy education, and technology-enhanced reading instruction. The emergence of themes such as home literacy environment, digital literacy, developmental language disorder, and impact reflects a growing recognition that literacy development extends beyond classroom instruction and involves environmental, technological, and social dimensions. These findings align with recent studies highlighting the role of family literacy practices, digital storytelling, and interactive literacy interventions in supporting children's reading development (López-Escribano et al., 2021; Maureen et al., 2020). Therefore, this study implies that future literacy research should continue to adopt integrative and innovative approaches by combining oral language development, literacy intervention, educational technology, and learner-centered pedagogies to support sustainable reading achievement in diverse educational contexts.

5. Conclusion

This bibliometric study mapped the intellectual structure and research development of early reading development studies published between 2020 and 2026. The findings revealed that research in this field has shown a consistent increase over time, indicating growing scholarly attention toward literacy development, oral language competence,

reading comprehension, and early literacy intervention. The publication trend further demonstrates that early reading development has become an important interdisciplinary area involving literacy education, psychology, linguistics, educational technology, and special education.

The analysis also identified influential authors, highly cited publications, and dominant research themes shaping the field. Themes such as literacy skill, oral language ability, phonological awareness, language comprehension, and home literacy environment emerged as central topics within the co-occurrence network. In addition, the visualization analysis showed that contemporary literacy research increasingly emphasizes multidimensional approaches integrating oral language development, cognitive processes, literacy environments, and learner-centered instructional strategies.

Furthermore, the bibliometric mapping revealed several emerging research directions, including digital literacy, inclusive literacy education, developmental language disorders, and technology-assisted literacy learning. These findings indicate that early reading development research continues to evolve toward more innovative and comprehensive literacy perspectives. Therefore, future studies are encouraged to explore integrative literacy interventions, longitudinal literacy development, digital learning environments, and inclusive reading instruction practices to support sustainable literacy achievement across diverse educational contexts.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article.

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Author Contributions

Fadli: Conceptualization, initial draft writing; methodology; Ikra: Data collection, editing; Rahman: Revision.

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