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Student Literacy and Literacy Skills in Higher Education: A Bibliometric Review

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ABSTRACT

Student literacy and literacy skills are crucial in developing critical thinking, analytical abilities, and overall academic success in higher education. This study provides an initial overview of research developments on these topics through a bibliometric analysis of studies published between 2004 and 2023. Data were collected from the Scopus database, identifying 675 relevant publications, and analyzed using tools such as Scopus, Mendeley, and VOSViewer to explore research trends, dominant keywords, and collaboration networks in this field. The findings reveal that studies on student literacy have steadily increased over the past two decades, with the United States and Indonesia as leading contributors. Key themes frequently emerging in these studies include literacy, students, writing, reading, and teaching. Despite this growing interest, research specifically linking literacy and student literacy skills in higher education remains limited, with most studies focusing on general literacy aspects. These insights highlight the need for further exploration, particularly in developing students' critical literacy skills in higher education contexts. This study aims to map the landscape of student literacy research, provide insights into researcher contributions, and identify research gaps for future studies. Ultimately, these findings can guide future research and policy development to enhance literacy skills critical for academic success and professional readiness.

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1. INTRODUCTION

Higher education plays a crucial role in shaping essential skills such as critical thinking (Silva et al., 2023; Zhang et al., 2023), analytical reasoning (Bairagya & Joy, 2022; Shaumiwaty et al., 2020), and creativity (Fischer & Barabasch, 2023; Mawartiningsih & Cintamulya, 2023), all of which are foundational for academic and professional success. One of the critical components in developing these competencies is student literacy and literacy skills (Marini et al., 2023; Werfel & Hendricks, 2023). Broadly, student literacy refers to the ability of students to comprehend, evaluate, and effectively use information (Mohammadi, 2024). Literacy skills, in particular, encompass the broader abilities to read, write, speak, and think critically (Alhaider, 2023), which are indispensable in navigating complex academic and real-world environments.

In the current information-rich and technology-driven era, where access to information is immediate and widespread (Miloud Dahmane et al., 2023; Schedl & Lex, 2023), the need for students to filter, assess, and apply relevant and reliable information is more pressing than ever (Van et al., 2022; Wyatt et al., 2023). These literacy skills are crucial within academic contexts (Castillo-Martínez et al., 2023; De Costa et al., 2022) and in everyday life and across professional fields (Boudard & Rubenson, 2003). As such, there is a growing demand for research examining the state and development of student literacy and literacy skills in higher education, making it a highly relevant and timely study area.

The evolution of literacy skills within higher education requires an understanding of how these skills develop in diverse academic contexts (Kartika-Ningsih & Rose, 2021; Lukman & Wahyudin, 2020). While there is

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a wealth of general literacy research, specific studies focusing on higher education literacy skills such as critical reading, analytical thinking, and evaluative skills are notably scarce, presenting challenges for institutions striving to equip students for a complex information landscape. Research indicates that literacy skills are not static; they transform significantly from secondary to higher education. For instance, Borgonovi and Pokropek (2021) found that disparities in literacy skills can widen post-schooling, emphasizing the role of higher education institutions in addressing these gaps through tailored educational practices. Additionally, Thamrin and Agustin (2019) highlight the importance of higher-order thinking skills (HOTS) in fostering critical reading abilities crucial for academic success in higher education, underscoring the need to focus on advanced literacy skills beyond foundational literacy competencies. Integrating digital literacy into higher education curricula has become increasingly essential in the digital age. Research by Chan et al. (2017) demonstrates that digital storytelling can significantly enhance students' digital literacy skills, which is vital for today's information-driven society. Vézina et al. (2019) underscore the impact of educational context on literacy skill development, noting that the quality and type of literacy education can vary significantly, particularly for immigrant populations. This variation is also evident in information literacy, where Krubu et al. (2017) highlight discrepancies between students' perceived and actual literacy capabilities, suggesting a need for more effective instructional strategies. Sparks et al. (2016) argue that digital information literacy is essential for academic and professional success, calling for robust assessment frameworks to effectively evaluate these skills. Together, these studies reveal the importance of a nuanced approach to literacy in higher education, emphasizing the need for adaptable curricula and targeted strategies to foster literacy skills that align with students' academic and professional needs.

Current studies on student literacy in higher education often overlook the complex contextual factors and cultural nuances that shape literacy development among students. While existing research provides a foundational understanding of literacy, it tends to treat literacy skills as universally applicable without fully exploring variations across diverse educational systems and sociocultural contexts. In countries like Indonesia, unique challenges impact student literacy, such as the influence of university curricula (Alhumsi, 2021), limited access to information resources (Sachdeva & Tripathi, 2019), and variations in technological infrastructure (Cabo & Lansiquot, 2016). Furthermore, academic culture varies significantly between regions and affects how literacy is taught, perceived, and practiced. For example, in collectivist cultures with collaborative learning approaches, literacy skills might develop differently compared to individualistic learning environments, where self-guided critical thinking is more emphasized (Ramakrishnan et al., 2018). However, these regional and cultural differences are rarely explored, creating a gap in our understanding of how such factors influence literacy outcomes globally. This gap underscores the need for a nuanced bibliometric analysis highlighting specific trends, challenges, and regional variations in student literacy research. By systematically mapping these variations, such an analysis can reveal underexplored themes, identify unique literacy challenges across regions, and cluster research around emerging issues. Addressing these gaps will enable educational policymakers and institutions to develop targeted, context-sensitive strategies to improve literacy instruction that aligns with the specific needs of students in different cultural and academic environments. Ultimately, this approach not only aims to broaden our comprehension of student literacy on a global scale but also to enhance the effectiveness of literacy education through culturally responsive practices that reflect diverse educational contexts.

Bibliometric research provides a powerful framework for systematically evaluating the landscape of scientific literature. It allows researchers to identify prominent trends, collaborative networks, and the most frequently used keywords that shape a field (Fernández et al., 2023; Olaleye, 2023; Schirone, 2023). By employing bibliometric analysis, scholars can map the distribution and evolution of research contributions, analyze the interconnectedness between themes, and reveal the intellectual structure underlying a research domain. This approach is particularly valuable for fields with complex, multidisciplinary aspects, as it enables researchers to identify popular topics and emerging areas of study, key publications, and influential researchers and institutions. In the context of student literacy, bibliometric analysis offers insights into the thematic and methodological

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trends that define the field, helping to clarify how research on literacy in higher education has evolved. While bibliometric analyses have been widely used in fields such as medicine, environmental science, and information technology, their application in studying literacy trends and developments within higher education remains limited. This underutilization leaves a gap in our understanding of how themes in student literacy interrelate, particularly regarding regional, cultural, and technological differences that may influence literacy skills in diverse academic contexts. This research aims to fill both a methodological and contextual gap by applying bibliometric analysis to student literacy studies. The findings are expected to provide a comprehensive view of the current research landscape, highlight underexplored areas, and inform future studies that enhance literacy practices within higher education.

This study aims to conduct a bibliometric analysis of publications on student literacy and literacy skills in higher education, specifically between 2004 and 2023. By examining publication productivity, collaborative networks among researchers, frequently recurring keywords, and the journals that most frequently publish on this topic, the study seeks to present a thorough understanding of the direction and evolution of research in this field, focusing on critical reading and literacy skills. To achieve these objectives, the study addresses the following research questions:

- **RQ1**: What is the publication productivity of research on "student literacy"?
- **RQ2**: What are the dominant topics and themes related to "student literacy"?
- **RQ3**: How has the novelty of topics related to student literacy and literacy skills evolved based on the keyword "student literacy"?

2. MATERIAL AND METHOD

This bibliometric analysis aims to advance research on student literacy and its connection to literacy skills in higher education by addressing two core objectives. First, this study seeks to identify prevailing research trends, patterns, and key knowledge hubs within the field of student literacy, thereby providing a detailed visual and thematic landscape of current studies. Through a systematic examination of influential studies, prominent authors, and collaborative networks, this analysis offers a comprehensive view of how student literacy research has evolved and where its current focus lies. This study highlights the areas that have shaped the field by identifying frequently addressed topics, methodologies, and leading contributors, allowing for a more nuanced understanding of current student literacy research.

The second objective is to uncover emerging or underexplored areas within student literacy research, particularly those related to literacy skills in higher education, such as critical reading, analytical thinking, and digital literacy. By pinpointing gaps in the literature, such as topics or regions that are less represented, this analysis provides actionable recommendations for future research, especially those that can address the specific needs of a diverse student population. By systematically mapping themes and research gaps, this study intends to support educators, researchers, and policymakers in identifying promising areas for exploration and potential collaborations. Ultimately, this approach aims to improve literacy practices across higher education institutions, fostering a deeper, evidence-based understanding of student literacy needs that can inform the development of more effective and context-sensitive literacy programs.

Research Process Overview

The research process is structured into several key steps, as illustrated in **Figure 1**. Initially, student literacy is examined in terms of its definitions, measurements, and conceptualizations within existing literature. Next, a literature review and bibliometric analysis are conducted on selected articles to identify prominent research patterns. Finally, the analysis concludes with suggestions for future research directions to advance understanding in this field.

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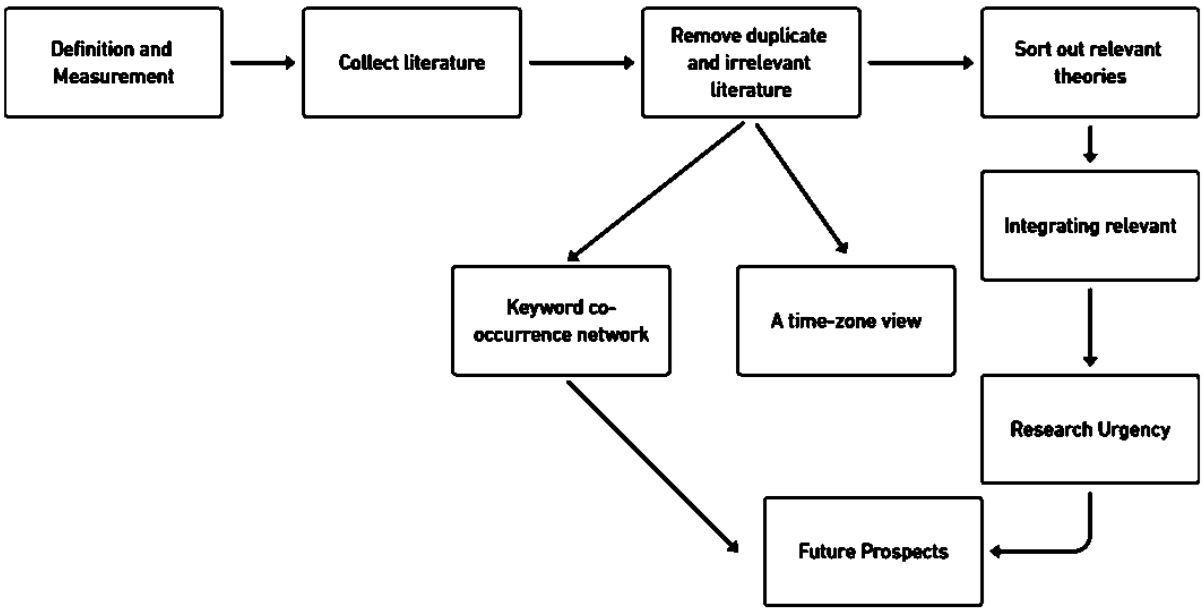

Figure 1. Review Process

Data Collection

Data for this analysis was collected from the Scopus database to ensure comprehensive coverage and quality. Inclusion and exclusion criteria were established to filter the publications, as detailed in **Table 1**. Only scientific articles, conference papers, book chapters, books, and reviews indexed in Scopus between 2004 and 2023 and written in English were included. However, publications outside this range or unrelated to "student literacy" were excluded.

Table 1. Inclusion and Exclusion Criteria for Publication Data

Criteria	Inclusion	Exclusion
Type of Publication	Scientific articles, conference papers, book chapters, books, and reviews indexed in Scopus.	Publications not indexed in Scopus.
Language	Publications written in English	Publications not written in English
Focus	Scientific publications about "student literacy."	Publications not about "student literacy."
Access	Accessible through Scopus	Not accessible through Scopus
Publication Range	Scientific publications within the 2004-2023 time range	Scientific publications outside the 2004-2023 time range

Search and Filtering Process

A search was conducted using the keyword "student literacy" across titles, keywords, and abstracts. The search yielded 652 publications, then refined through VOSviewer to eliminate duplicates and unrelated content, resulting in 115 relevant articles for analysis. This process is visually summarized in **Figure 2**, which illustrates the PRISMA flow for literature selection and refinement.

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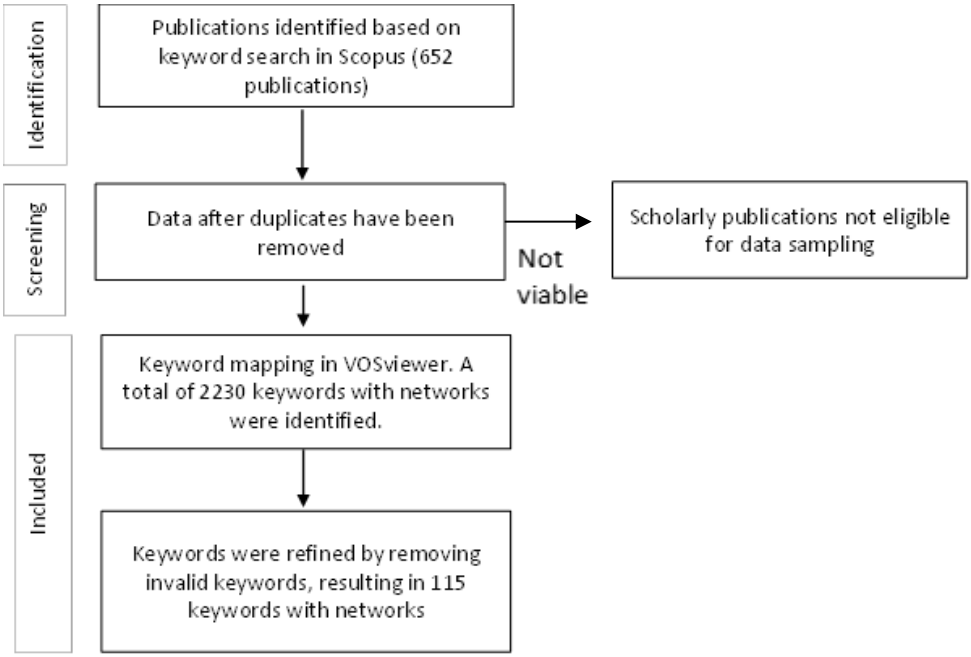

Figure 2. PRISMA Flow Diagram for Search and Selection Process

Analysis Methode

Bibliometric analysis

Bibliometric analysis is a quantitative research method used to systematically organize, analyze, and map the structure of academic publications over a specified period. This approach allows researchers to explore the landscape of a given field, identifying key trends, influential publications, author collaborations, and the evolution of specific research themes. By quantifying the impact and frequency of publications, bibliometric analysis provides a comprehensive view of the intellectual development within a research area, enabling scholars to understand where the field has been and where it might be headed.

This research follows the four-step bibliometric analysis procedure outlined by Donthu et al. (2021), ensuring a systematic approach to understanding patterns in student literacy research and its relationship with literacy skills in higher education. The first step, defining research objectives and scope, involves articulating the goals of the bibliometric analysis. This study aims to identify trends and explore the interplay between student literacy and literacy skills in higher education, establishing a focused foundation aligned with specific research questions.

The second step, selecting analysis techniques, involves choosing appropriate methods to capture various dimensions of the research landscape. This study employs co-authorship analysis to identify collaborative networks among scholars, keyword co-occurrence analysis to uncover recurring themes, and citation analysis to highlight influential publications in the field. These techniques provide a comprehensive view of the scholarly discourse on student literacy. The third step, data collection, involves gathering relevant data from the Scopus database, known for its extensive coverage and high-quality indexing. The dataset includes scholarly articles, conference papers, book chapters, and reviews published between 2004 and 2023. Inclusion and exclusion criteria are applied to ensure relevance and reliability, focusing solely on "student literacy" publications and indexed in Scopus.

The fourth step, conducting bibliometric analysis, thoroughly examines the collected data. This step assesses publication productivity to understand research output trends over time and uses keyword analysis to reveal main topics and emerging trends in student literacy research. The intellectual structure of the field is mapped by identifying central themes, leading researchers, and research clusters, providing a comprehensive understanding of the field. Visualization tools like VOSviewer are employed to create network maps, illustrating

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the relationships between keywords, authors, and institutions and offering valuable insights into the research landscape.

Content Analysis

Content analysis was employed to supplement the bibliometric approach to gain a deeper, more qualitative understanding of the themes identified in the student literacy research. While bibliometric analysis provides a broad overview of trends, publication productivity, and key topics, content analysis enables a more nuanced interpretation by examining the context, meaning, and connections between various findings in the literature. By focusing on the content of selected publications, this method allowed the research team to explore underlying patterns and concepts that are not readily visible through quantitative analysis alone. Content analysis was particularly valuable for addressing specific research questions related to critical reading skills within the broader domain of student literacy. Through this approach, the team could interpret how critical reading is conceptualized across different studies, identify recurring themes, and understand the emphasis on literacy skills required in higher education contexts. This analysis highlighted the skills most frequently associated with academic success, such as critical thinking, analytical reasoning, and information literacy, allowing for a more comprehensive understanding of how these competencies are integrated into student literacy research. Overall, content analysis provided valuable insights that complemented the bibliometric findings, offering a richer, contextually informed perspective on the critical areas of student literacy research.

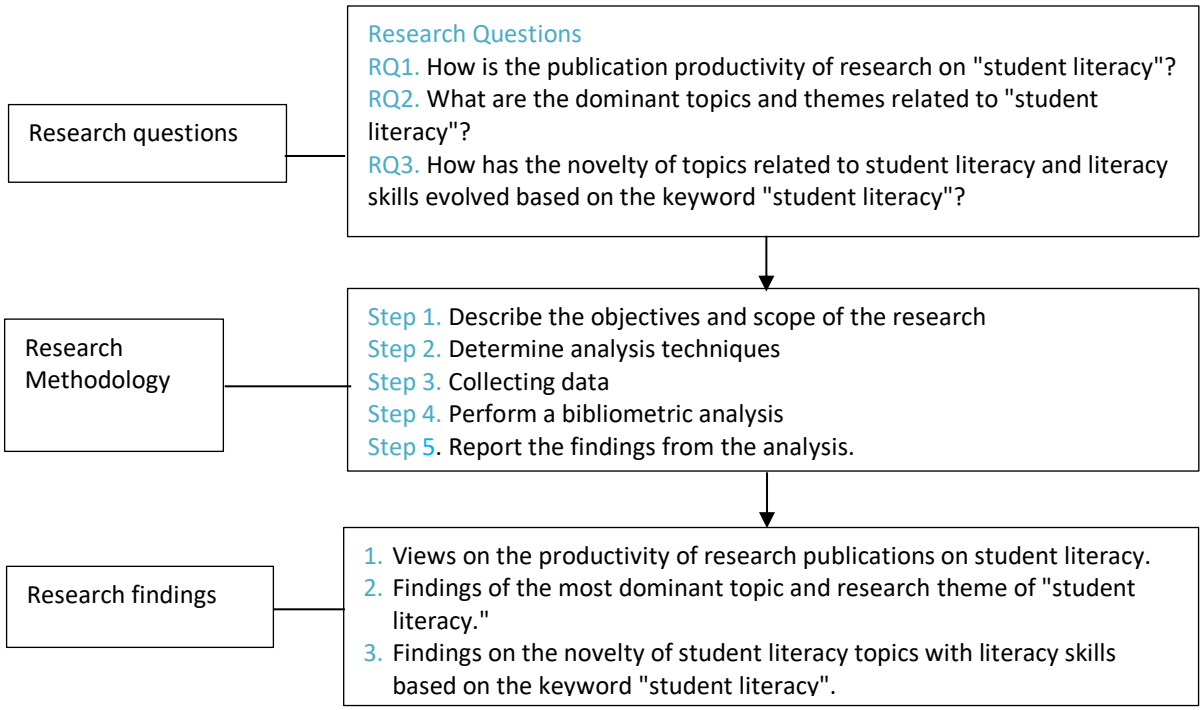

Figure 3. Research Framework

3. Result

Results The findings from the bibliometric analysis are presented based on the answered research questions. Specifically, the findings relate to publication productivity, prominent themes, theoretical foundations, variables, and their relationships. The research findings that will form the basis of the discussion to answer the three research questions are:

Publication Productivity

The number of publications released on a particular subject can reflect changes in specific research over time. Future research development in critical reading also affects fluctuations in the number of relevant publications. Figure 3 depicts the annual publication volume from 2004 to 2023 (as of December 2023). In general, an increase in the number of published publications can be observed. Over 20 years, the number of

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published publications and those with relevant titles, abstracts, and keywords experienced fluctuations. However, overall, publications have increased and peaked in 2020 to 2022. In 2022, the number of published articles reached 70 publications. Based on these findings, it can be concluded that publications or research related to "student literacy" are expanding. Research related to critical reading has gained increased attention across various fields of study and diverse topics. As seen in the graph below.

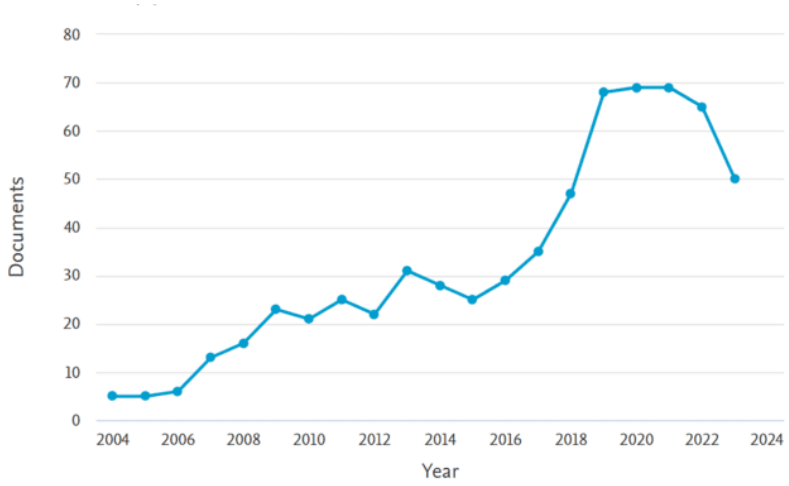

Figure 4. Graph the number of publications searched for with the keyword "student literacy."

Table 2. High-frequency keywords represent topic or theme clusters in the field of research conducted

Keyword	Occurrences	Total link strength
Literacy	100	239
Students	89	301
Writing	36	139
Reading	27	107
Teaching	24	102
Education Computing	24	88
Human	23	193
Engineering education	17	84
Education	16	66
Professional development	14	64
Scientific literacy	14	40
Student	13	82
e-learning	13	52
Teacher Education	12	58
Assessment	12	34
Learning systems	11	47
Pisa	11	9
Mayor clinical study	10	81
Comprehension	10	71
Language	10	61

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Dominant Topics and Themes Related to "Student Literacy"

Based on the analysis of 652 collected scholarly articles, the keyword frequency function in VOSviewer software generated a keyword map containing 2,230 interconnected keywords. The size of the circles and letters reflects keyword frequency, with larger nodes and text indicating more frequent mentions of that keyword during the specified period. Lines connecting circles illustrate relationships between keywords, with the color and thickness of these lines indicating the timing and frequency of each keyword's occurrence. After filtering, high-frequency keywords related to critical reading were identified, and invalid terms, such as overly general words like "gender" or specific country names, totaling 13 keywords, were removed. Synonyms were also merged to ensure accuracy. This process resulted in 115 interconnected keywords, as displayed in **Figure 2**. The top 20 high-frequency keywords, which represent clusters of prominent topics or themes in the research field, are shown in **Table 2**.

The novelty of Student Literacy Topics with Literacy Skills Based on the Keyword "Student Literacy"

In bibliometric analysis, a visual representation overlay uses bright-colored circles to indicate topics requiring more research or not being widely explored. In contrast, darker-colored circles signify that a topic has been extensively studied, as illustrated in **Figure 10**. Using the keyword "student literacy," several intriguing topics emerged, including "students," "literacy," "reading comprehension," "literacy skills," "critical literacy," "language learners," "college/university students," and "higher education." This section aims to group these fascinating themes that have not yet been thoroughly investigated by presenting previous research to highlight the relevance of these keywords.

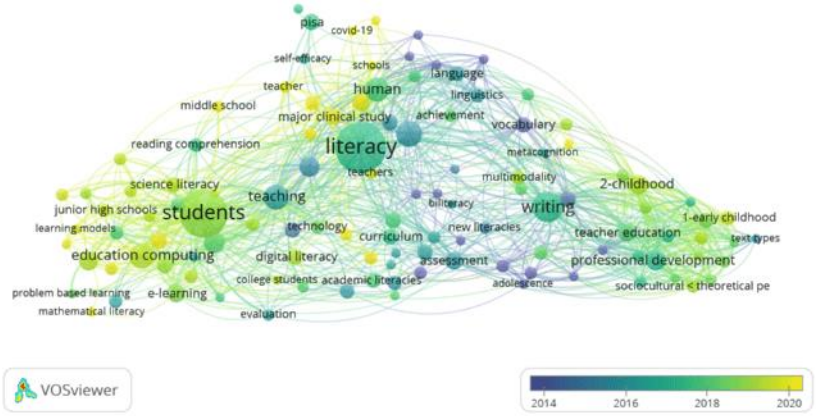

Figure 5. "Students literacy" cluster overlay diagram

4. Discussion

Publication Productivity with the Keyword "Student Literacy"

Based on **Figure 4.**, it can be concluded that publications or research related to "student literacy" are becoming more extensive. Research related to critical reading has received increasing attention across many fields of study and various topics. Meanwhile, research related to the keyword "Student literacy" across various countries from 2004 to 2023 shows significant differences in publications (**Figure 5**). The United States takes the top position with the highest number of publications, reaching 263 publications related to the keyword "student literacy." One of these publications investigates teaching-related literacy with a focus on students. The article explores how prospective teachers at a university in the northwestern mountainous region of the United States understand and apply literacy and how they position themselves in terms of literacy knowledge. (Borti, 2023). Following the United States, Indonesia ranks second with 95 publications. This indicates that there is still a significant gap in terms of publication productivity. Despite considerable interest, research on students and literacy, especially focusing on higher education students, still needs to be expanded. One research conducted on literacy in higher education focusing on literacy skills among university students is the study by Yuniawan *et al.* (2022), where literacy in the research is linked to the concept of the environment. Additionally, research on literacy in higher education is associated with utilizing literacy skills to understand IT. (Arifin & Setiawan, 2022).

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Publications indexed in Scopus from 2004 to 2023 focusing on student literacy or literacy skills in higher education still need to be made available. Published research often intersects with literacy or higher education in specific discussions but may only partially be dedicated to these topics.

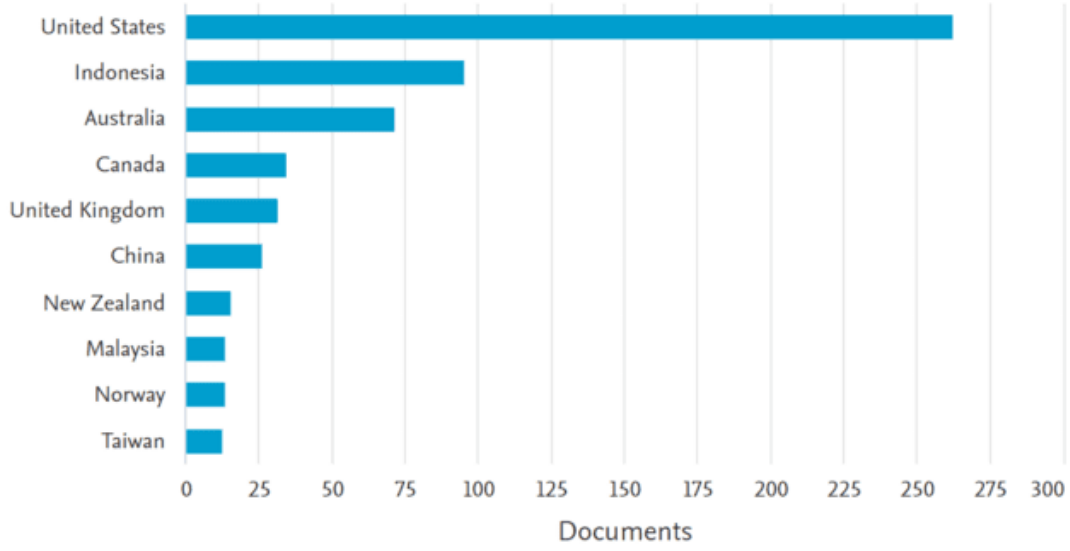

Figure 6. Distribution diagram of publication by country

Dominant Keywords and Their Network with Other Keywords

Research related to the keyword "literacy" has been conducted 100 times from 2004 to 2023. An analysis of the keyword co-occurrence graph revealed 20 popular keywords closely associated with the research topic, particularly regarding "student literacy." The popularity of these keywords is determined by the number of studies that have utilized them over the past fifteen years.

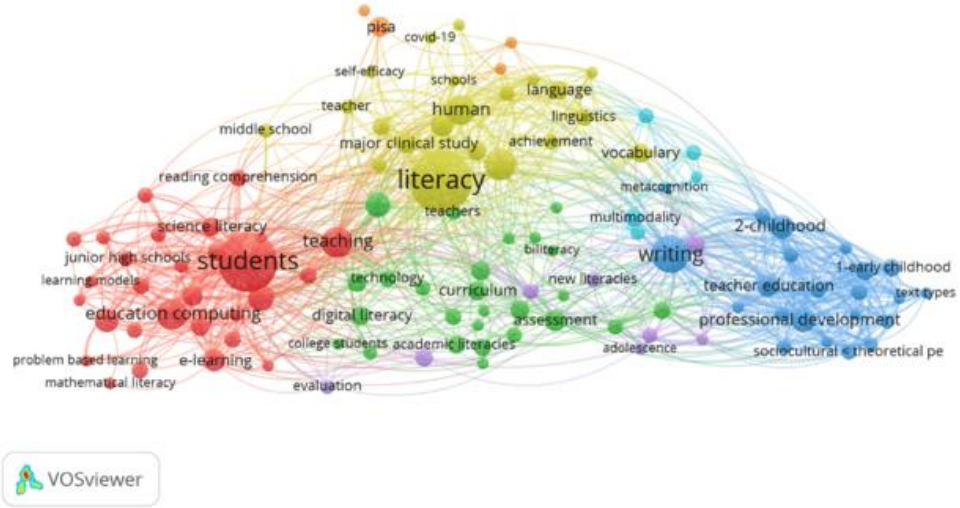

Figure 7. Research network diagram relating to “student literacy.”

The VOSviewer keyword cluster analysis shows that "student literacy" research is organized into thematic clusters with dominant keywords. The primary keyword in this area is "students," illustrated with complex networks in **Figure 5**. Another related keyword is also "students," depicted in **Figure 8**. One Scopus-indexed article that discusses "Students" and "Literacy" examines literacy assessment through educational games for students (Fang et al., 2023) and also addresses "reading comprehension," which is closely related to the other keywords.

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Figure 8. Network diagram of the “students” cluster.

One commonly used keyword is "literacy" in the context of complex networks, as illustrated in **Figure 9**. One article indexed in Scopus that features the keyword "literacy" discusses the development of dialogic reading attitudes, which are supported by skills in both expressive and critical reading (Marini et al., 2023). Research related to the keyword "literacy" is often associated with educational themes, including "teaching," "e-learning," "evaluation," and "assessment," among others. Additionally, it is connected to language-related topics such as "language," "linguistics," "writing," and "reading comprehension."

Figure 9. “Literacy” cluster network diagram.

Another frequently used keyword in research related to "student literacy" is "writing," which forms relatively complex networks, as illustrated in **Figure 10**. Studies related to "writing" are often associated with topics in education, teaching, students, and linguistics. One example of research linking "student literacy" and "writing" is Andersen et al.'s (2022) study, which explores the development of writing skills through shared reading interventions conducted at home.

Figure 10. Network diagram of the "writing" cluster.

Additionally, a commonly used keyword in research related to "student literacy" is "curriculum," which is associated with fairly complex networks, as illustrated in **Figure 11**. Within the "curriculum" cluster, research

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pertains to students, technology, higher education, digital literacy, online learning, and more, as shown in **Figure 9**. One notable study that explores the relationship between "student literacy" and "curriculum" is Ristiana's (2023) research on managing Self-Managed Curriculum Learning to enhance students' literacy and numeracy competencies in schools.

Figure 11. Network diagram of the "curriculum" cluster

The novelty of the topic of student literacy skills based on the keyword "student literacy"

This section addresses RQ3, which explores the novelty of the topic of student literacy skills, focusing on the keyword "student literacy." The primary keywords that drive interest in this topic are "students" and "literacy." Numerous relevant studies on these concepts are conducted worldwide, reflecting diverse approaches and contexts. For instance, Cockerill et al. (2023) studied the use of proficiency teaching and strategies to address reading comprehension difficulties to enhance reading outcomes. Bazalgette & Buckingham (2013) investigated the impact of literacy feedback on teachers. Farias-Gaytan et al. (2023) examined digital transformation and digital literacy within the complexities of higher education. De Oliveira (2017) focused on the development of numeracy and early literacy skills. Additionally, Orhan (2023) explored critical thinking and new media literacy by studying the detection of fake news on social media. Thomson (2023) contributed research on information literacy support for postgraduate students. Together, these studies highlight the evolving interest in student literacy and its various applications across educational settings.

The analysis results presented in **Figure 12** indicate the presence of a central cluster that functions as a distribution point for topics related to "students." There are opportunities to connect the concept of "students" with various existing keywords, as highlighted by previous researchers in the areas of "e-learning" (Battista et al., 2023; Rufia Thaseen et al., 2024), "science literacy" (Liang et al., 2023; Purwanti & Desstya, 2023), "reading comprehension" (Moghadam et al., 2023; Zadkhast et al., 2023), "information literacy" (Mawartiningsih & Cintamulya, 2023; Smith & Sanger, 2023), and "education computing" (Gunness et al., 2023; T. Wang, 2023). These connections demonstrate the broad scope of student-related research and its intersections with various educational themes

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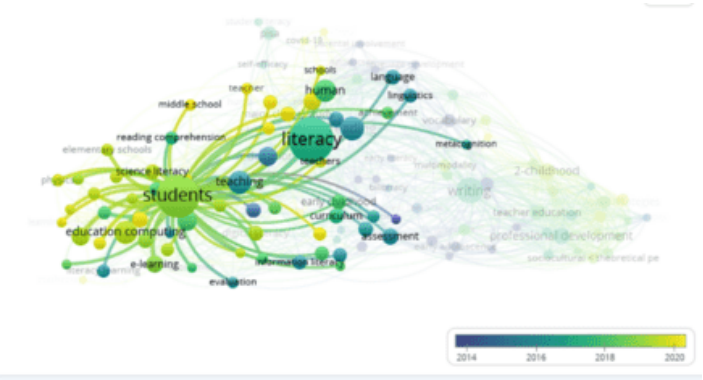

Figure 12. "students" cluster overlay diagram

The analysis results from **Figure 13** indicate a cluster that acts as a central distribution point for topics related to "literacy." This cluster presents opportunities to connect the concept of "literacy" with various existing

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keywords, as explored by previous researchers. For instance, studies have linked "literacy" to "e-learning" (Ali et al., 2023; Kageyama et al., 2023), "reading comprehension" (Feller et al., 2023; Stiff et al., 2023), "multimodality" (Kenalemang-Palm, 2023; Liang et al., 2023), "early childhood" (Dahm et al., 2023; Hasan et al., 2023), and "education computing" (Grover & Twarek, 2023; Haskel-Ittah, 2023). These connections illustrate the expansive scope of literacy-related research and its intersections with diverse educational themes.

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Figure 13. "Literacy" cluster overlay diagram.

The third key term driving interest in this topic is "reading comprehension," a concept that has been extensively studied worldwide. For example, Tong et al. (2023) explored the role of prosodic sensitivity in enhancing reading comprehension. Meng et al. (2023) integrated belief-based knowledge to improve comprehension outcomes. Ahmed Abdel-Al Ibrahim et al. (2023) examined how collaborative learning, scaffolding-based teaching, and self-assessment influence reading comprehension, along with their effects on student motivation and anxiety. Hammad Al-Rashidi et al. (2023) analyzed the comparative impact of portfolio-based assessment, self-assessment, and peer assessment on reading comprehension, vocabulary learning, and grammatical accuracy. Meanwhile, Z. Wang et al. (2023) investigated the relationship between morphological awareness and reading comprehension among Chinese children, adding to the growing body of knowledge on this skill.

The analysis results, shown in **Figure 14**, reveal a cluster that serves as a central hub for topics related to "reading comprehension." This cluster indicates further opportunities to connect "reading comprehension" with other keywords explored by researchers, such as "education computing" (Liu et al., 2022; Serrano-Mendizábal et al., 2023), "elementary schools" (Nurmahanani 2023; Zhou et al., 2023), and "middle school" (Lim & Park, 2023; H.-H. Wang et al., 2023). hese connections underscore the extensive research possibilities within the "reading comprehension" cluster, linking it with various educational levels and technological applications, and demonstrating the multi-faceted interest in understanding and improving reading comprehension skills.

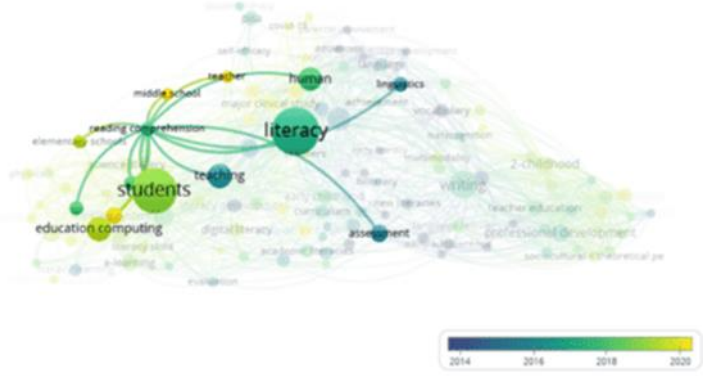

Figure 14. Overlay diagram of the "reading comprehension" cluster.

The fourth key term driving interest in this topic is "literacy skill," a concept examined in numerous studies worldwide. For example, Conica et al. (2023) explored the relationship between preschool language and children's literacy and numeracy skills. Chang (2023) investigated how early numeracy and literacy skills influence

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later mathematical achievement. Kertész & Honbolygó (2023) conducted a study predicting literacy skill development in children, while Susanta et al. (2023) focused on literacy skills among elementary school students. Additionally, Damsgaard et al. (2023) examined learning activities aimed at enhancing letter-sound knowledge in children with varying reading abilities.

The analysis results from **Figure 15** reveal a cluster serving as the central distribution point for topics related to "literacy skill." This cluster highlights opportunities to connect "literacy skill" with various other keywords explored in previous studies. For instance, researchers have linked "literacy skill" to "e-learning" (Ahmetovic et al., 2023; Lang et al., 2023), "literacy learning" (Hilmawan et al., 2022; Weadman et al., 2023), and "education computing"(Cioc et al., 2022; Fang et al., 2022). These connections suggest a wide range of research possibilities within the "literacy skill" cluster, integrating it with themes such as digital learning, literacy development, and technological applications in education.

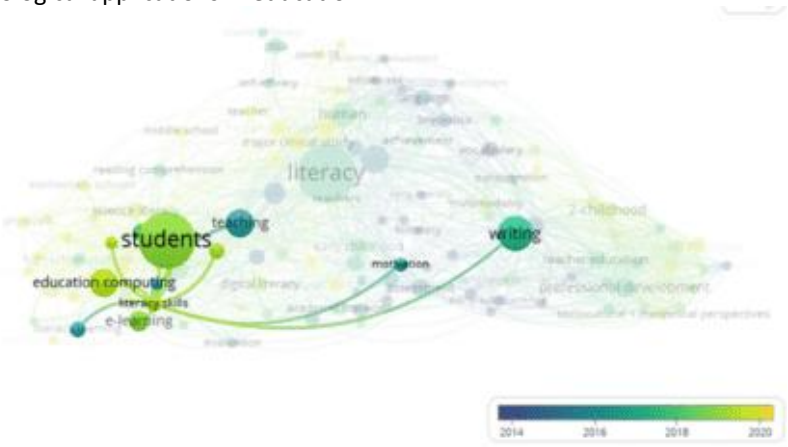

Figure 15. "Literacy skill" cluster overlay diagram

The fifth keyword that forms the basis of interest in this topic is "critical literacy." There have been several relevant studies on the concept of "critical literacy" distributed across various parts of the world. For instance, Johnson (2023) discusses critical literacy and solidarity emerging among African-American children. Brownell (2023) conducts a case study of critical literacy in the works of English language arts inventors. Abas (2023) engages in critical multimodal literacy practices in student-made comics. Jones & Manion (2023) conducted a critical literacy study on children's rights education in Uganda and Canada. Hosek & Handsfield (2023) reveals teachers' experiences in digital literacy.

An analysis of **Figure 16** reveals that a particular cluster functions as a central hub for topics related to "critical literacy." This presents opportunities to connect the concept of "critical literacy" with various other keywords, as explored by researchers focusing on "linguistics" (Gebhard & Blaisdell, 2022; Ludwig & Summer, 2023) and "multimodality" (Pires et al., 2023; Tilakaratna, 2022).

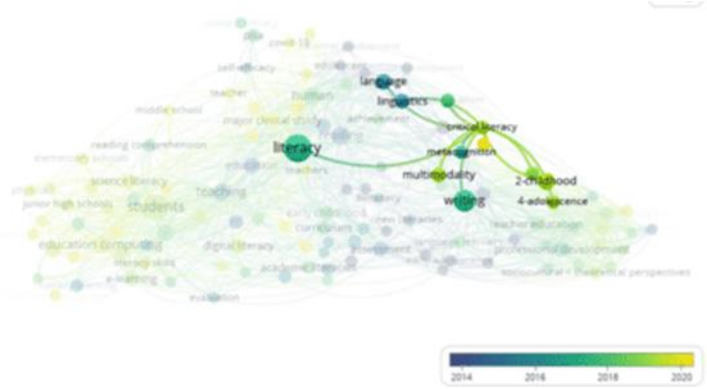

Figure 16. Overlay diagram of the "critical literacy" cluster

The sixth and seventh keywords of interest in this topic are "S-College/University Students" and "higher education." Numerous studies on "S-College/University Students" have been conducted across various regions.

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For instance, Hamadi El-Den (2024) examines sustainable digital learning in higher education, while Rotar (2024) xplores the experiences of adult students in online learning to improve educational outcomes. Darby et al. (2023) nvestigate efforts to meet the needs of college students, and Shu & Wang (2023) analyze the expansion of higher education in China. Additionally, Lo (2023) studies the implementation of digital learning and online ESL classes within higher education.

Analysis of **Figure 17** reveals that a particular cluster serves as a central distribution point for topics related to "S-College/University Students." This suggests opportunities to link the concept of "S-College/University Students" with various other keywords. Previous researchers have explored these connections in areas such as "teacher education"(Nabayra & Tambong, 2023; Yako-Suketomo et al., 2023), "language learners" (Alemu et al., 2023; Robles et al., 2024), and "professional development" (Karpava, 2023; Lee & Garcia, 2015).

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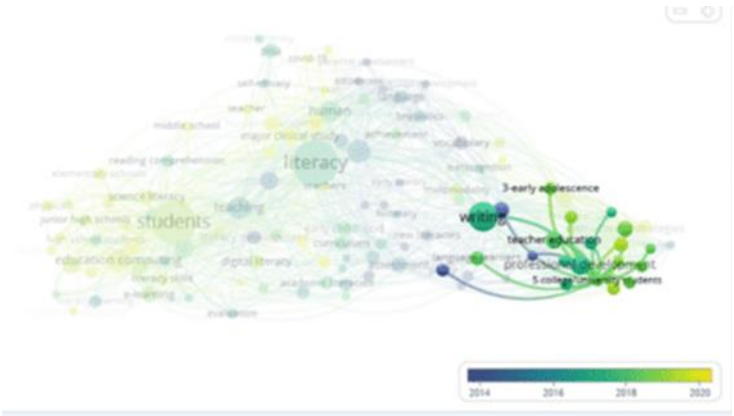

Figure 17. "S-College/University Students" cluster overlay diagram

The analysis of **Figure 18** indicates that a specific cluster functions as a central distribution point for topics related to "higher education." This finding highlights opportunities to link the concept of "higher education" with various other keywords. Previous researchers have explored these connections in areas such as "education" (Leatemia et al., 2023; Park et al., 2023), "curriculum" (Olanya et al., 2023; Sajja et al., 2023), and "assessment" (Adama et al., 2023; Cao et al., 2023).

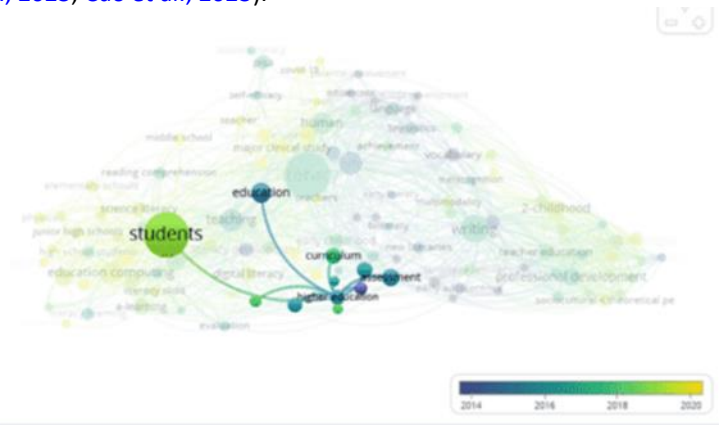

Figure 18. "Higher education" cluster overlay diagram

5. CONCLUSION

Based on the formulated research questions, the study revealed three main findings. First, the productivity of publications related to critical reading from 2004 to 2023 reached a total of 675 articles from various countries. Over this 20-year period, the number of publications incorporating "student literacy" in their titles, abstracts, and keywords showed fluctuations, with a peak in 2022. Although research on this topic remains relatively limited, there is a clear upward trend, with interest and productivity increasing each year. This growth

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reflects the rising recognition of student literacy as an important field in academic research. Second, the analysis identified three major themes frequently associated with "student literacy," primarily centered around education and language. Common keywords included "literacy," "students," "writing," "reading," and "teaching." Additionally, several promising topics emerged through the use of the keyword "student literacy," such as "reading comprehension," "literacy skills," "critical literacy," "language learners," "college/university students," and "higher education." These topics remain underexplored, presenting valuable opportunities for further research and innovation in this field. Expanding on these areas could deepen the understanding of student literacy's role in higher education and support the development of novel research insights.

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