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ORIGINAL

Mapping the Evolution of Digital Literacy in Asian Learning Environments: A Bibliometric Analysis

Mapeo de la Evolución de la Alfabetización Digital en los Entornos de Aprendizaje Asiáticos: Un Análisis Bibliométrico

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ABSTRACT

Introduction: this article presents a bibliometric analysis of the relationship between digital literacy and learning in Asia. The aim of this research is to identify patterns and trends in digital literacy and its impact across various educational levels, ranging from early childhood education to higher education.
Method: this study employs a keyword co-occurrence analysis method on relevant publications in the fields of digital literacy and education. Data were collected from leading academic databases and analyzed to identify thematic clusters and the relationship between digital literacy and educational outcomes.
Results: the bibliometric analysis results indicate a significant increase in the number of publications related to digital literacy and learning in the Asia region, peaking in 2024 with a total of 84 publications. It was identified that 46,6 % of the publications fall under the subject area of Social Sciences. The country with the highest number of publications is Indonesia (96 publications), predominantly from Universitas Negeri Yogyakarta (13 publications). However, the author with the most publications is Shamila Mohamed Shuhidan from Universiti Teknologi MARA Malaysia.
Conclusions: the bibliometric analysis conducted in this study underscores that digital literacy is a fundamental element in education across Asia, encompassing various aspects from early childhood education to higher education. These findings suggest that the development of digital literacy skills should be prioritized, emphasizing collaboration among educators, parents, and other stakeholders as key factors in creating effective learning environments. Furthermore, digital literacy should extend beyond mere technological proficiency, focusing on the development of critical and analytical thinking skills essential for addressing challenges in the modern era.

Keywords: Digital Literacy; Learning; Asia; Bibliometric Analysis.

RESUMEN

Introducción: este artículo presenta un análisis bibliométrico de la relación entre la literacidad digital y el aprendizaje en Asia. El objetivo de esta investigación es identificar patrones y tendencias en la literacidad

digital y su impacto en diversos niveles educativos, que van desde la educación infantil hasta la educación superior.
Método: este estudio emplea un método de análisis de co-ocurrencia de palabras clave en publicaciones relevantes en los campos de la literacidad digital y la educación. Los datos fueron recopilados de bases de datos académicas líderes y analizados para identificar clústeres temáticos y la relación entre la literacidad digital y los resultados educativos.
Resultados: los resultados del análisis bibliométrico indican un aumento significativo en el número de publicaciones relacionadas con la literacidad digital y el aprendizaje en la región de Asia, alcanzando su punto máximo en 2024 con un total de 84 publicaciones. Se identificó que el 46,6 % de las publicaciones pertenecen al área temática de Ciencias Sociales. El país con el mayor número de publicaciones es Indonesia (96 publicaciones), predominantemente de la Universitas Negeri Yogyakarta (13 publicaciones). Sin embargo, el autor con más publicaciones es Shamila Mohamed Shuhidan de la Universiti Teknologi MARA de Malasia.
Conclusiones: el análisis bibliométrico realizado en este estudio subraya que la literacidad digital es un elemento fundamental en la educación en Asia, abarcando diversos aspectos desde la educación infantil hasta la educación superior. Estos hallazgos sugieren que el desarrollo de habilidades de literacidad digital debe ser priorizado, enfatizando la colaboración entre educadores, padres y otros interesados como factores clave para crear entornos de aprendizaje efectivos. Además, la literacidad digital debe ir más allá de la mera competencia tecnológica, centrándose en el desarrollo de habilidades de pensamiento crítico y analítico esenciales para abordar los desafíos de la era moderna.

Palabras clave: Literacidad Digital, Aprendizaje, Asia, Análisis Bibliométrico.

INTRODUCTION

Digital literacy has emerged as an increasingly significant issue within the context of global education, particularly in the Asian region, where many countries are classified as developing nations.[1,2] In the current digital era, the ability to access, comprehend, and utilize information through digital technology is crucial for enhancing educational quality and preparing the younger generation to face global challenges. However, despite advancements in information and communication technology, there remains a significant gap in digital literacy among various societal groups. Individuals from low socioeconomic backgrounds often have limited access to digital devices and the internet, which hinders their ability to develop digital literacy skills.[3] In Asia, this challenge is further complicated by disparities in technological infrastructure, educational access, and government policies. The digital divide is not merely a technological issue but also encompasses socioeconomic disparities that manifest in students' abilities to navigate and effectively utilize digital resources, thereby reinforcing inequalities among different socioeconomic groups in these countries.[4] The digital divide continues to be an urgent problem, particularly in areas where resources are scarce and pedagogical methods are outdated.[5] Therefore, it is essential to analyze existing scientific production to understand the current research landscape and identify areas that require further attention.

The concept of digital literacy encompasses not only technical skills but also individuals' abilities to understand, process, and utilize digital information.[6] In the context of developing countries in Asia, the development of digital literacy serves as a crucial pillar in efforts to enhance educational quality and empower individuals to reach their full potential.[2] Consequently, this research aims to conduct a bibliometric analysis of digital literacy in education in Asia, focusing on the growth, distribution of scientific documents, as well as the structure and dynamics of published scientific information.

The primary objective of this study is to map and critically analyze the scientific landscape of digital literacy in education across Asian countries through a comprehensive bibliometric approach. This includes tracing the annual growth of publications from 2015 to 2025, classifying articles by subject area, identifying leading countries and institutions in research output, and highlighting the most influential works through citation analysis. Additionally, the study aims to uncover thematic structures and intellectual linkages through keyword co-occurrence mapping, thereby revealing dominant and emerging trends. By offering an evidence-based synthesis of the evolution, distribution, and conceptual development of digital literacy research in Asia, this study aspires to inform future scholarly directions and policy decisions, while supporting the advancement of inclusive and context-relevant digital education strategies.

METHOD

A bibliometric study was conducted regarding digital literacy in education within the Asian region, with a particular emphasis on bibliometric analysis. This research adheres to a methodology similar to that proposed by Robles and is executed using documentary or bibliographic research techniques, applying a research

methodology defined in five stages.[7]

In the first stage, the field of study is identified as "the development of digital literacy in education across countries within the Asian continent," with a publication period spanning from 2015 to 2025.

In the second stage, Scopus was selected as the source of information due to its status as a robust and reliable bibliographic database, recognized as one of the largest repositories of literature that has undergone a peer-review process, encompassing scholarly journals, books, and conference proceedings. In this study, we exclusively utilized documents in the form of articles sourced from countries within the Asian continent.

In the third stage, a search was conducted in accordance with the following equation: (TITLE ("digital literacy") AND TITLE-ABS-KEY (learning)) AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (LIMIT-TO (AFFILCOUNTRY , "Hong Kong") OR LIMIT-TO (AFFILCOUNTRY , "China") OR LIMIT-TO (AFFILCOUNTRY , "Taiwan") OR LIMIT-TO (AFFILCOUNTRY , "Malaysia") OR LIMIT-TO (AFFILCOUNTRY , "Thailand") OR LIMIT-TO (AFFILCOUNTRY , "South Korea") OR LIMIT-TO (AFFILCOUNTRY , "Japan") OR LIMIT-TO (AFFILCOUNTRY , "India") OR LIMIT-TO (AFFILCOUNTRY , "Singapore") OR LIMIT-TO (AFFILCOUNTRY , "Pakistan") OR LIMIT-TO (AFFILCOUNTRY , "Philippines") OR LIMIT-TO (AFFILCOUNTRY , "Indonesia") OR LIMIT-TO (AFFILCOUNTRY , "Kazakhstan") OR LIMIT-TO (AFFILCOUNTRY , "Qatar") OR LIMIT-TO (AFFILCOUNTRY , "Azerbaijan") OR LIMIT-TO (AFFILCOUNTRY , "Cambodia") OR LIMIT-TO (AFFILCOUNTRY , "Iran") OR LIMIT-TO (AFFILCOUNTRY , "United Arab Emirates") OR LIMIT-TO (AFFILCOUNTRY , "Turkey") OR LIMIT-TO (AFFILCOUNTRY , "Sri Lanka")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (DOCTYPE , "ar")).

In the fourth stage, the management and filtering of the obtained results were conducted utilizing the Scopus search results analysis tool. Finally, in the fifth stage, the results were analyzed, which included the identification of relevant publications, an assessment of their quality, and the extraction of pertinent data. The analysis period encompassed 258 articles published from 2015 to 2025. Furthermore, graphical representations and distribution maps were created using Microsoft Excel, while co-occurrence maps were generated with Vosviewer, employing keywords for further analysis.

RESULTS

Figure 1 illustrates the publication trends of articles concerning digital literacy within the context of education in the Asian region from 2015 to 2025. There is a significant increase in the number of articles, with 84 publications recorded in 2024, marking the highest peak during this period. Additionally, the year 2025 yielded 20 articles, indicating that interest in this topic remains robust, albeit with a decline compared to the previous year. Overall, this data reflects a consistent growth in research pertaining to digital literacy, which is increasingly recognized as a vital component of education in Asia.

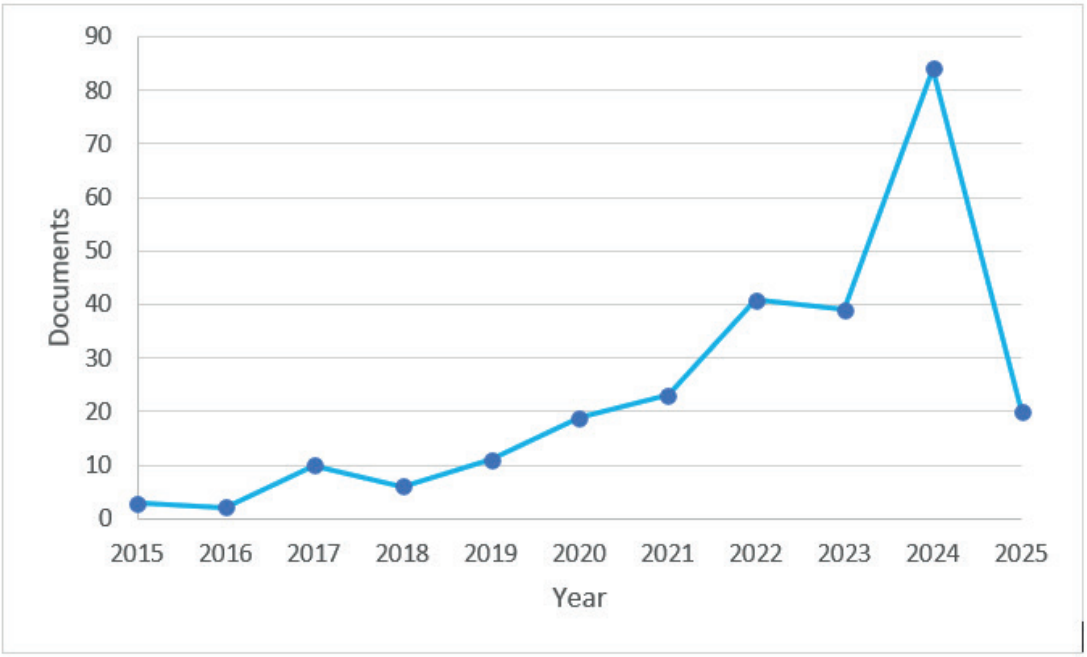

Figure 1. Evolution of the number of publications per year

Figure 2 illustrates the percentage of articles categorized by subject area. The distribution of articles concerning digital literacy in education across Asia is depicted based on subject areas. A significant majority of

the publications are concentrated in the field of Social Sciences, totaling 207 articles (46,6 %), which reflects a strong interest in the social aspects of digital literacy, including the sub-area of education. This is followed by Computer Science, which accounts for 60 articles (13,5 %), indicating the relevance of technology within this context. Other subject areas, such as Arts and Humanities (35 articles or 7,9 %) and Engineering (33 articles or 7,4 %), also contribute to the discourse, albeit in smaller quantities, suggesting that digital literacy has a broad impact across various disciplines. Figure 3 presents a map illustrating the distribution of publications from countries in Asia.

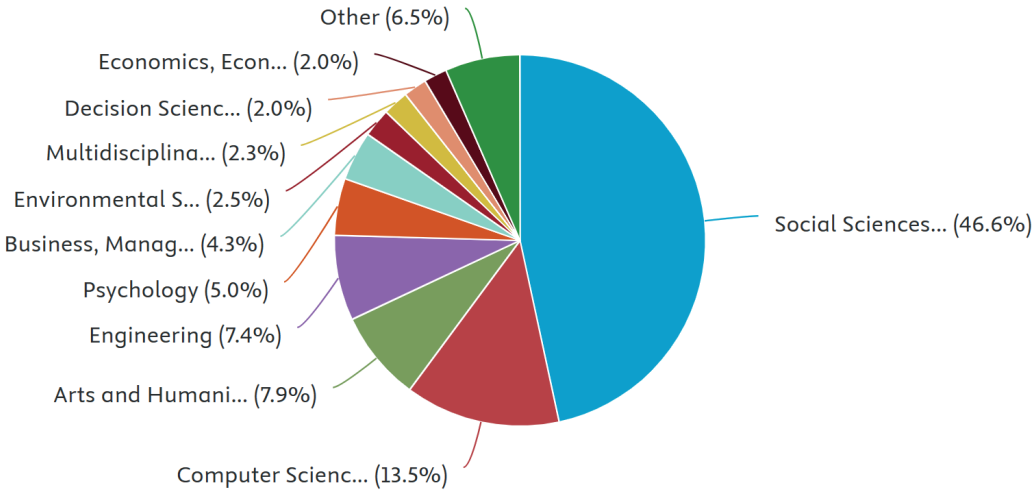

Figure 2. Percentage of Articles by Subject Area

The data presented in figure 3 illustrates the map of publication distribution concerning digital literacy in education across Asia, categorized by country or region. Indonesia leads with a total of 96 articles, indicating a strong commitment to research in this field. Following Indonesia is China, with 35 articles, while Malaysia, South Korea, Thailand, and Turkey each contribute 20 articles, reflecting significant interest in digital literacy within these nations. In contrast, Hong Kong, India, Taiwan, and Kazakhstan exhibit lower publication numbers, with 16, 15, 10, and 8 articles respectively. This variation suggests that, although there is a growing awareness of digital literacy, the level of research activity differs among Asian countries.

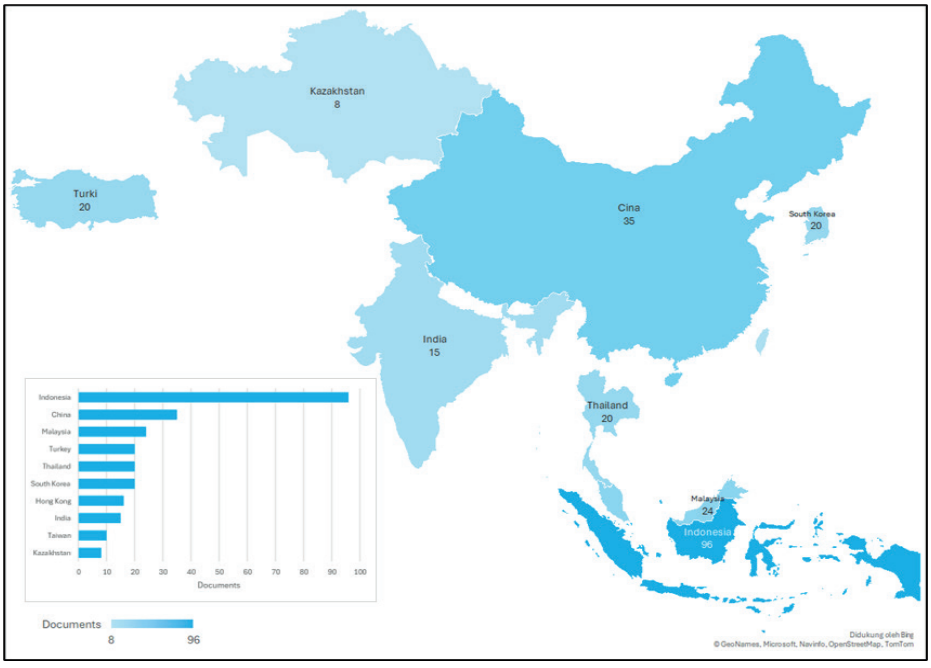

Figure 3. Countries with the highest scientific production

Among the institutions with the highest affiliation in scientific production are: Yogyakarta State University in Indonesia, with 13 publications; Indonesia University of Education, with 10 publications; and Jakarta State University, with 9 publications. Additionally, Universiti Teknologi MARA, The University of Hong Kong, Semarang State University, and Malang State University each have 7 publications, while Padang State University and Makassar State University each contribute 6 publications. The author with the highest number of publications is Shamila Mohamed Shuhidan, affiliated with Universiti Teknologi MARA. Furthermore, the data presented in table 1 highlights the 20 most cited publications.

Table 1. The 20 most cited publications

Title	Year	Cites
Social Support and Playing Around: An Examination of How Older Adults Acquire Digital Literacy with Tablet Computers.[8]	2017	181
Digital literacy: A prerequisite for effective learning in a blended learning environment?[9]	2016	143
Self-regulated learning strategies in higher education: Fostering digital literacy for sustainable lifelong learning.[10]	2020	138
Towards an inclusive digital literacy framework for digital India.[11]	2018	136
Digital literacies and language learning.[12]	2015	97
Measuring digital literacy across three age cohorts: Exploring test dimensionality and performance differences.[13]	2020	93
A Scientometric Study of Digital Literacy, ICT Literacy, Information Literacy, and Media Literacy.[14]	2021	85
Tapping into students' digital literacy and designing negotiated learning to promote learner autonomy.[15]	2015	73
Digital literacy and digital didactics as the basis for new learning models development.[16]	2020	69
Technology integration for students' information and digital literacy education in academic libraries.[17]	2019	68
Does digital literacy influence students' online risk? Evidence from Covid-19.[18]	2021	66
A mixed research-based model for pre-service science teachers' digital literacy: Responses to "which beliefs" and "how and why they interact" questions.[19]	2018	66
Technology-based language learning: Investigation of digital technology and digital literacy.[20]	2021	54
Digital literacy of EFL students in a junior high school in Iran: voices of teachers, students and Ministry Directors.[21]	2022	51
The structural relationship among digital literacy, learning strategies, and core competencies among south korean college students.[22]	2019	51
Connecting digital literacy in higher education to the 21st century workforce.[23]	2022	51
Digital literacy of language learners in two different contexts.[24]	2017	47
Investigating the relationship of technology learning support to digital literacy from the perspective of self-determination theory.[25]	2022	45
Human–Computer Interaction and Digital Literacy Promote Educational Learning in Pre-school Children: Mediating Role of Psychological Resilience for Kids' Mental Well-Being and School Readiness.[26]	2025	43
Digital literacy, digital competence and research productivity of educators.[27]	2019	43

The topics listed in table 1 that are most frequently studied regarding digital literacy in the context of education in Asia include social support, blended learning environments, self-directed learning strategies, inclusive digital literacy frameworks, and the relationship between digital literacy and learning. Finally, figure 4 presents an analysis of the co-occurrence of keywords related to digital literacy in education across Asia, revealing six highly relevant clusters.

The clusters depicted in figure 4, organized according to their significance and accompanied by pertinent keywords, are as follows:

Child (in red): This research focuses on aspects such as Augmented Reality, Dataset, Digital Device, Digital Literacy Education, Digital Literacy Practice, Kindergarten, Parent, Pre-Service Teacher, Reading, and Young Child.

English (in green): This study emphasizes aspects including Computer, EFL Teacher, Language Learning, Older Adult, Social Medium, and Young Learner.

Variable (in blue): This research addresses aspects such as 21st Century Skills, Goals, Indicators, Scales, Teacher Performance, and Validity.

Quality (in yellow): This study concentrates on aspects such as College, College Student, Core Competency, E-Learning, Online Education, and Satisfaction.

Category (in violet): This research focuses on aspects including Digital Literacy Ability, Expert, Physics, Preservice Teacher, Self-Regulation, and Web.

Academic Performance (in cyan): This study examines aspects such as Academic Achievement, Critical Thinking, and Digital Learning.

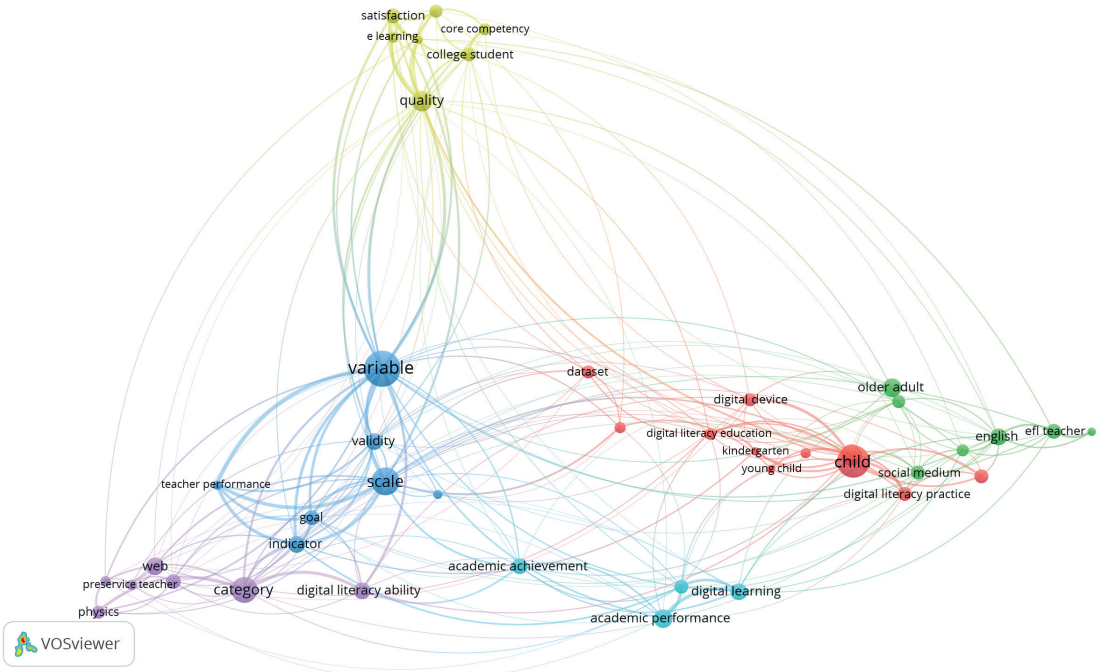

Figure 4. Analysis of co-occurrence of keywords

DISCUSSION

In this bibliometric analysis, we identified several intriguing patterns and trends that reflect the relationship between digital literacy and learning in Asia, based on the results of the keyword co-occurrence analysis.

Firstly, the Child cluster (represented in red) indicates that research on digital literacy is heavily focused on skill development among children. Aspects such as Augmented Reality, Digital Devices, and Digital Literacy Education underscore the significance of technology in enhancing digital literacy skills at an early age. This research also encompasses the roles of Parents and Pre-Service Teachers, highlighting that collaboration between families and educators is crucial in creating a supportive learning environment.[28,29,30]

Secondly, the Computer cluster (depicted in green) emphasizes the use of technology in language education, particularly within the context of English as a Foreign Language (EFL). Keywords such as EFL Teacher, Language Learning, and Social Medium indicate that pedagogical strategies integrating digital literacy for teaching English to diverse learner groups, including Older Adults and Young Learners, are a primary focus. Digital literacy is not only essential for information access but also for enhancing language proficiency, which is a critical skill in today's globalized world.[21,31]

Thirdly, the 21st Century Skill cluster (illustrated in blue) demonstrates that the competencies required for success in modern education are closely linked to digital literacy. Keywords such as Goal, Indicator, and Scale reflect a focus on measuring educational outcomes and the effectiveness of teaching practices that incorporate digital literacy. Digital literacy encompasses not only the mastery of technology but also the development of critical and analytical thinking skills necessary to address the challenges of the 21st century.[32,33,34]

Fourthly, the College cluster (represented in yellow) highlights themes related to higher education and the experiences of College Students. Keywords such as Core Competency, E-Learning, and Online Education indicate that the integration of digital literacy into college curricula is becoming increasingly important.[22,32] The emphasis on Quality and Satisfaction suggests that the effectiveness of online learning environments and student satisfaction with their digital learning experiences are primary concerns in this research. Online learning not only offers flexibility and accessibility but also requires strong digital literacy skills for students to navigate and fully utilize learning platforms, thereby enhancing their satisfaction with the learning process.[35,36]

Fifthly, the Digital Literacy Ability cluster (illustrated in purple) emphasizes the development of digital literacy skills among pre-service teachers and experts in the field. Keywords such as Self Regulation and Web

indicate a focus on the skills necessary for effective online teaching and learning. This underscores the necessity for digital literacy to be an integral part of teacher training to ensure that educators can impart these skills to their students.[37,38]

Lastly, the Academic Performance cluster (depicted in cyan) focuses on the relationship between digital literacy and academic performance. Keywords such as Academic Achievement, Critical Thinking, and Digital Learning indicate that digital literacy has a significant impact on overall educational outcomes. Research within this cluster emphasizes the importance of critical thinking skills that can be developed through the use of technology in learning, as well as how digital learning and digital literacy can enhance students' academic achievements.[39,40]

This analysis demonstrates that digital literacy plays a crucial role in education across Asia, encompassing various interconnected aspects, from early childhood education to higher education. The study underscores the necessity for a comprehensive approach to developing digital literacy, which involves collaboration among educators, parents, and other stakeholders to create a supportive and effective learning environment.[28,29,30]

It is important to note that among the 20 most cited publications, the topics most frequently addressed include social support, blended learning environments, self-directed learning strategies, inclusive digital literacy frameworks, and the relationship between digital literacy and learning. These topics are not only relevant but also essential, making them highly sought after by the academic community. Furthermore, the factors contributing to an article's citation include the scientific authority relevant to the field, both from the authors and the journals in which the articles are published.[41]

Implications of the Research

This study has several significant implications for the development of digital literacy within the educational context in Asia. Firstly, the results of the analysis indicate that digital literacy should be an integral part of the educational curriculum at all levels, from early childhood education to higher education. This underscores the importance of developing digital skills that not only focus on the use of technology but also on fostering critical and analytical thinking skills necessary to address the challenges of the 21st century.

Secondly, collaboration among educators, parents, and other stakeholders is crucial in creating a supportive learning environment. This research demonstrates that social support can enhance the effectiveness of digital learning, making it essential to involve all parties in the educational process.

Limitations of the Research

While this study provides valuable insights, there are several limitations that should be acknowledged. Firstly, the analysis is limited to publications indexed in SCOPUS, which may not encompass all relevant research in the field of digital literacy. Consequently, there is a possibility that some important perspectives are not represented in this analysis.

Secondly, the focus on specific countries in Asia may restrict the generalizability of the findings. Each country possesses unique social, cultural, and educational contexts that can influence the implementation of digital literacy. Further research is needed to explore how local contexts affect the development of digital literacy.

Future Research Opportunities

Future research can explore several intriguing opportunities that arise from these findings. Firstly, longitudinal studies examining the development of digital literacy among students from diverse backgrounds could provide deeper insights into the factors influencing the success of digital learning.

Secondly, research focusing on the development and evaluation of training programs for educators in teaching digital literacy could enhance the quality of instruction. This includes the creation of curricula that effectively and relevantly integrate technology.

Thirdly, further exploration of the impact of digital literacy on academic performance across various disciplines could yield a better understanding of how digital skills can improve overall educational outcomes.

CONCLUSION

The bibliometric analysis conducted in this study provides profound insights into the relationship between digital literacy and learning in Asia. The key findings indicate that digital literacy is a crucial element in education, encompassing various aspects from early childhood education to higher education. This research identifies several important clusters, including the development of skills among children, the use of technology in language education, and the 21st-century competencies associated with digital literacy.

The significance of collaboration among educators, parents, and other stakeholders is emphasized as a key factor in creating a supportive learning environment. Furthermore, this study demonstrates that digital literacy not only focuses on the mastery of technology but also on the development of critical and analytical thinking skills necessary to address challenges in the modern era.

This research opens avenues for further exploration in the field of digital literacy, which is essential for preparing future generations to confront the ever-evolving global challenges. With a comprehensive and collaborative approach, it is hoped that digital literacy can be effectively integrated into educational curricula across Asia.

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CONFLICT OF INTEREST

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