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The Intellectual Evolution of Digital Literacy Studies: A Bibliometric Analysis of Scopus Publications

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ABSTRACT

This study aims to map and analyze the global research landscape of digital literacy through a bibliometric approach. Data were retrieved from the Scopus database and analyzed using VOSviewer software to examine co-authorship patterns, institutional collaborations, country contributions, keyword co-occurrence structures, and citation impact. The co-authorship analysis reveals that author-level collaboration in digital literacy research is not organized into a single integrated community but into four largely disconnected teams that are unified almost entirely through the boundary-spanning position of one prolific author, while institutional collaboration remains sparse and structured as a thin, crossing chain linking business and communication, management, and nursing faculties. At the country level, China and the United States function as dual central hubs, with Indonesia forming a substantial secondary hub that reflects the strong presence of Southeast Asian scholarship, alongside more selective participation from countries such as Canada, Australia, Spain, and the Russian Federation. As shown by the keyword co-occurrence analysis, the field is organized around four interconnected clusters covering the library- and bibliometric-oriented dimension of digital literacy, the artificial-intelligence-driven pedagogical dimension, the human-subject and disability-oriented dimension, and a smaller pandemic-related bridging dimension, with digital literacy, artificial intelligence, and human forming the dominant conceptual anchors. The overlay and density analyses further indicate a clear temporal shift from foundational information-literacy and human-subject themes toward generative-AI-oriented and bibliometric-mapping themes in more recent years. The citation analysis demonstrates that the field draws on cross-disciplinary foundational works spanning financial literacy, disability inclusion, multimodal literacy, and generative artificial intelligence. Taken together, these findings suggest that digital literacy research has developed into a globally distributed yet structurally fragmented field that is rapidly reorienting itself around the integration of artificial intelligence into literacy theory and practice.

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1. INTRODUCTION

The capacity to locate, evaluate, create, and communicate information through digital technologies has become a defining competency of contemporary social, educational, and economic life, giving rise to the construct widely known as digital literacy. Early conceptual work situates digital literacy not as a narrow technical skill but as a practice embedded in the everyday, situated ways in which citizens use the internet to accomplish personal, civic, and professional goals [1]. This everyday-practice orientation distinguishes digital literacy from earlier, more instrumental notions of computer literacy, positioning it instead as a socially and contextually constructed capability.

Building on this practice-based foundation, subsequent scholarship has reframed digital literacy as a contested and power-laden construct, arguing that the ability to participate safely and meaningfully in digital environments is inseparable from questions of surveillance, agency, and risk management, particularly for users who are structurally disadvantaged [2]. This critical turn has broadened the scope of digital literacy research beyond skill acquisition toward an examination of who is empowered, and who is placed at risk, by digital participation.

The conceptual trajectory of digital literacy is also closely intertwined with adjacent literacies, most notably information literacy, which emphasizes the effects of formal instruction, teaching methods, and information and communication technology use on students' capacity to locate and evaluate information critically [3]. As digital and information environments have become increasingly interdependent, this overlap has positioned digital literacy as a bridging concept connecting library and information science, education, and communication studies.

The growing global interest in digital literacy has produced a rich and heterogeneous body of scholarship extending well beyond its educational core. Empirical work has, for instance, applied bibliometric methods to trace the intellectual development of financial literacy as a distinct but conceptually related field of inquiry [4], while other studies have documented the particular digital-inclusion barriers faced by people with intellectual disabilities during the COVID-19 pandemic [5]. Complementary research has further shown that the digital divide is not gender-neutral, identifying persistent structural barriers to women's digital inclusion and outlining emerging directions for closing this gap [6].

At a more applied level, scholars have examined how digital literacy can be understood and mapped specifically for students with disability [7], while others have traced how digital literacy is enacted by teachers navigating lifelong professional learning [8] and have identified digital safety as a distinct and increasingly critical component of teachers' digital competence [9]. Collectively, these studies illustrate that digital literacy functions simultaneously as an educational objective, a professional competency, and a matter of social inclusion.

As this literature continues to expand across education, library science, health, and social policy, it becomes increasingly difficult for researchers and practitioners to maintain a comprehensive and structured understanding of the field's leading contributors, institutional actors, and intellectual trajectory, particularly as generative artificial intelligence begins to reshape how digital literacy is taught, practiced, and studied. Bibliometric analysis offers a robust quantitative framework for examining not only the thematic evolution of a research field but also its social and institutional architecture, including co-authorship patterns, institutional collaboration, and international participation. Prior bibliometric investigations of adjacent literacy domains have provided useful methodological precedents for systematically mapping such intellectual structures [10], [11] yet comprehensive bibliometric investigations that jointly map the collaborative networks and the intellectual structure of global digital literacy research remain relatively limited.

The present study addresses this gap by conducting a comprehensive bibliometric analysis of global research on digital literacy, drawing on publication data extracted from the Scopus database. VOSviewer is employed to construct co-authorship, institutional, and country collaboration networks, alongside keyword co-occurrence, overlay, and density visualizations, together providing a multi-dimensional view of the field's social and intellectual structure. In doing so, the study aims to identify leading collaborative clusters, examine the geographic distribution of research contributions, trace the temporal evolution of key research themes, and highlight the most influential publications. By systematically mapping the global research landscape, this study seeks to provide scholars and practitioners with actionable insights into the current state and future trajectories of digital literacy research.

2. METHOD

This study adopts a bibliometric methodology to systematically examine the global research landscape of digital literacy. Bibliometric analysis is a well-established quantitative approach that enables researchers to evaluate the scientific output and intellectual structure of a research field by analyzing patterns in publication volumes, citation relationships, collaboration networks, and keyword co-occurrence. Such a methodological framework is particularly well suited to the objectives of the present study, as it allows for the systematic mapping of a large and disciplinarily diverse body of literature in an objective and reproducible manner, without the subjectivity inherent in traditional narrative reviews. Accordingly, the methodological design of this study encompasses three primary stages: data collection, data preparation, and bibliometric visualization and analysis.

Data for this study were sourced from the Scopus database, chosen for its broad and comprehensive coverage of peer-reviewed academic literature across disciplines including education, library and information science, communication studies, and health sciences. The search was structured using keyword queries centered on the construct of digital literacy and its key conceptual derivatives, including digital literacies, information literacy, media literacy, and digital competence. In order to ensure analytical consistency and comparability across records, the search was limited to journal articles, conference papers, and review articles written in English, while documents lacking sufficient bibliographic information for network construction were excluded during data preparation.

The analysis itself was carried out using VOSviewer, a software application developed specifically for constructing and visualizing bibliometric networks. VOSviewer was applied to construct co-authorship networks at the author, institutional, and country levels in order to reveal the collaborative structure underlying digital literacy research, using fractional counting and association-strength normalization to ensure an accurate representation of relational strength among bibliographic items. In parallel, keyword co-occurrence analysis was performed with a minimum occurrence threshold applied to retain only statistically meaningful associations, and the resulting network was examined across three complementary visualization modes: the network map, illustrating thematic clustering; the overlay map, depicting the temporal evolution of themes based on average publication year; and the density map, representing the relative concentration of research intensity around each keyword node [10], [11].

In addition, citation analysis was conducted to identify the most influential publications, ranked by total citation count as reported in Scopus, so as to complement the network-based findings with an assessment of the field's most consequential intellectual contributions.

3. RESULT AND DISCUSSION

3.1 Result

a. Co-Authorship Analysis

The following figure presents a VOSviewer co-authorship network

visualization illustrating the collaborative structure among leading authors in the global research field of digital literacy.

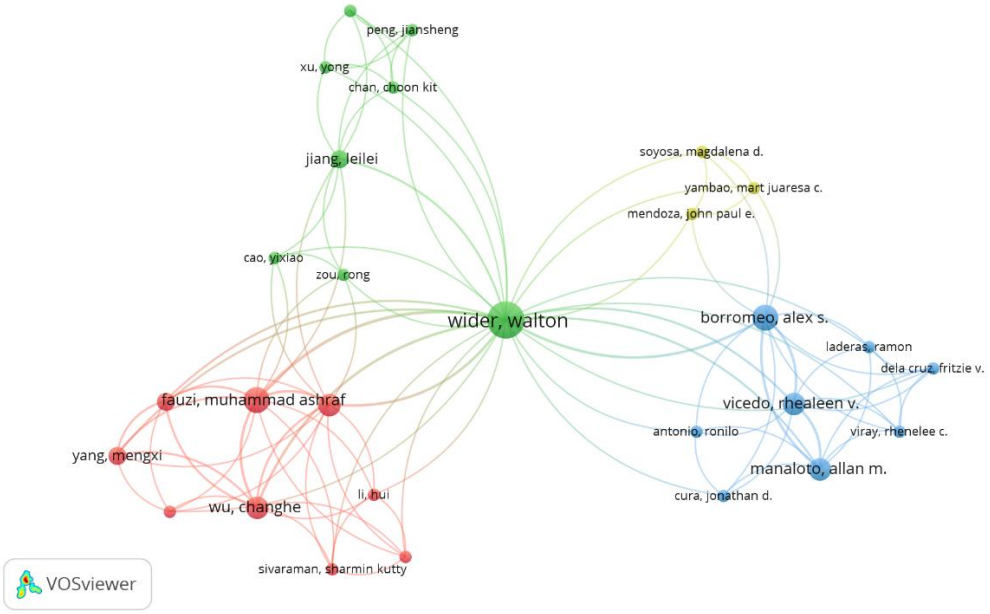

Figure 1. Author Visualization
Source: Data Analysis, 2026

As shown in the network map, author-level collaboration in digital literacy research is organized into four distinct clusters rather than a single unified community, unified almost entirely through the position of Wider, Walton, who occupies the central node of the network and maintains direct ties to every other cluster. The green cluster, comprising Peng Jiansheng, Xu Yong, Chan Choon Kit, Jiang Leilei, Cao Yixiao, and Zou Rong, forms Wider Walton's most densely interconnected team. The red cluster, anchored by Fauzi Muhammad Ashraf, Yang Mengxi, Wu Changhe, Li Hui, and Sivaraman Sharmin Kutty, represents a second, internally cohesive team investigating a related but analytically distinct strand of digital literacy scholarship. The blue cluster, the largest of the four, brings together Borromeo Alex S., Vicedo Rhealeen V., Manaloto Allan M., Antonio Ronilo, Cura Jonathan D., Laderas Ramon, dela Cruz Fritzie V., and Viray Rhenelee C., while a smaller yellow cluster comprising Soyosa Magdalena D., Yambao Mart Juaresa C., and Mendoza John Paul E. connects to the network exclusively through Wider Walton.

Notably, none of the four clusters share direct ties with one another; every cross-team connection in the network passes through Wider, Walton, indicating a hub-and-spoke rather than a distributed collaborative topology. This pattern implies that, unlike fields organized around several bridging authors, knowledge production in this segment of digital literacy research depends disproportionately on the boundary-spanning activity of a single highly prolific researcher, and that the apparent global cohesion of the network would likely fragment into four isolated research teams in the absence of this central figure.

The following figure illustrates a VOSviewer network of institutional co-authorship relations

in the field of digital literacy, highlighting collaboration patterns among research institutions.

Figure 2. Institution Visualization
Source: Data Analysis, 2026

In contrast to the star-shaped author-level network, the institutional collaboration network takes the form of two intersecting bridges rather than a single connected hub. On one side, a blue cluster centered on a faculty of business and communication connects to a smaller faculty of education and liberal arts and to a college of nursing, while also linking, through a green cluster of partially labelled institutes including one affiliated with Nanjing University, to a faculty of management at Shinawatra University; on the other side, this green cluster in turn connects onward to a second, separate college of nursing represented by a red cluster.

This crossing, figure-eight configuration, in which institutions are linked through a small number of intermediary faculties rather than through a densely interconnected hub, suggests that inter-institutional collaboration in digital literacy research is built around a handful of specific joint projects spanning business and communication, management, and health-sciences faculties rather than sustained, multi-project alliances. Such a pattern indicates that formal institutional collaboration in this field remains comparatively limited relative to author-level collaboration, with much of the field's collaborative activity occurring through individual research partnerships that have not yet translated into stable, cross-institutional research programs.

The following figure presents a VOSviewer country co-authorship network illustrating international collaboration patterns in research on digital literacy.

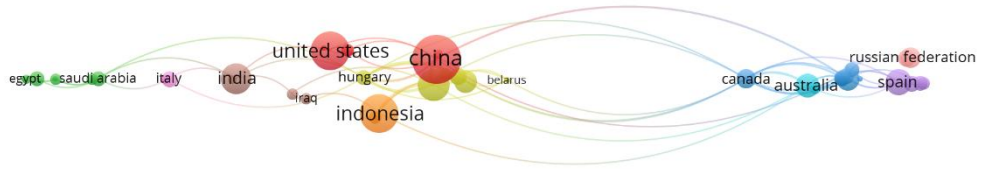

Figure 3. Country Visualization
Source: Data Analysis, 2026

The country-level network shows that China occupies the most central position in the global collaboration structure, marked by the largest node size, followed closely by the United States, which together form the dominant red cluster at the core of the network. This dual centrality reflects the leading role of Chinese- and U.S.-based institutions in producing and disseminating digital literacy knowledge, while Indonesia emerges as a substantial secondary hub, its large orange node reflecting extensive and increasingly influential Southeast Asian participation in the field.

A yellow-green cluster comprising Hungary and Belarus links closely to the China–United States core, while a chain of smaller, more peripheral countries, including India, Iraq, Italy, Saudi Arabia, and Egypt, extends outward from this core, reflecting a more selective and indirect pattern of participation. On the opposite side of the network, a distinct cluster comprising Canada, Australia, the Russian Federation, and Spain forms a secondary axis of international collaboration, indicating that digital literacy research, while clearly concentrated around its Chinese, American, and Indonesian hubs, nonetheless maintains meaningful collaborative ties across North America, Oceania, and Europe.

b. Citation Analysis

The following table presents the most cited publications in the broader literature connected to digital literacy research.

Table 1. Most Cited Article

Citations	Author and Year	Title	Publication
892	K. Goyal, S. Kumar [4]	Financial literacy: A systematic review and bibliometric analysis	International Journal of Consumer Studies
141	D. Chadwick, K.A. Ã…gren, S. Caton, E. Chiner, J. Danker, M. GÃ³mez-Puerta, V. Heitplatz, S. Johansson, C.L. Normand, E. Murphy, P. Plichta, I. StrnadovÃ¡, E.F. WallÃ©n [5]	Digital inclusion and participation of people with intellectual disabilities during COVID-19: A rapid review and international bricolage	Journal of Policy and Practice in Intellectual Disabilities

Citations	Author and Year	Title	Publication
109	Å◎. Tomczyk [9]	Skills in the area of digital safety as a key component of digital literacy among teachers	Education and Information Technologies
101	K. Lenters [12]	Riding the lines and overwriting in the margins: Affect and multimodal literacy practices	Journal of Literacy Research
98	D. Tafazoli [13]	Exploring the potential of generative AI in democratizing English language education	Computers and Education: Artificial Intelligence
84	A.J. Banks [14]	Digital griots: African American rhetoric in a multimedia age	Digital Griots: African American Rhetoric in a Multimedia Age
81	O. Erstad, J. Sefton-Green [15]	Identity, community, and learning lives in the digital age	Identity, Community, and Learning Lives in the Digital Age
67	F. Motolese, A. Magliozzi, F. Puttini, M. Rossi, F. Capone, K. Karlinski, A. Stark-Inbar, Z. Yekutieli, V. Di Lazzaro, M. Marano [16]	Parkinson's Disease Remote Patient Monitoring During the COVID-19 Lockdown	Frontiers in Neurology
48	S. Yang, J.W. Lee, H.-J. Kim, M. Kang, E. Chong, E.-M. Kim [17]	Can an online educational game contribute to developing information literate citizens?	Computers and Education
47	L. Zhang, N. Eichmann-Kalwara [11]	Mapping the Scholarly Literature Found in Scopus on Research Data Management: A Bibliometric and Data Visualization Approach	Journal of Librarianship and Scholarly Communication

Source: Scopus, 2026

The citation landscape of digital literacy research is concentrated around a small number of highly cited but thematically diverse contributions. The most cited work, a systematic review and bibliometric analysis of financial literacy [4], reflects the extent to which digital literacy scholarship draws on, and is cited alongside, closely related literacy constructs that share its methodological and conceptual apparatus. The second most cited contribution extends the field into disability studies by examining the digital inclusion and participation of people with intellectual disabilities during the COVID-19 pandemic [5], reinforcing digital literacy as a matter of social equity rather than a purely technical competency. Several highly cited studies further illustrate the field's conceptual breadth, including work on digital safety as a core component of teachers' digital literacy [9], research on affect and multimodal literacy practices in children's digital text-making [12], and explorations of generative artificial intelligence's potential to democratize English language education [13]. The presence of rhetoric- and identity-oriented scholarship, including African American digital rhetoric [14]and identity and community

formation in digital learning environments [15], together with health-technology-oriented work on remote patient monitoring during the COVID-19 lockdown [16] and educational-game-based information literacy research [17], confirms that digital literacy functions as an integrative concept linking education, rhetoric, health technology, and social inclusion, while the presence of a Scopus-based bibliometric mapping study among the most cited works [11] underscores the field's own growing methodological self-awareness.

c. Keyword Co-Occurrence Analysis

The following figure presents a VOSviewer keyword co-occurrence network illustrating the thematic structure and intellectual relationships in the global literature on digital literacy.

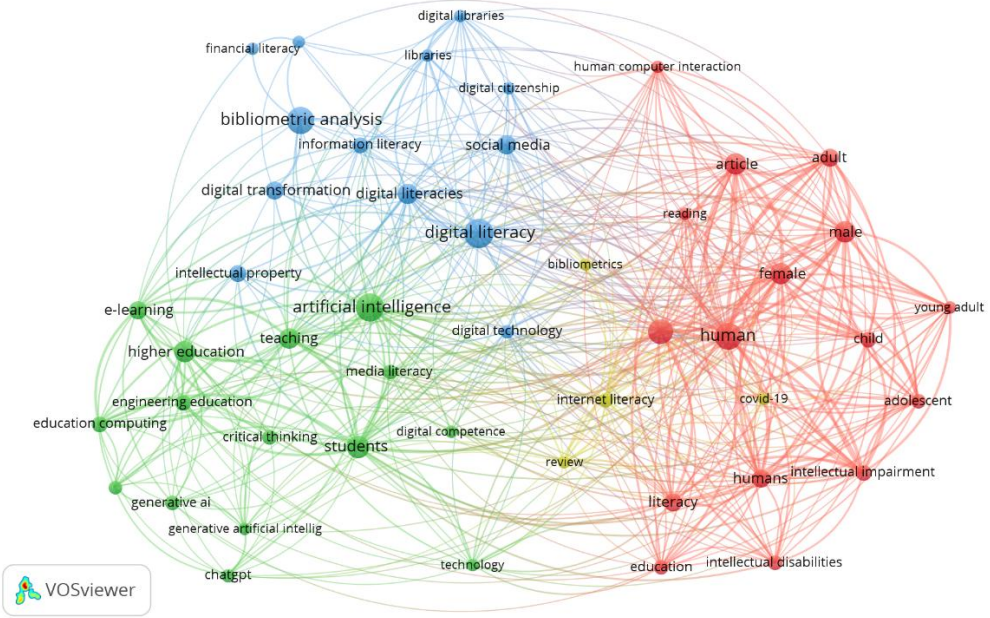

Figure 4. Network Visualization
Source: Data Analysis, 2026

As shown in the network, the visualization displays a densely interconnected knowledge structure organized into four distinct thematic clusters, with digital literacy, artificial intelligence, and human occupying the most prominent positions as the field's primary conceptual anchors. The blue cluster, positioned toward the upper-left of the network, encompasses digital libraries, financial literacy, libraries, digital citizenship, bibliometric analysis, information literacy, social media, digital transformation, digital literacies, digital literacy, and intellectual property, representing the library-, information-, and bibliometric-oriented dimension of the field.

The green cluster, positioned toward the lower-left of the network, groups together artificial intelligence, e-learning, higher education, teaching, media literacy, engineering education, education computing, critical thinking, students, digital competence, generative ai, generative artificial intelligence, chatgpt, and technology, reflecting the rapidly expanding pedagogical dimension of the field, in which digital literacy is increasingly examined through the lens of AI-assisted teaching and

learning. The red cluster, occupying the right side of the network, encompasses human computer interaction, article, adult, male, female, human, reading, child, adolescent, young adult, humans, intellectual impairment, literacy, intellectual disabilities, and education, reflecting a substantial body of human-subject and disability-oriented digital literacy research. A smaller yellow cluster at the center of the network, comprising bibliometrics, internet literacy, review, and covid-19, functions as a thin bridge connecting the library-oriented, AI-oriented, and human-subject clusters, reflecting the field's methodological and pandemic-related crosscutting concerns.

The following figure shows an overlay of keywords used in studying digital literacy using VOSviewer, wherein the nodes are colored according to the temporal evolution of themes from earlier years (purple-blue, around 2022) to more recent years (yellow, around 2025).

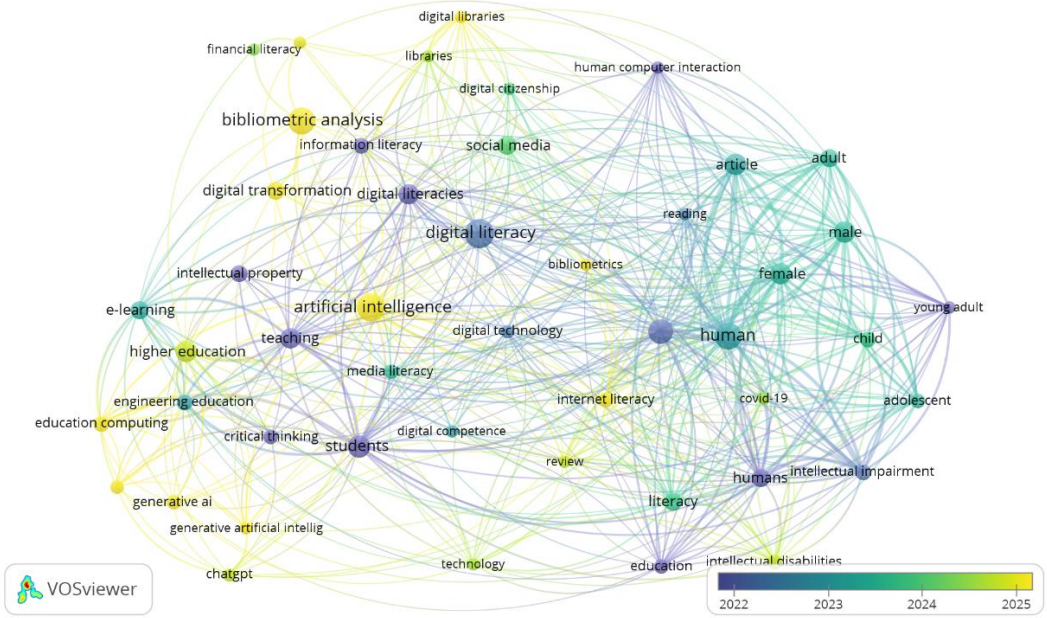

Figure 5. Overlay Visualization
Source: Data Analysis, 2026

The temporal distribution of the keyword network indicates that the earliest phase of research, represented by nodes in dark purple and blue, is concentrated around human computer interaction, intellectual property, digital literacies, information literacy, students, critical thinking, reading, humans, intellectual impairment, adult, young adult, and review. This pattern suggests that scholarship from this period conceptualized digital literacy primarily through established information-science and human-subject frameworks, situated within the field's original library- and skills-oriented foundations.

A subsequent phase, denoted by teal and green nodes, encompasses digital literacy, artificial intelligence, human, literacy, education, digital competence, media literacy, adolescent, covid-19, and child. This shift reflects a growing thematic maturity in the field, in which digital literacy comes to be examined increasingly through the lens of artificial intelligence and pandemic-driven remote learning, alongside a

continued emphasis on demographic and developmental dimensions of literacy practice.

The most recent phase, indicated by green-to-yellow nodes, is characterized by a pronounced concentration around bibliometric analysis, digital transformation, generative ai, chatgpt, generative artificial intelligence, education computing, engineering education, financial literacy, digital citizenship, and technology. This development indicates that contemporary research increasingly situates digital literacy within generative-AI-driven pedagogical framings and bibliometric self-reflection, while simultaneously extending the concept into digital citizenship and adjacent literacies such as financial literacy. Notably, digital literacy, artificial intelligence, and human remain the dominant nodes throughout all temporal stages of the network, confirming their continued function as the field's central organizing constructs even as the surrounding thematic structure expands toward increasingly AI-driven and bibliometric domains.

The following figure presents a VOSviewer density visualization (heatmap) of keyword co-occurrence in the global research landscape of digital literacy, where brighter regions indicate higher term density and stronger conceptual concentration.

Figure 6. Network Visualization
Source: Data Analysis, 2026

The density visualization reveals a clearly defined intellectual core surrounded by a comparatively diffuse periphery. Human and artificial intelligence emerge as the brightest and most centrally positioned hotspots in the map, indicating that these two constructs function as the primary point of conceptual integration across the various strands of digital literacy research. Surrounding this core, terms such as digital literacy, students, bibliometric analysis, female, literacy, and education likewise display high density, suggesting that these concepts

constitute the theoretical and empirical backbone of the field.

By contrast, terms located toward the periphery of the map, including chatgpt, generative ai, generative artificial intelligence, technology, financial literacy, digital citizenship, human computer interaction, and intellectual disabilities, exhibit noticeably lower density. This pattern indicates that such themes represent emerging or more specialized directions of inquiry rather than well-established components of the field's core structure, reflecting the fact that generative-AI-oriented and adjacent-literacy research, although rapidly growing, remains at an earlier stage of conceptual consolidation than the field's established human-subject and bibliometric core.

3.2 Discussion

This bibliometric analysis offers a systematic account of the collaborative structure, intellectual development, and thematic composition of digital literacy research within contemporary science. Overall, the results indicate that knowledge production in this field is organized around a small number of internally cohesive but mutually disconnected research teams rather than a single, broadly integrated global community, with China, the United States, and Indonesia functioning as the principal nodes of international collaboration. This pattern echoes bibliometric findings in other rapidly growing scientific fields, where a handful of central actors and institutions disproportionately shape the research agenda while broader international participation continues to expand at the periphery.

In terms of conceptual content, the keyword co-occurrence analysis shows that digital literacy remains firmly embedded within information-science and human-subject theoretical structures, particularly through its close association with information literacy, bibliometric analysis, and human-computer interaction. These themes form the conceptual backbone of the field, tracing back to foundational treatments of digital literacy as an everyday, situated practice. At the same time, the presence of strong and rapidly intensifying linkages to artificial intelligence, generative ai, and chatgpt indicates an emerging paradigm shift, in which digital literacy is increasingly understood not solely as a set of static information-handling skills but also as a competency actively reshaped by generative-AI tools and pedagogical processes.

The overlay and density maps jointly establish a discernible temporal trajectory in the field's intellectual development. Early and well-established scholarship concentrated on foundational, information- and human-subject-centered dimensions of digital literacy, particularly in relation to information literacy and human-computer interaction. Research at an intermediate stage increasingly incorporated digital literacy into broader discussions of artificial intelligence and pandemic-driven remote learning, reflecting a shift toward understanding digital literacy as a technologically mediated and demographically differentiated phenomenon. More recent scholarship has diversified further into generative-AI and bibliometric-mapping territory, indicating that the field is progressively engaging with the tools and self-reflective methods through which digital literacy research itself is produced and disseminated.

The citation analysis adds a further dimension by identifying the specific contributions that have most significantly shaped the intellectual trajectory of digital literacy research. The dominance of highly cited but thematically diverse works reflects the field's continued reliance on cross-disciplinary conceptual foundations spanning financial literacy, disability

inclusion, and generative AI, while the strong presence of rhetoric-, identity-, and health-technology-oriented studies among the top-cited works confirms that the field's applied and interdisciplinary orientation remains highly influential. This pattern suggests that theoretical authority in the field remains concentrated around a small set of cross-disciplinary and application-oriented contributions rather than being broadly distributed, pointing toward future research that more deliberately strengthens cross-institutional and cross-country collaboration, particularly by connecting the field's established information-literacy and human-subject research communities with the rapidly growing generative-AI and digital-citizenship literature.

4. CONCLUSION

This study offers a comprehensive bibliometric mapping of the global research network on digital literacy by employing the Scopus database and VOSviewer techniques. As shown by the co-authorship, institutional, and country analyses, the field is driven by a small number of internally cohesive but disconnected research teams and a globally distributed collaboration network centered on China, the United States, and Indonesia, with meaningful but more selective participation from countries such as Canada, Australia, Spain, and the Russian Federation. The keyword co-occurrence, overlay, and density analyses confirm that digital literacy, artificial intelligence, and human form the intellectual core of the field, while generative-AI-oriented and bibliometric-mapping research constitute significant and rapidly expanding secondary pillars. The citation analysis further demonstrates that the field's theoretical foundations remain firmly cross-disciplinary, spanning financial literacy, disability inclusion, rhetoric, and generative artificial intelligence. Taken together, these findings indicate that digital literacy research has developed into a structurally fragmented yet globally engaged field that is rapidly reorienting itself toward the integration of artificial intelligence into literacy theory and practice, with clear potential for future growth at the intersection of generative AI, digital citizenship, and cross-institutional scientific collaboration.

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