Acta Scientiarum
http://periodicos.uem.br/ojs
ISSN on-line: 2178-5201
https://doi.org/10.4025/actascieduc.v48i1.75567

Academic literacy in digital environments: key to innovation in higher education

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ABSTRACT. Academic literacy (AL) in digital environments has become a fundamental component of 21st-century education, especially in Higher Education Institutions (HEIs). This literacy goes beyond traditional reading and writing skills, as its greater social impact promotes equality and educational inclusion, as well as the ability to equitably access information and communication technologies (ICTs) to facilitate research and generate it at the higher education level. However, despite its relevance, scientific output in this area remains limited, highlighting the need to expand scholarly production in this field and achieve conceptual consensus. Thus, the aim of this study is to identify, evaluate, and synthesize the relevant literature on academic literacy in digital environments during the period 2018–2023, using a systematic search methodology. This underscores the importance of defining and structuring the main challenges that AL poses in the contemporary digital context of higher education. To this end, explicit search criteria were applied, employing inclusion and exclusion indicators in Google Scholar. Among the findings, a definition with diverse pedagogical implications stands out, highlighting the need to view this phenomenon in higher education institutions as polysemous—without considering the discursive interpretation it will acquire with the growing presence of artificial intelligence. Among the notable trends, it is reinforced that AL is dynamic and contextual rather than universal, shaped by the disciplinary contexts, environments, tools, and sociocultural conditions specific to each country.

Keywords: writing; digital competence; higher scientific education; higher education.

Literacia acadêmica em ambientes digitais: chave para a inovação no ensino superior

RESUMO. A alfabetização acadêmica (AA) em ambientes digitais tornou-se um componente fundamental da educação do século XXI, especialmente nas Instituições de Ensino Superior (IES). Essa alfabetização vai além das habilidades tradicionais de leitura e escrita, pois seu maior impacto social promove a igualdade e a inclusão educacional, bem como a capacidade de acessar equitativamente as Tecnologias da Informação e Comunicação (TICs) para facilitar e gerar pesquisa no nível do ensino superior. No entanto, apesar de sua relevância, a produção científica nessa área permanece limitada, o que destaca a necessidade de promover sua produção e alcançar um consenso conceitual. Este estudo visa identificar, avaliar e sintetizar a literatura relevante sobre alfabetização acadêmica em ambientes digitais no período de 2018 a 2023, utilizando uma metodologia de busca sistemática. Isso ressalta a importância de definir e estruturar os principais desafios que a AA apresenta no contexto digital contemporâneo do ensino superior. Para tanto, foram aplicados critérios de busca explícitos, empregando indicadores de inclusão e exclusão no Google Acadêmico. Entre as conclusões, destaca-se uma definição com diversas implicações pedagógicas, ressaltando a necessidade de encarar esse fenômeno nas instituições de ensino superior como polissêmico — sem considerar a interpretação discursiva que adquirirá com a crescente presença da inteligência artificial. Dentre as tendências mais relevantes, reforça-se a ideia de que a aprendizagem ad hoc é dinâmica e contextual, não universal, condicionada pelas disciplinas, ambientes, ferramentas e fenômenos socioculturais de cada país.

Palavras-chave: escrita; competência digital; ensino científico superior; educação superior.

Alfabetización académica en entornos digitales: clave para la innovación en la educación superior

RESUMEN. La alfabetización académica (AA) en entornos digitales se ha convertido en un componente fundamental de la educación del siglo XXI, especialmente en las Instituciones de Educación Superior (IES),

pues esta alfabetización va más allá de las competencias tradicionales de lectura y escritura, ya que su mayor representación social, promueve la igualdad e inclusión educativa, así como la capacidad de disponer con equidad de las tecnologías de la información y la comunicación (TIC) para favorecer el acceso a la investigación y generarla a nivel superior. No obstante, a pesar de su relevancia, la producción científica en este ámbito aún es limitada, lo que enfatiza la precisión de fomentar su producción, igualmente de alcanzar un consenso conceptual. Este estudio tiene como objetivo identificar, evaluar y sintetizar la literatura relevante sobre la alfabetización académica en entornos digitales durante el periodo 2018-2023, utilizando el enfoque metodológico de búsqueda sistemática. Lo que determina la importancia de definir y estructurar los principales desafíos que plantea la AA en el contexto digital contemporáneo de la educación superior. Para ello, se aplicaron criterios explícitos de búsqueda que emplearon indicadores de inclusión y exclusión en Google Académico. Entre los hallazgos, destaca una definición con diversas implicaciones pedagógicas que resalta la necesidad de visualizar este fenómeno en las IES como polisémico —sin considerar la interpretación discursiva que adquirirá con la creciente presencia de la inteligencia artificial—. Entre las tendencias sobresalientes se refuerza que la AA es dinámica y contextual, no universal, condicionada por disciplinas, entornos y herramientas y fenómenos socioculturales de cada país.

Palabras clave: escritura; competencia digital; enseñanza científica superior; educación superior.

Received on February 5, 2025.
Accepted on November 13, 2025.
Published in June 02, 2026.

Introduction

We live in the digital age, a period in which the electronic environment has significantly transformed and diversified communication and information access (Quinaluisa Morán et al., 2023). In this context, the academic sphere is not isolated from constant evolution; in fact, traditional forms of reading and writing are increasingly linked to the growing use of information and communication technologies (ICTs), which have become fundamental elements in the production and analysis of texts characteristic of written culture in higher education (Chaverra Fernández et al., 2022; Serrano Giménez, 2024).

Tools such as the Internet, technological devices, and digital media have reshaped the standards by which we conduct research, produce knowledge, design, and learn. The availability of the Internet, digital libraries, online databases, and digital communication tools has expanded access to knowledge for students and academics (Benito-Peregrina, 2007; Baldrich et al., 2024). Notably, the digital environment has revolutionized academic communication and collaboration (Ramos Meza, 2021), facilitating the exchange of ideas and cooperation in research projects through tools such as e-mail and messaging platforms (Serrano Giménez, 2024). This shift in the interaction among students, teachers, and researchers not only transforms communication conventions but also poses new challenges in digital literacy (Martínez-Lugo, 2024).

Similarly, digital literacy emerges as a set of written communicative practices in the digital sphere that require more sophisticated critical strategies for the production and comprehension of texts. That is, the distinctive features of digital reading and writing—such as hypertextuality and interactivity—demand an approach that develops the necessary skills to navigate and participate effectively in an increasingly digitized academic environment (Cassany, 2002; Chaverra Fernández et al., 2022; Olaizola, 2017). In this regard, Quezada Camberos (2021, p. 121) states that "[...] the effects of changes in textual supports affect the way in which research is generated and disseminated; the walls of spaces are broken [...]" —those traditionally delimited by institutional school spaces, classrooms, libraries, or offices.

Chaverra Fernández et al. (2022) argue that the incorporation of online learning platforms and open-access educational resources has democratized access to education and academic literacy (AL). For authors such as Cápona González (2022), it is essential to focus on academic literacy, as teachers receive hundreds of students in the first years of higher education with significant difficulties in reading comprehension and text production. This situation reflects existing educational inequalities and has repercussions on the academic development and professional future of students, constituting a global challenge.

In addition to the foregoing, Ayón Ochoa et al. (2025, p. 374) state that "Academic literacy represents a key axis for promoting educational inclusion in vulnerable communities in Latin America, overcoming the reductionist view of reading and writing [...]", a perspective similar to that raised a decade earlier by Stagnaro and Natale (2016). That is, it is recognized that self-directed learning and ongoing training contribute to the development of a more educated and capable society.

At the international level, the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2016), in its report "Education 2030: Incheon Declaration and Framework for Action for the Implementation of Sustainable Development Goal 4," promotes that all population groups have access to quality education and that academic literacy serves as a tool to empower individuals and reduce social and economic gaps.

However, it is unavoidable to acknowledge that, even as the benefits of AL in digital environments are recognized by organizations such as UNESCO, challenges and concerns simultaneously emerge regarding equitable access to technology and, with it, the inequalities in effectively realizing the educational potential of these environments, which advance beyond the processes of reading, writing, and textual production. Possessing such access now represents inclusive, quality digital education for all (Belandria Balestrini & Monsalve Diaz, 2021).

Nevertheless, academic literacy in digital environments is not only a concern of national and international organizations or higher education institutions, as Quezada Camberos (2021, p. 122) notes:

> The educational ideal in the digital age demands that recipients cease to be passive; the volume of information to which we are exposed calls for increasingly effective and competent readers and writers. Within the textual universe, as in the past, students in training must progressively develop the skills to produce coherent, accurate, and effective messages across different social contexts and environments; conversely, readers are expected to assess messages and sources with critical rigor.

Academic literacy is thus a multifaceted construct encompassing various dimensions necessary for success in the educational environment. First, it includes initial literacy, which refers to basic reading and writing skills, fundamental to knowledge acquisition. This is followed by information literacy (INFOLIT), which involves the ability to search for, evaluate, and critically use information, especially in a data-saturated world. Additionally, there are other forms of literacy that complement these competencies, such as digital literacy—also identified as academic literacy in digital environments—which focuses on the effective use of digital technologies and tools, and discipline-specific academic literacy, related to the conventions and practices of academic discourse across various disciplines. Together, these form a comprehensive set of skills that enables students to navigate their educational and professional trajectories successfully (Olaizola, 2017; Ramos Meza, 2021; Schiavinato et al., 2021). For authors such as Ayón Ochoa et al. (2025, p. 375), academic literacy, from a social justice perspective, "[…] contributes to reducing gaps in access and retention within the educational system."

Given the foregoing considerations, the purpose of this article is to identify, evaluate, and synthesize selected literature (2018–2023) through a systematic review, in order to document general AL trends, as well as to establish that AL is strengthened through informational and digital literacy, and that it is conceptually determined by the sociocultural contexts of each country and, within those, by the specific requirements of higher education.

Academic literacy in digital environments

Hocks (2003; cited in Olaizola, 2017) highlighted the need for substantial changes in the conception of writing and pedagogy when approaching the teaching of digital rhetoric. The practice of analyzing and generating texts in digital contexts provides students with the opportunity to cultivate rhetorical skills and maintain their roles as reflective and critical authors. Accordingly, digital writing and reading offer a pathway for academic discourse to expand and adopt a transmedial character. In this regard, a substantial body of academic work highlights the transformation of mass media and the digitization of information as determining factors in contemporary societies (Baldrich et al., 2024). Burin et al. (2016) emphasized the importance of mastering technical and operational skills in digital spaces, as well as cognitive skills in relation to academic objectives.

Reading and writing in digital environments are characterized by the interconnectivity of both the context and the devices used to produce, distribute, archive, and consume digital compositions, leveraging technologies such as the Internet (Chaverra Fernández et al., 2022; Olaizola, 2017). From this perspective, Cassany and Ayala (2008) describe multilaterality as a constant movement between different supports or even within the same support toward different places or communicative intentions. This phenomenon, termed *zapping*, is perceived by Quezada Camberos (2021) as an aspect of electronic literacy.

International organizations have also emphasized the value and importance of incorporating 21st-century skills into AL, as illustrated by the Organisation for Economic Co-operation and Development (OECD) publication "21st Century Skills for Student Learning," which identifies essential competencies—such as problem-solving, critical thinking, and effective communication—as key components of AL in the digital age (OECD, 2018).

Conceptual evolution of academic literacy

In 1989, the term academic literacy was used for the first time (Ramos Meza, 2021); in 2003, Carlino (2003) addressed and defined it. The same year, UNESCO issued its position on media literacy through the Prague Declaration, with the purpose of fostering an information-literate society (Hernando-Gómez et al., 2022). Subsequently, as the decade advanced, new distinctions emerged within the concept of literacy, most notably the consolidation of information literacy, which responds to growing demands regarding the competencies required to manage information in digital environments (Area & Guarro, 2012; Catts & Lau, 2009; Gómez Hernández & Licea de Arenas, 2005).

A further dimension of this conceptual evolution is digital literacy, which emphasizes the development of technological skills applicable in both personal and professional contexts (Benito-Peregrina, 2007; Gros & Contreras, 2006). Subsequently, the notion of multiliteracy emerged, reflecting the need to integrate multiple competencies in an increasingly complex digital environment (Tyner et al., 2015). Similarly, according to Arévalo (2014), scientific literacy is related to the promotion of critical thinking and scientific knowledge and understanding in educational settings.

As noted at the outset, UNESCO has maintained and expanded a preponderant role in this process, generating annual events in which stances of change are upheld and grounded in favor of research, experiences, and good practices among countries—both in development and as global presentations. For Hernando-Gómez et al. (2022), this constitutes support for educational policies that investigate literacy as a cardinal social practice, underscoring cultural, academic, and technological realities aimed at a comprehensive and multiple understanding of what it means to be literate in the 21st century (Gregori-Giralt et al., 2023).

While some "[...] studies do not constitute a novelty, given that this line of research has been pursued for many years [...]" (Ceretta Soria et al., 2024, p. 93), literacy has been redefined in recent decades, moving from being perceived solely as the ability to read and write to encompassing a broader concept that includes informational, digital, scientific, and academic competencies (Santos Salazar, 2025; UNESCO, 2024a).

During the United Nations Literacy Decade (UNLD), UNESCO (2009, p. 7) proposed an innovative and forward-looking vision of literacy, describing it as "[...] a plural and dynamic concept, difficult to define in a universally accepted manner." This vision acknowledges that "[...] literacy needs are changing everywhere and must be addressed with innovative criteria [...]" (UNESCO, 2009, p. 3), positioning literacy as "[...] the central core of Education for All (EFA)" (UNESCO, 2009, p. 3).

More recently, in 2024, UNESCO has profiled AL as a means of personalization, comprehension, interpretation, improvement, and communication in a digitized world (UNESCO, 2024b). That is, academic literacy goes beyond "[...] the acquisition of a set of tools and skills necessary to participate in university culture, but also takes into account the specific ways of producing and circulating knowledge in different disciplines [...]" (Schiavinato et al., 2021, p. 7) through digital tools. The same organization has delineated it "[...] as a means of identification, understanding, interpretation, creation, and communication in an increasingly digital world, mediated by information-rich, rapidly changing texts" (UNESCO, 2024b, para. 1). This positions it as a social practice that evolves and adapts to different contexts (Street, 2015).

In this evolutionary process, traditional literacy progresses toward the integration of informational and digital competencies, extending its scope toward more specialized development in academic and scientific competencies. According to Santos Salazar (2025), the conceptual evolution of academic literacy is grounded in our own understanding—or insufficiency—of capacities in the processes of critical reading and academic writing; therefore, its perception and development continue at the university level, reconciling its conceptual evolution with the '[...] power structures and forms of knowledge construction specific to each field' (Santos Salazar, 2025, p. 10).

In the context of continuous social and technological change, traditional literacy, recognized by UNESCO as a fundamental pillar of Education for All (UNESCO, 2011), has evolved into an integrated set of information and digital competencies, underscoring its growing relevance for the development of specialized academic and scientific competencies.

In conclusion, Palmucci (2024) describes that, in the sphere of higher education, AL expands and continues to expand as part of a constantly accelerating metamorphic process; what was "previously" accessible only through the written word is now visible in multiple formats. Therefore, AL has transcended the unique reputation of the written word to enter a multimodal and digital environment, a scenario in which being academically literate implies not only reading and writing texts on paper, but also "[...] possessing digital competencies to interpret and produce meanings with moving images, sounds, music, among others" (Palmucci, 2024, p. 11).

Method

The methodological purpose of the systematic literature mapping employed in this research lies in the fact that its techniques "[...] are useful at the beginning of a systematic literature review as a brainstorming and contextualization tool" (CASCADE Project, 2012, as cited in García-Peñalvo, 2021, p. 15). Moreover, it allows one to "Achieve a deeper knowledge in one's field of knowledge and obtain information about current trends and future challenges" (García-Peñalvo, 2021, p. 26) on a particular topic.

Table 1 presents the methodological structure applied in the systematic mapping, adapted to the specific descriptions of this study, as the same author states: "The techniques and results of literature mappings are highly variable depending on the purpose" (García-Peñalvo, 2021, p. 16).

Table 1. Operational description derived from the systematic mapping of AL in digital environments.

Phase	Stage	Steps
Systematic literature mapping	1. Identification of the concept of academic literacy in higher education within digital environments.	- Identification of the research problem. - Definition of the guiding research question and research objective.
	2. Description of the components of academic literacy.	- Delimitation and selection of keywords. - Selection of education-related thesauri in Spanish. - Definition of search equations. - Definition of inclusion and exclusion criteria.
	3. Classification of the academic literacy construct in higher education within digital environments.	- Classification of terms associated with academic literacy.

Note. Prepared by the authors.

Stage 1. Identification of the term academic literacy in the field of higher education in digital environments.

Identification of the research problem.

Research question. What are the main trends in the published academic literature on academic literacy in digital environments, and how have they evolved over time?

Stage 2. Description of the elements comprising academic literacy.

Related terms. Terms closely related to academic literacy in digital environments, understood by various authors as digital literacy, are considered. Thesauri such as the UNESCO Thesaurus, the European Education Thesaurus, EuroVoc, the Documentation Sciences Thesaurus, and the ERIC Thesaurus are used. The Multilingual Thesaurus of the United Nations Bibliographic Information System (UNBIS) was excluded due to lack of access.

Google Scholar search strategy. The following combinations of terms were used: 'academic literacy' + 'digital environments' and 'digital literacy' + 'higher education'.

Selection criteria. The selection and delimitation of the inclusion and exclusion criteria for the documents are presented in Table 2.

Table 2. Stage 2. Inclusion and Exclusion Criteria.

Criterion	Inclusion	Exclusion
Documents	Peer-reviewed journal articles	Theses, conference papers, books, and book chapters
Language	English and Spanish	Languages other than English or Spanish
Period	2018-2023	Publications prior to 2018
Access	Open access	Subscription required
Knowledge area	Social Sciences	Other knowledge areas

Note. Prepared by the authors.

Stage 3. Classification of the academic literacy construct in higher education in digital environments.

Identified terms. The review and selection of the terms established for the AL construct in digital environments recorded the incidence of words concentrated in the concepts stated in the reviewed articles. To this end, seven classifications were mapped: (1) literacy and academic literacy; (2) digital and technological literacy; (3) academic writing; (4) university environments and contexts; (5) information literacy and reading; (6) competencies and capacities; and (7) educational policies and frameworks, which were subsequently unified.

Results

The results are presented in accordance with the three stages and steps established in the Methodology section of this study.

Stage 1.

The research problem on the subject, according to Giraldo Gaviria and Caro Lopera (2022) from Colombia and Reyes Reyes et al. (2020) from Mexico, is particularly sustained by the scarcity of research and the absence of a conceptual consensus on the dimensions and definitions of academic literacy in digital environments, as well as its contextual and disciplinary variability.

Stage 2.

The description of the elements comprising academic literacy, derived from the thesauri, is presented in Table 3, and Table 4 highlights the most significant trends identifying AL in digital environments, providing a response to the research question and objective..

Table 3. Thesaurus results.

Thesaurus	Identified keywords
UNESCO	Digital literacy (computer literacy); related concepts: information literacy, computer application, computer-assisted instruction, and computer science education.
UNESCO	Information literacy: includes competencies to recognize information needs and to locate, evaluate, apply, and create information within social and cultural contexts // related concepts: access to information, media education, computer literacy, information society // (Computer literacy: refers to something more specialized).
European education thesaurus	Computer literacy → computer initiation.
Documentation sciences thesaurus	Information literacy, user training services.
ERIC	Discipline-specific academic literacy.

Note. Prepared by the authors.

The keywords identified in the analyzed thesauri demonstrate the growing importance of digital and informational literacy in the educational sphere. In this regard, in 2024, UNESCO stated that digital literacy does not necessarily refer to technical matters but rather requires consideration of the capacity to apply such skills in broader informational domains. This may be interpreted as the need for educators not only to teach how to use computer tools but also to promote critical competencies that enable students to evaluate and create information effectively. Meanwhile, the context of media education highlights the importance of developing the necessary tools for critical thinking that allow individuals to access the vast amount of information available in contemporary digitized society.

The foregoing suggests that education must be oriented toward the formation of students, helping them face specific challenges in their areas of study, helping them develop information literacy skills that strengthen their learning processes. Thus, the coexistence of these concepts reinforces the demand for a holistic educational approach that, in addition to preparing students for the ethical use of ICTs, also provides them with indispensable tools to contribute critically to information in their social, cultural, and academic contexts.

As stated at the outset, regarding the theoretical contributions identified that respond to the main trends and thematic areas in the academic literature published on academic literacy in digital environments in higher education, the findings are presented in Table 4.

Table 4. Thematic trends in academic literacy.

Authors	Year	Institutional affiliation	Country	Publication Title
Böhm-Carrer & Lucero	2018	Universidad del Aconcagua; Universidad Nacional del Cuyo	Argentina	University Literacy and Engagement with Information Sources: Key Factors for Learning in Higher Education
Bruno & Pinedo	2019	N/A	N/A	Digital and Academic Literacy in a Transforming University
Ponce-Carrillo & Alarcón-Pérez	2020	Benemérita Universidad Autónoma de Puebla	Mexico	Virtual environments for academic writing: A model in Minecraft
Leal-Rivas	2020	University of Naples Federico II	Italy	Critical-reading competence in digital environments: a holistic vision for L2/FL
Marzal	2020	Universidad Carlos III de Madrid	Spain	A taxonomic proposal for multiliteracies and their competences
Arias & Ramírez	2020	Instituto Técnico los Patios Cúcuta	Colombia	Literacy in digital environments of the educational community of Instituto Técnico Patios Centro Nº 2. Cúcuta, Colombia
Cápona González	2022	Universidad Adolfo Ibáñez	Chile	Teaching challenges for academic literacy in entry to higher education studies
Chaverra Fernández et al.	2022	Universidad de Antioquia	Colombia	Review of research on academic writing for the creation of an online writing center in higher education
Sánchez Soto et al.	2022	Universidad Michoacana de San Nicolás de Hidalgo	Mexico	Learning to write with style at university: Digital resources from Web 2.0
Schiavinato et al.	2021	Instituto de Investigaciones en Ciencias de la Comunicación y Diseño ICCOD	Argentina	Technology-mediated academic literacy from the perspective of Social Communication students: Changes, continuities, and challenges during the pandemic
Laplagne Sarmiento & Urnicia	2023	Universidad Nacional de San Juan	Argentina	B-learning protocols for information literacy in Higher Education
Giraldo Gaviria & Caro Lopera	2022	Universidad del Quindío	Colombia	Academic literacy: an alternative for rethinking initial teacher training in Colombian higher-level normal schools
Nava Gómez	2023	Universidad Autónoma del Estado de México	Mexico	Review of educational and linguistic policy at the higher level and its relationship with the graduation rate in a university setting
Mejía Corredor et al.	2023	Universidad de La Salle; Universidad EAN; Universidad Santo Tomás	Colombia	Adaptation of the questionnaire for the study of digital competence in higher education students (CDAES) for the Colombian population
Mejía Giraldo et al.	2023	Institución Universitaria Antonio José Camacho	Colombia	My learning environments: An educational innovation proposal to support the preparation process for university life

Note. Prepared by the authors.

The analysis of information presented regarding institutional affiliations and countries of origin from 2018 to 2023 reveals several trends and patterns, with geographical diversity including institutions from four Latin American and European countries: Argentina, Mexico, Colombia, Chile, Italy, and Spain. Since 2020, an increase has been observed in the number of institutions and countries involved, which may indicate growing awareness of the importance and emerging relevance of the subject studied.

Notably, in 2023, Colombia and Mexico showed significant representation with several higher education institutions, which could reflect the growing relevance and prominence of academic literacy and its relationship with digital environments. It is also observed that 2019 appeared as a year with an absence of scientific output, which may indicate a year of transition or a lack of records of activity during that period. This may be relevant for analyzing the context of academic collaboration in those years. It should be noted that only scientific articles were considered. Meanwhile, Argentina emerged as a prominent point in several years—2018 and 2023—which may reflect a consistent and relevant academic participation from its HEIs in both national and international contexts.

Stage 3.

The thematic trends reflected in the titles of the reviewed scientific documents reveal the significant value attributed to academic and digital literacy within the context of higher education, underscoring how these competencies are essential for equipping students with the academic skills required in university environments without overlooking the digital dimension..

Accordingly, the articles describe the need to establish skills that enable students to effectively interact with various informational competencies and digital tools, which contribute to academic success. Consequently, there is evident interest in establishing processes for adapting common learning to new technological realities, that is, to virtual environments, such as the use of innovative platforms for academic writing. Simultaneously, information literacy and multiliteracies involve a global approach that advances knowledge acquisition in spheres beyond academia; therefore, the challenges that teachers face when implementing—working with—these competencies subject them to a transformative process without end, one that is not always endorsed by educational policies.

As shown in the word cloud analysis in Figure 1, the interconnection of key concepts consistent with literacy and contemporary education in Latin America is visualized. The incidence of certain terms—such as 'academic, digital, and informational literacy'—underscores the type of critical competencies that university students must know and critically develop to navigate ethically in digital/virtual environments. The reference to challenges such as the 'digital divide' and the influence of the COVID-19 pandemic constitutes a historical memory that marked a before and after in the use of ICTs.

Figure 1. Analysis of Keyword Frequency in the SLM articles.

Note. Prepared by the authors.

Similarly, the initial seven classifications of the academic literacy construct in higher education in digital environments were maintained throughout.

Closing considerations

It should not be overlooked that academic literacy is a process constituted by all the conceptual elements that identify digital and informational literacy in the context of higher education. This does not lead us to accept that a single concept exists; rather, it is nourished and grows on the basis of the educational, social, cultural, and political context. We must therefore adopt a comprehensive, global approach that represents us beyond a technical capacity. Let us remember that possessing the skills to be literate in this contemporary, multifaceted, and constantly evolving world is a right that grants equality, equity, and inclusion in contexts as simple as reading a text message on a phone or delivering a videoconference. We all face challenges and opportunities to be literate; however, educators face this challenge with particular urgency, as they not only teach with technological tools but are also expected to foster the development of critical and analytical thinking in their students. What does this represent? An immediate, tangible, and constantly growing commitment in favor of informed and active citizens, equipped to discern and contribute to the vast ocean of information that surrounds us through diverse technologies. We need to make good use of them, as "through virtual and digital environments, it is possible to strengthen the formative processes surrounding academic writing. Through these same spaces, it is possible to empower young people to develop their creativity and critical thinking capacity" (Ponce Carrillo & Alarcón Pérez, 2022, p. 84).

Therefore, as higher education institutions acknowledge that we live in a constantly evolving environment, it is imperative to reassess and redesign pedagogical strategies that harmonize digital literacy with critical thinking

and social responsibility, and perhaps aspire to forge an inclusive and equitable educational system that prepares us to face the challenges of the future of education.

By proactively and collaboratively addressing these challenges, we can expand the possibilities for transforming education in time and space, paving the way for a critical and committed citizenry to build a knowledge society for all. What remains is to await an opportunity and a collective commitment to construct a more just, equitable, and inclusive space for all.

It is important to recognize that the arrival of artificial intelligence (AI) is driving unimaginable changes in the academic and educational contexts, especially in the automatic creation of texts and its impact on academic literacy (Flores-Vivar & García-Peñalvo, 2023). The question becomes more complex: Is working on academic literacy in digital environments within education a challenge, in which innovation must always be accompanied by a commitment to comprehensive training and academic ethics?

Research Horizons: where to advance in academic literacy in digital environments

It is imperative to recognize that future research on this topic consists of living documents that advance in parallel with the sociocultural needs of higher education institutions, as literacy has ceased to be an isolated concept. It is therefore necessary to advance by considering disciplinary variability, the incidence of artificial intelligence, and emerging technologies in general in relation to new concepts. In this regard, Santos Salazar (2025, p. 13) puts it plainly: writing must continue "[...] fulfilling its role in the construction of knowledge despite having very powerful tools such as artificial intelligence (AI); educational institutions must adapt their pedagogical practices."

Therefore, it is necessary to continue building a flexible theoretical and conceptual framework that evaluates both non-formal and formal contexts, as being academically literate in digital environments is a right of equity that we must all attain.

Data availability

Not applicable

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Note:
The authors declare that they were responsible for the conception, analysis, and interpretation of the data; the drafting and critical revision of the manuscript; and the approval of the final version for publication.

Associate Editor in charge:
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Evaluation Rounds:
Three review invitations were sent, and two reviews were received

Standardization reviewer:
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