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Information literacy in research training in virtual postgraduate programs*

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Abstract

Information literacy has become an important component of research training at the postgraduate level, as is the case in online master's programs in Colombia. Currently, this education is being affected by the saturation of digital platforms and tools used excessively and without control by students, impacting the development of their research work and the resulting academic output. The problem is exacerbated when master's students rely solely on digital resources for writing their texts, with emerging technologies like generative artificial intelligence becoming their primary assistant, thus neglecting their independent and scientifically rigorous research. This is reflected in their ability to manage information, encountering difficulties in search strategies, selecting academic sources, and validating consulted data. This study aims to explore the role of information literacy in the use of digital resources within postgraduate research processes. The study employed a quantitative, descriptive approach, supported by online questionnaires administered to 100 faculty members of the research component of the online master's programs at the Minuto de Dios University Corporation (UNIMINUTO). This allowed for the identification of different student practices regarding information management in digital media. The results show frequent use of tools such as Artificial Intelligence (AI) for information retrieval, but also limitations in the proper handling of content, critical analysis, and the identification of validity criteria for selecting theoretical data. Consequences associated with the unregulated use of artificial intelligence were also identified, such as a lack of information filters, a lack of awareness of standards for written work, and the delegation of academic processes to algorithmic systems. The conclusions indicate that access to information does not guarantee research quality; therefore, it is necessary to strengthen information literacy skills focused on analytical and critical thinking, intellectual autonomy, and the ethical use of information in online master's programs.

Keywords: Information Literacy, Postgraduate Education, Virtual Learning, Critical Thinking, Digital Competencies.

Introduction

Higher education across all levels, particularly within graduate programs such as Master's degrees, is currently immersed in a saturation of digital environments that streamline information access through tools like Generative Artificial Intelligence (GenAI). Consequently, there is an urgent need to emphasize Information Literacy (IL) within the framework of virtual Master's programs. It is essential to clarify that IL and the development of information competencies extend beyond mere technical proficiency or the operational management of resources like AI. Instead, it entails the cognitive ability to recognize specific information needs, formulate sophisticated search strategies, critically evaluate sources, and utilize information ethically and assertively to produce new

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knowledge. As noted by Cobo (2016), the fundamental challenge lies not in information availability, but in the capacity to leverage collected data analytically, avoiding use without academic discernment—a critical factor to address with students and a key element identified by UNIMINUTO through its trajectory in virtual academic programs.

Empirical evidence gathered through closed-ended surveys with research-focused faculty indicates that, although students frequently turn to digital tools like GenAI for information retrieval and presentation, they face significant difficulties in formulating search strategies and utilizing academic sources. This suggests a disconnect between the technical exercise of resources and the student's criteria for discerning their inquiries. This situation aligns with D'Avolio (2006), who argues that literacy must be embedded within digital culture initiatives, promoting a critical dimension to understand the intentions, filters, and structures underlying information. This approach seeks to move beyond mere content transmission toward a genuine transfer and reproduction of knowledge with a meaningful social contribution.

The integration of artificial intelligence, platforms, and other digital elements into academic processes creates new challenges for higher education, especially at the graduate level. It is imperative to transcend traditional issues like plagiarism and address emerging complexities such as information filtering, disinformation, "infoxication," and the delegation of text production to algorithms. Research training in graduate studies fosters the development of complex competencies, including critical and reflective thinking skills, as highlighted by Ruiz-Iglesias (2010). These research competencies represent a demanding capability to analyze, interpret, and produce new knowledge rather than simply replicating information. This perspective complements the relationship between pedagogy and information management, where autonomy—as conceptualized by Freire (2011)—is validated by reinforcing the student's role as an active, self-regulated subject capable of constructing knowledge through the responsible use of technology within their learning ecosystem.

This study analyzes how information literacy has become a fundamental axis for the ethical use of artificial intelligence and other digital tools within the research development of students in virtual Master's programs. Based on the findings, the need to strengthen pedagogical mediations is recognized, contributing to scientific information management and consolidating academic practices oriented toward the critical validation of content. García-Aretio (2017) emphasizes that virtual education must transcend toward approaches centered on the transfer and construction of content, favoring formative processes that enhance reflection, autonomy, and the meaningful production of knowledge, thus responding to the demands of graduate training in digital environments.

Following this perspective, it is crucial to clarify the description of information competencies within the educational context of Master's degrees.

Information competencies are understood as the set of knowledge, skills, and attitudes that enable students to identify their information needs, as well as to search for, evaluate, select, and utilize information critically across various digital environments. These competencies have been described as essential for objective performance in academic contexts; consequently, Cabero-Almenara et al. (2024) associate them with the development of digital skills and educational transformation in higher education. Trixa and Kaspar (2024) highlight the critical evaluation of information and the formation of digital citizenship as key strategies to address information saturation. Similarly, Chourio-Acevedo et al. (2024) describe them as integrated skills for searching, interpreting, and communicating information within the digital ecosystem. Finally, UNESCO (2021) situates these competencies within the framework of Media and Information Literacy, emphasizing their importance for critical thinking, social and democratic participation, and the responsible use of information in digital contexts.

Conceptual framework

The objective of this research is to analyze the significance of information competencies for the responsible and ethical use of artificial intelligence tools in online higher education (Montoya, 2015). To achieve this, the experiences of faculty members within the research components of graduate programs were addressed. These programs represent the areas where the greatest need has been identified to strengthen appropriate practices for developing research projects and academic productions—such as articles and books—that require reliable and verifiable information.

In context, digital technologies have expanded the horizons of world exploration, allowing for the discovery of not only local contexts but also regional and international perspectives encompassing cultural, social, political, and educational spheres. Buckingham (2019) describes how internet users have been able to exchange ideals,

tastes, and perceptions on various trending topics in social networks, as well as participate in entertainment and academic activities through virtual events and spaces.

Information queries on the internet and content creation have become tools of consumption and a means of gaining visibility and acceptance within virtual peer groups. Consequently, it is imperative to implement training programs in information competencies. These programs ensure that digital citizens first recognize the risks encountered when sharing information. Furthermore, these competencies empower users to make appropriate use of data, exercise discernment in sharing information, create content for various media, and ultimately protect their own image and that of others by understanding cybersecurity criteria (Wilson et al., 2011).

The University of Havana (Izquiero, Río, & Silva, 2020) presents a proposal for Media and Information Literacy (MIL) training for undergraduate communication students. The purpose is to build competencies that enable the ethical and assertive management of information from digital, academic, and scientific media. This initiative arose from the need to mitigate cyber-related issues, such as the defamation of individuals and companies, and the viral spread of fake news without verification, which leads to disinformation and the distortion of reality. It also addresses the use of erroneous data in university assignments and the publication of unverified news in professional media. The proposed program outlines a pedagogical and practical framework for literacy, demonstrating step-by-step the relevance of the content, its objectives, and scope, alongside learning strategies and an evaluation model to monitor student performance.

The UNESCO competencies within the Media and Information Literacy framework for teachers are also applicable to students to enhance skills for the ethical and appropriate use of content in the digital ecosystem. These competencies are related in Figure 1, illustrating Media and Information Literacy as adapted from Villavicencio and Rivera (2024).

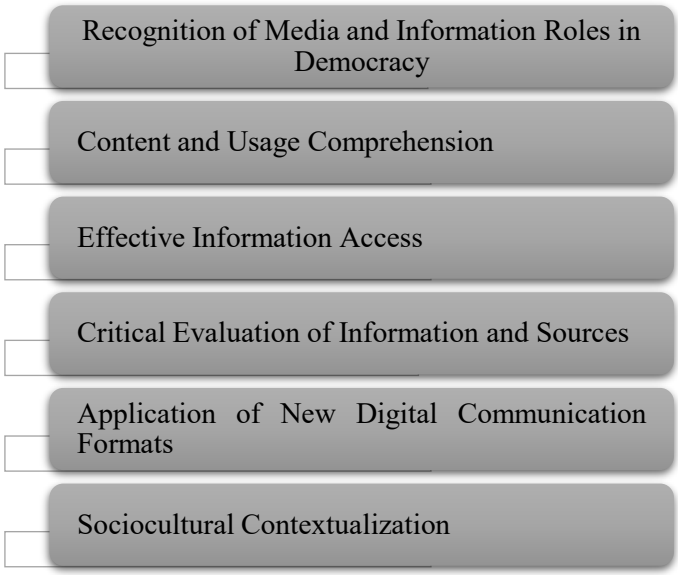

Fig. 1. Media and Information Literacy Competencies

Source: Own elaboration based on Villavicencio and Rivera (2024).

In a systematic review conducted at the Universidad Militar Nueva Granada (Colombia), Mesquita & Fernández (2023) characterized various educational and pedagogical stances regarding literacy. They found that this dynamic emerged between the 19th and 20th centuries, as the transition from physical to mechanical and electronic media transformed how individuals interacted with information. Moving beyond paper-based formats to include the telegraph, radio, photography, and cinematography, this evolution led to the massification of content across diverse audiovisual sources. This resulted in excessive information consumption, where consumers often failed to verify the validity of their searches, leading to the transmission of unverified data and contributing to disinformation. Consequently, the concepts of audiovisual, digital, and media literacy arose during these centuries as an industry-driven effort to foster proper media usage through social education.

A significant milestone is the collaborative effort between UNESCO, the United Nations Alliance of Civilizations (UNAOC), and UNIMINUTO—through its Scientific Park for Social Innovation and its School of Social

Innovation. This partnership involved participating in the "update and complementation of the media and information literacy curriculum alongside 24 other universities worldwide" (UNIMINUTO, 2022). The objective is to conduct a pilot program in 23 schools of the Minuto de Dios Corporation across the national territory, implementing a curriculum designed to strengthen competencies in the critical and respectful management of cyber-information, with the long-term goal of establishing a public policy.

This challenge enables basic education to train not only students but also teachers in the appropriate and objective treatment and consumption of information. This ensures that content creation and data transfer are assertive and reliable, facilitating the transmission of constructive, clear, and comprehensive messages. Through this alliance, UNIMINUTO is a member of the UNESCO University Network on Media and Information Literacy and Intercultural Dialogue.

Various entities have contributed to the updating and complementation of the media and information literacy curriculum for basic education; these are listed in Figure 2.

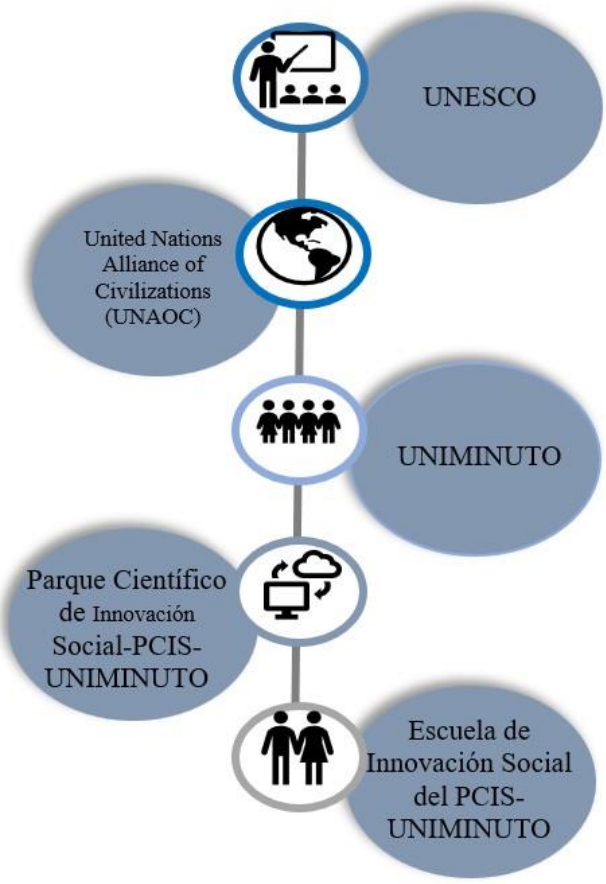

Fig. 2. Participating Entities in the Development of Media and Information Literacy.

Source: Own elaboration, 2026.

Research conducted by Mesa et al. (2022) at the University of Oriente in Santiago de Cuba examined the level of computer and information competencies among graduate faculty. Their findings initially revealed that skills in source identification, the ethical use of information, and critical interpretation are independent of the computing resources available to faculty in both virtual and face-to-face modalities. The authors identified that although faculty members have access to computers and complementary devices for university research, their proficiency in managing these devices, peripherals, and computer systems remains at a basic level despite their availability.

Furthermore, the study reported low proficiency in the specific information skills required for scientific production—skills that are fundamentally expected to be transferred to graduate students. This level of training is particularly demanding, as it involves developing theoretical frameworks, engaging in academic discussions, and establishing new perspectives based on the literary reappraisals developed by graduate students. The authors establish a direct correlation between information skills and research phases, highlighting the relevance of research literacy as illustrated in Figure 3.

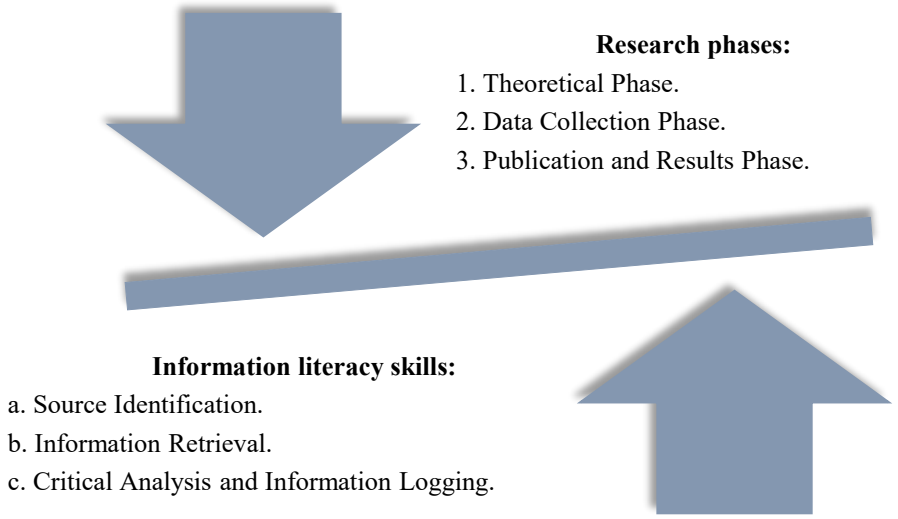

Fig. 3. Figure 3. Relationship between Information Skills and Research Phases.
Fuente: Source: Adapted from Mesa et al. (2022)

Heredia (2022) proposes that university librarians implement digital didactic resources, such as WebQuests, for media and information literacy aimed at first-year university students. This approach seeks to strengthen competencies in planning, accessing, managing, and using information. The author emphasizes that libraries must go beyond merely supplying requested sources; they must provide training to enable the academic community to conduct more assertive scientific text consultations, fostering ethical and responsible search environments. Through such didactic resources, as noted by Adell et al. (2015), the aim is to consolidate information competencies, facilitating constructive learning for the appropriate treatment of information essential to university education processes.

In the Colombian context, CIVIX (2024) is a foundation dedicated to offering experiential training programs to strengthen active and informed citizenship. It focuses on training teachers and students in basic and secondary education across the country. Since 2018, with the support of the European Union, CIVIX has developed a pedagogical resource called "DOBLE CLICK." This media, digital, and information education initiative utilizes physical didactic materials, such as learning guides, alongside digital resources including podcasts, videos, and gamification.

Furthermore, UNESCO (2021), in its publication Media and Information Literate Citizens: Think Critically, Click Wisely, and through its 2019 partnership with Twitter (UNESCO, 2019), has sought to promote MIL within social networks. This initiative highlights the necessity of understanding and deciphering information from both mass media and scientific sources to ensure it is shared and transmitted objectively and ethically. Key aspects, such as the "Five Laws of Media and Information Literacy," the digital footprint, and user moderation in the digital ecosystem, are incorporated into this training. This combines a regulatory framework for MIL competencies with a social network that allows for public opinion and critique, serving as a digital classroom for learning these skills (INFOCOP, 2019).

Finally, Area and Guarro (2012) argue that information literacy constitutes a vital process for knowledge management in the digital society. Within the educational and academic community, it empowers students to discern relevant information, validate sources, and correct unverified reproduction practices. In graduate research, these skills are crucial for constructing grounded theoretical frameworks and ensuring the overall quality of academic productions.

Methodology

This research adopts a quantitative approach with a non-experimental, descriptive design. Information was collected through an online questionnaire, allowing for an objective analysis of the phenomena emerging from the use of Artificial Intelligence (AI) tools in academic work and productions by students, as perceived through faculty experience and career trajectories. Following the framework proposed by Bernal (2010), the data are described based on the observer's assessment, employing a descriptive scope to facilitate diagnostics that can subsequently inform the development of proposals, such as guides, models, or prototypes.

For the methodological execution, information collection techniques included an online questionnaire consisting of 15 Likert-scale items administered to 100 faculty members. A non-probabilistic sampling method was utilized (Mejía Navarrete, 2000), specifically selecting groups of research-component professors from virtual Master's programs at a higher education institution in Colombia during the second semester of 2025. This component is critical as students require advanced information management skills and frequently utilize AI tools, such as ChatGPT or Gemini, to support their research. This approach provided insight into student dynamics from the professional perspective of the faculty.

Analysis Categories

The categories addressed in this study were: Information Literacy, Ethical Use of Artificial Intelligence, and Research Competencies in Digital Environments. These categories, used to analyze faculty responses, were defined based on a systematic literature review and the necessity of identifying the factors impacting the articulation of information literacy for the ethical use of AI in higher education, specifically at the graduate level within virtual Master's modalities.

Table 1. Analysis Categories

Objectives	Research Categories
To analyze the development of skills for information search and selection using AI.	Information Literacy
To examine, from the faculty's perspective, student practices regarding the ethical use of AI tools.	Ethical Use of Artificial Intelligence
To identify the relationship between AI tools and the development of research competencies.	Research Competencies in Digital Environments

Source: *Own elaboration, 2026.*

Instruments and Validation

The instruments were validated by a panel of experts, including disciplinary specialists from an international university and methodological experts from the Colombian institution. This process ensured the quality, clarity, and validity of the items, thereby guaranteeing the collection of objective and reliable data. Table 2 presents a selection of the questions administered to the faculty members through the online questionnaire.

Table 2. Survey Items for Faculty Members

Question/Item	Analysis Category
How frequently do students apply search criteria (authority, timeliness, and relevance) to select information sources for their research projects?	Information Literacy
What difficulties do you identify in students regarding the critical use of academic information?	Information Literacy
What is the primary difficulty students face concerning the ethical use of artificial intelligence?	Ethical Use of Artificial Intelligence
What are the main risks to which students are exposed when using artificial intelligence inappropriately?	Research Competencies in Digital Environments

Source: *Own elaboration, 2026.*

Results

Information Literacy

According to the data, 54% of the faculty reported that students apply search criteria "almost always," 25% do so "sometimes," and only 10% do so "always." As illustrated in Figure 4, these results evidence a partial appropriation of information competencies. Furthermore, 12% of the faculty indicated that these criteria are applied "rarely" or "never." This highlights that, despite living in the digital era, formative gaps persist, which may lead to uncritical practices regarding information usage.

In the context of technology-mediated Master's programs, these findings suggest that while there is a favorable trend toward using search strategies, it is still necessary to strengthen their reflective application. It is imperative to promote the development of not only technical but also ethical skills within research training, enabling students to manage, evaluate, and utilize information responsibly throughout their academic processes.

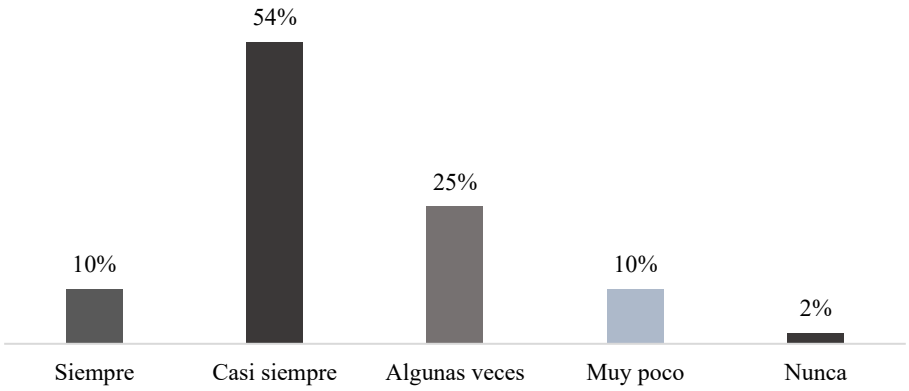

Fig. 4. Frequency of Application of Search Criteria for Information Selection by Graduate Students.
Source: *Own elaboration, 2026*

Continuing with the inquiry among graduate faculty in virtual or online modalities, Figure 5 illustrates that 44% of research-component professors identify the frequent use of non-academic sources as the primary difficulty. This is followed by challenges in searching for information within specialized databases (25%) and limitations in evaluating source validity (20%). Additionally, a lack of information analysis capacity was identified by 12% of the respondents. These findings indicate that in virtual graduate environments, critical weaknesses are concentrated in the selection and validation processes rather than mere access to information tools. For instance, the ease of obtaining content through Artificial Intelligence resources may inadvertently reinforce uncritical practices. This suggests an urgent need to strengthen information competencies through an ethical and applied lens, enabling students to not only refine their search strategies but also to develop rigorous evaluation criteria for the responsible and verifiable use of investigated knowledge.

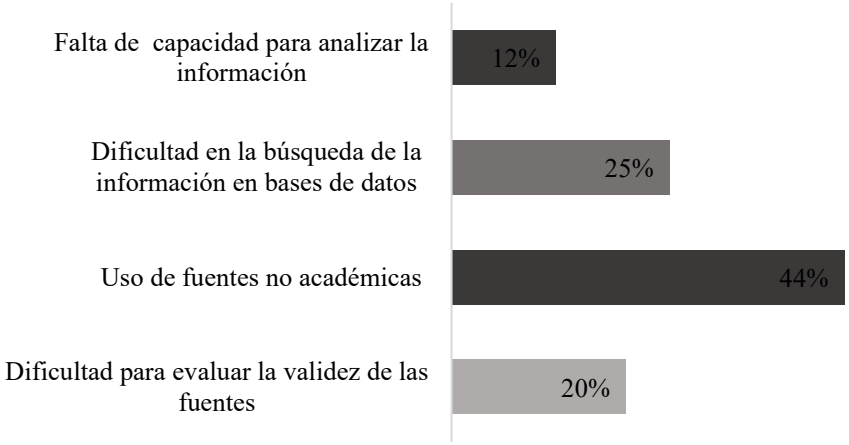

Fig. 5. Difficulties regarding the critical use of academic information.
Source: *Own elaboration, 2026.*

Ethical Use of Artificial Intelligence

According to the results illustrated in Figure 6, tensions persist regarding the use of Artificial Intelligence by students, specifically concerning ethical and critical dimensions. The data shows that 39% of faculty identify a lack of knowledge regarding academic integrity standards, while 33% observe that students use AI without verifying the information. Together, these factors indicate that more than two-thirds of the identified problems are concentrated in uncritical practices.

Additionally, 18% of respondents identify a recurring dependency on these emerging technological tools, and 10% report their use as the sole learning guide. Although this latter figure is on a smaller scale, it is highly significant in formative terms. These results not only reveal the presence of difficulties but also suggest that the primary challenge for faculty is not technology access, but rather its reflective, ethical, and academic application. This reinforces the need to consolidate training processes in information competencies that guide students toward a critical and responsible appropriation of AI in graduate programs, specifically within virtual Master's modalities.

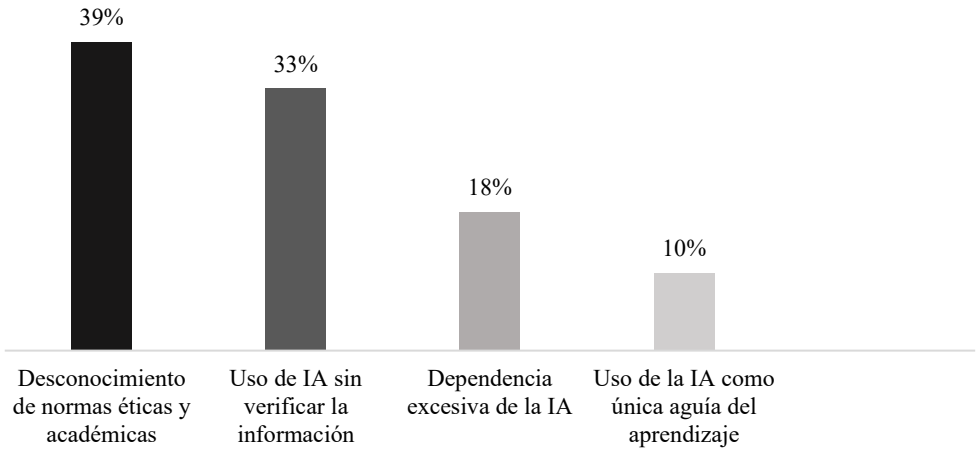

Fig. 6. Primary difficulties regarding students' ethical use of artificial intelligence.
Source: *Own elaboration, 2026.*

Faculty members expressed concern regarding plagiarism (29%); however, a significantly higher level of anxiety was identified regarding **information bias (54%)**. This indicates that the core problem is no longer merely copying, but rather constructing knowledge upon distorted foundations. Additionally, although to a lesser extent, faculty noted the presence of misinformation in research (10%) and negative impacts on autonomous learning (7%), evidencing a relationship of uncritical trust between students, Artificial Intelligence, and cognitive representation.

In this sense, Figure 7 suggests that the formative challenge does not lie in restricting the use of these tools, but in developing students' capacity to interrogate the information produced, contrast it, and situate it within rigorous academic frameworks. This reinforces the role of information competencies as a key axis for the ethical and reflective use of academic platforms and AI tools in virtual Master's programs.

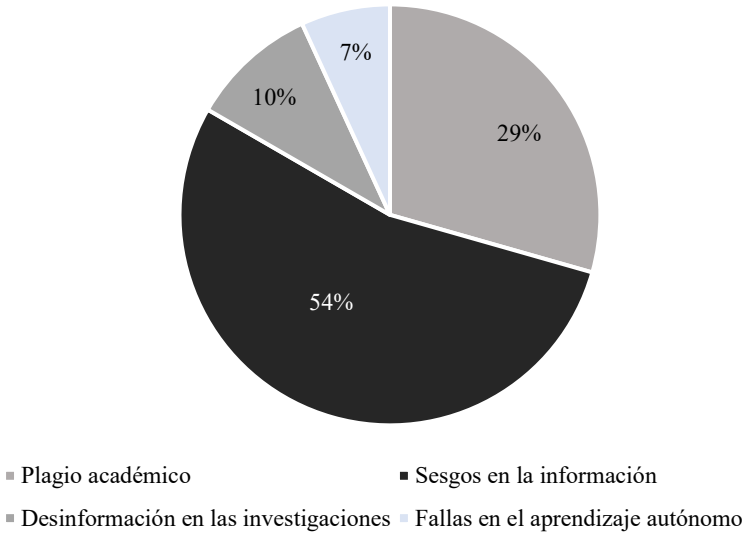

Fig. 7. Riesgos de exposición en los estudiantes con el uso de la inteligencia artificial
Fuente: Elaboración propia, 2026

Research Competencies in Digital Environments

According to the findings from graduate faculty in virtual modalities, the primary challenge for students lies not in the technical handling of technological tools, but in the development of solid research criteria—a trend consistently observed throughout the study. **Figure 8** illustrates that the greatest difficulty is centered on the formulation of search strategies (44%), suggesting a need to strengthen faculty guidance to help students manage information saturation.

Furthermore, 27% of the faculty reported that the selection of relevant information is a significant challenge for students, confirming that quality filtering and content curation are constant concerns in the teaching process. Criteria such as source citation (16%) and information organization (13%) were identified as less critical by the faculty. This implies that a priority mission in higher education is the strengthening of critical thinking and research autonomy, as these are the articulating axes required to achieve academic excellence in Master's programs.

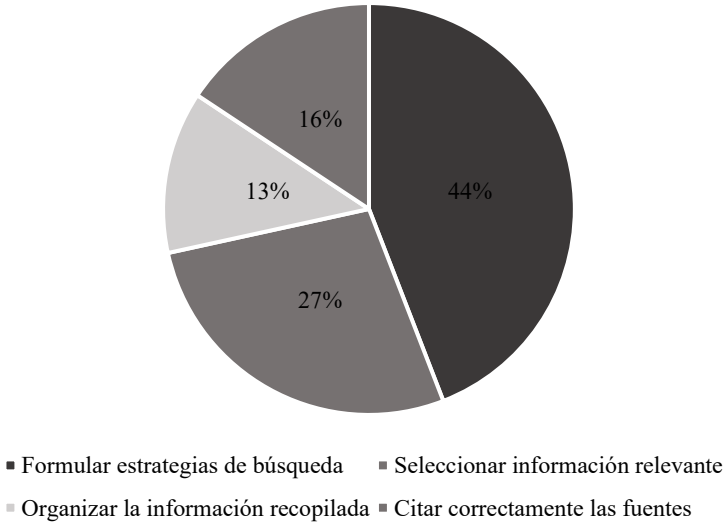

Fig. 8. Student actions with the greatest difficulty in virtual research environments.
Source: *Own elaboration, 2026.*

It is essential to highlight that Figure 9 illustrates the primary challenge facing faculty: fostering the development of solid research criteria for the assertive leverage of digital tools. Data indicates that 54% of faculty observe that

students primarily use these tools for information retrieval; consequently, greater instructional attention is required to provide guidelines for digital environments, ensuring students locate sources with scientific and academic rigor.

Furthermore, 20% of the respondents noted that students utilize AI for data analysis, while 15% use it for text drafting. This suggests that once search barriers are overcome, students appear to find the construction of investigative texts more accessible. Finally, 12% of the faculty highlighted that students use AI for text generation. This finding brings to the forefront the pedagogical challenge of integrating these emerging tools into the research process without compromising the autonomy and critical thinking that characterize graduate researchers in virtual Master's programs.

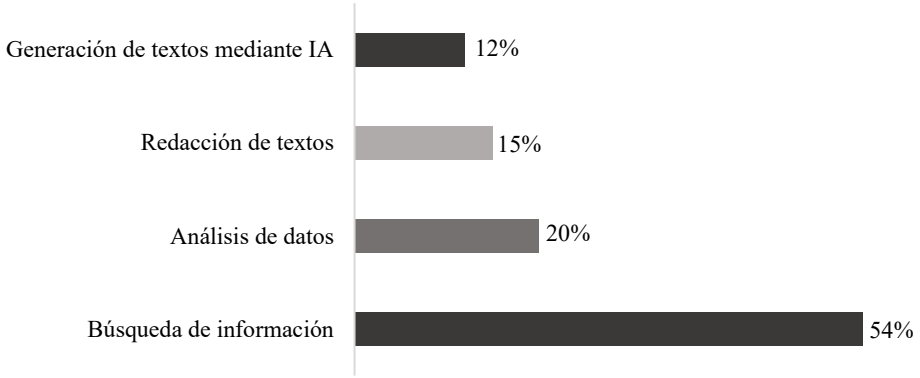

Fig. 9. Primary usage of digital tools for research by students.
Source: *Own elaboration, 2026.*

Discussion

The findings of this study, centered on faculty experiences with virtual Master's students in Colombia, reveal a significant tension between the availability of technological tools and the development of research autonomy characterized by scientific rigor. While students prioritize technology for information retrieval, faculty members identify substantial difficulties in formulating search strategies and a recurrent reliance on non-academic sources. This highlights a disconnect between technical operationality and intellectual judgment—a critical factor in academic and research development. This phenomenon aligns with the analysis by Cobo (2016), who posits that true information literacy does not reside in the instrumental mastery of platforms, but in the capacity for content curation that transforms data saturation into meaningful knowledge.

Furthermore, the prevalence of information bias and a lack of awareness regarding academic standards in the use of Artificial Intelligence (AI) are notable, even among graduate students. This scenario reinforces the perspective of Cassany (2012) on the necessity of critical and ethical literacy, understood as the ability to discern the ideology and validity behind search algorithms to avoid becoming passive subjects of information. The systemic weakness in source validation remains the primary concern. In this regard, Ruiz-Iglesias (2010) argues that research competence at the graduate level is a superior cognitive faculty that demands a reflective, critical, and analytical "know-how," distinct from the mere mechanical attainment of results.

Moreover, given that students are already delegating text generation to AI, it is imperative to reclaim the pedagogy of autonomy proposed by Freire (2011). As García-Aretio (2017) notes, virtual education must transcend "banking" and automated education to foster an epistemological curiosity that guarantees integrity and individual identity. The discussion suggests that the formative challenge does not lie in restricting digital platforms, but in enhancing information competencies so that students can interrogate technology, contrast sources, and produce scientific knowledge that responds with ethical responsibility to the demands of advanced training in virtual environments.

Conclusions and Recommendations

Conclusions

This study establishes that research training within virtual Master's programs requires dedicated spaces to strengthen practices related to information management and governance. Such environments are essential for students to assertively leverage digital resources, including Artificial Intelligence (AI) tools. Findings derived from faculty surveys emphasize that the predominant use of digital tools is concentrated on information retrieval, which paradoxically correlates with significant difficulties in formulating search strategies and navigating specialized databases. This confirms that graduate students, despite being "digital natives," maintain a primarily operational profile regarding scientific inquiry. Unlimited access to information has not translated into improved research quality but rather into an "information saturation" that students struggle to manage. Consequently, there is a recurrent reliance on non-academic sources and basic search engines, hindering the selection of relevant, high-impact literature. The core of the problem lies not in the digital resources themselves, but in the absence of robust content curation criteria to prioritize scientific knowledge over generic content.

Furthermore, a key conclusion regarding academic integrity in the AI era is that faculty concern has shifted from traditional plagiarism control to the monitoring of information bias and the lack of awareness regarding academic standards associated with emerging technologies. The observation that students are delegating text generation to AI and treating it as a sole learning guide indicates a concerning transfer of intellectual autonomy to algorithms. This relationship of uncritical trust jeopardizes the essence of the Master's level: the production of original, situated knowledge. Ultimately, to overcome this automated process, virtual programs must redesign their pedagogical mediation, prioritizing information literacy and critical thinking as transversal axes. Only through faculty guidance that transcends the provision of guidelines and focuses on ethical validation can researchers be trained to interrogate technology and respond with the academic and scientific rigor required by their respective territories.

Recommendations

Higher education institutions leading virtual Master's programs must undertake a pedagogical re-engineering of their mediations, shifting the focus from technical operations to critical information literacy. Research seminars should not be limited to platform instructions but must integrate scientific content curation as a core competency. It is suggested that workshops be developed where students learn to hierarchize information and overcome persistent difficulties in search strategy formulation, transforming inquiry into an exercise of epistemological discernment. Faculty support should prioritize active tutoring in specialized database management and source validation, ensuring students evolve from passive content collectors into rigorous evaluators of academic literature.

In response to the integration of AI, the creation of institutional ethical protocols and guidelines is recommended to educate students on the risks of algorithmic bias and the nuances of academic integrity. The objective must be to dismantle the tendency to delegate learning and writing to algorithms, promoting instead a model of supervised co-creation where technology enhances, rather than replaces, intellectual judgment. Digital libraries and institutional writing centers should design mentoring programs to navigate information saturation, ensuring that digital tools serve as support for original knowledge production with social impact. Finally, faculty training must be strengthened regarding assessment methodologies that transcend traditional plagiarism detection, focusing instead on the traceability of the research process and the originality of the argument, thereby mitigating technological dependency and fostering authentic academic development.

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