Seminars in Medical Writing and Education. 2025; 4:445
doi: 10.56294/mw2025445

REVIEW

Critical Thinking in the Information Age: A Systematic Review on the Role of MIL and Information Overload

Pensamiento Crítico en la Era de la Información: Revisión Sistemática sobre el Rol de la AMI y la Saturación Informativa

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Cite as: Chara-DeLosRios T, Bejarano-Álvarez P, Poma-Cornejo H, Quispe-Munares M, Reyes-Contreras K. Critical Thinking in the Information Age: A Systematic Review on the Role of MIL and Information Overload. Seminars in Medical Writing and Education. 2025; 4:445. https://doi.org/10.56294/mw2025445

Submitted: 20-08-2024 **Revised:** 02-01-2025 **Accepted:** 03-07-2025 **Published:** 04-07-2025

Editor: PhD. Prof. Estela Morales Peralta

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ABSTRACT

Introduction: in a context marked by information overload, critical thinking and media and information literacy (MIL) have become essential for effectively understanding and evaluating information.
Objective: to analyze and synthesize the most recent scientific literature on critical thinking, media and information literacy (MIL), and information overload. The aim is to identify the relationships among these concepts, their educational and social implications, and the strategies that contribute to strengthening critical competencies in information-saturated contexts.
Method: a systematic review of scientific literature published between 2019 and 2024 was conducted. Empirical, theoretical, and review studies addressing the relationship between critical thinking, MIL, and information overload were selected. A qualitative analysis was applied to group themes, identify patterns, and detect trends and gaps in current research.
Results: media and information literacy is a key skill to mitigate the negative effects of overload and to enhance critical thinking. Educational interventions that integrate MIL have proven effective in improving the ability to critically assess information. Moreover, information overload can be addressed through innovative and contextualized pedagogical strategies.
Conclusions: it is concluded that MIL is fundamental for the development of critical thinking in a context dominated by information overload. Education must respond with innovative methodologies and tools that incorporate both digital and traditional literacies, considering the social and technological factors that influence access to and processing of information.

Keywords: Critical Thinking; Media and Information Literacy; Information Overload; Critical Education; Digital Competencies; Information Evaluation.

RESUMEN

Introducción: en un contexto marcado por el exceso de información, el pensamiento crítico y la alfabetización mediática e informacional (AMI) se vuelven esenciales para comprender y evaluar la información de manera eficaz.
Objetivo: analizar y sintetizar la producción científica más reciente sobre el pensamiento crítico, la alfabetización mediática e informacional (AMI) y la saturación informativa. Se busca identificar las relaciones

entre estos conceptos, sus implicaciones educativas y sociales, y las estrategias que contribuyen a fortalecer competencias críticas en contextos saturados de información.
Método: se realizó una revisión sistemática de literatura científica publicada entre 2019 y 2024. Se seleccionaron estudios empíricos, teóricos y de revisión que abordaron la relación entre pensamiento crítico, AMI y saturación informativa. Se aplicó un análisis cualitativo para agrupar temas y encontrar coincidencias, así como para identificar tendencias y vacíos en la investigación actual.
Resultados: la alfabetización mediática e informacional es una habilidad clave para mitigar los efectos negativos de la saturación informativa y para potenciar el pensamiento crítico. Las intervenciones educativas que integran AMI han demostrado mejorar la capacidad de evaluación crítica de la información. Además, la saturación informativa puede ser contrarrestada mediante estrategias pedagógicas innovadoras y contextualizadas.
Conclusiones: se concluye que la AMI es fundamental para el desarrollo del pensamiento crítico en un contexto marcado por la saturación informativa. La educación debe responder con metodologías y herramientas innovadoras que integren tanto alfabetización digital como tradicional, y que consideren los factores sociales y tecnológicos que influyen en el acceso y procesamiento de la información.

Palabras clave: Pensamiento Crítico; Alfabetización Mediática e Informacional; Saturación Informativa; Educación Crítica; Competencias Digitales; Evaluación de la Información.

INTRODUCTION

In today's digital era, the overabundance of information has given rise to a phenomenon known as information overload, which affects people's ability to process and evaluate information critically. A report by OpenText reveals that 80 % of workers worldwide experience information overload due to fragmented data and poor information management.[1]

Moreover, the growing reliance on technologies such as generative artificial intelligence raises concerns about the decline of human cognitive skills. Experts warn that excessive use of tools like ChatGPT may erode critical thinking and creativity by fostering dependency that reduces the mental effort required to solve problems and learn.[2]

The lack of skills to identify false or misleading information is another significant challenge. A global survey conducted by MediaWise indicates that approximately 75 % of adults do not feel very confident in identifying misinformation, and 60 % are very or extremely concerned about AI-generated content.[3]

In Chile, a recent study reveals that although news consumption has increased, so has distrust in the media. The ideological segmentation of audiences has created information bubbles, where individuals consume content that reinforces their beliefs while avoiding opposing perspectives. In addition, 75 % of Chileans fear that artificial intelligence will increase the spread of fake news.[4]

In Colombia, although programs have been implemented to improve educational quality, challenges remain in developing students' critical and analytical skills. Exposure to digital content without proper guidance can hinder the development of the critical thinking necessary to discern truthful information.[5]

In Peru, internet penetration reached 71,1 % of the population in 2023, with over 24 million users. However, media and information literacy (MIL) has not advanced at the same pace. The concept of MIL is not included in the national school curriculum, limiting the development of critical skills in students.[6]

UNESCO has emphasized the importance of developing MIL competencies, especially among young people aged 15 to 24, who represent 80 % of internet users in the country. Initiatives such as "A Mí No Me La Hacen" and the video game "Infodemic" aim to promote media literacy and address digital misinformation.[7]

Furthermore, studies conducted in Peruvian universities have shown a positive correlation between media literacy and critical thinking among education students. However, the lack of integration of MIL in teacher training programs limits the development of these competencies in the educational field.[8]

Justification and need for Media and Information Literacy (MIL), information overload and critical thinking

This research responds to the urgent need to understand how Media and Information Literacy (MIL), information overload, and critical thinking interrelate within contemporary educational and social contexts.[9,10,11]

As digital environments become the primary sources of information for millions of people, the ability to distinguish between true and false content has become essential.[12,13] However, empirical evidence shows that large sectors of the population, especially young people and students, lack the cognitive and educational tools to face this challenge. The lack of critical and media skills not only limits informed citizen participation but also increases vulnerability to ideological manipulation, misinformation, and polarization. This systematic review is necessary to rigorously group, synthesize, and analyze existing research, identify knowledge gaps, and

propose concrete courses of action aimed at strengthening critical thinking in times of information overload.[14]

Academic, Educational, and Social Relevance

The development of this research is highly relevant at both theoretical and practical levels. Academically, it contributes to consolidating an up-to-date body of knowledge on the relationship between Media and Information Literacy (MIL), information overload, and critical thinking, facilitating access to organized and categorized findings for future research. In the educational sphere, this research is crucial for teachers, curriculum designers, and policymakers, who will have access to systematized evidence supporting the inclusion of MIL as a cross-cutting component in teaching and learning processes. Socially, this review is especially valuable as it contributes to the formation of citizens with greater capacity to evaluate, compare, and reflect on the information they consume, reducing the impact of phenomena such as post-truth, emotional manipulation, and digital extremism. Furthermore, in a context where artificial intelligence and content automation are becoming increasingly prominent, critical education becomes an essential 21st-century competency.[15,16]

Constructivist Theory

Media literacy is based on the theory of constructivism and active participation. Both Piaget and Vygotsky believe that students actively construct knowledge, which is essential for media literacy.[17] Media requires individuals not only to consume information but also to analyze, interpret, and restructure it according to their cultural and social context.[18] Vygotsky's social theory of Social Constructivism, according to Drotner & Kobbernagel[19] emphasizes the importance of social context and language in learning, which is key to media literacy. Media learning requires social interaction and shared understanding of messages, which fosters critical and collaborative skills.[20]

Media literacy is conceived in this context as the ability to understand, interpret, and critically relate to news and discourse in digital formats, in order to foster teachers' critical thinking in conjunction with their digital competencies.[21] The role of teachers is essential for students to effectively strengthen their media skills. According to Altamirano[22], when teachers possess these skills and recognize the importance of media literacy, they are better equipped to prepare their students to effectively use technological media.[23]

Van De Vord[24] argues that the adaptation of educational institutions to a digital environment and their proper management is a matter of great importance that should be a priority for political, economic, and social decision-makers. According to Li et al.[25], media education implies that students actively engage in exploration and research using digital content for communicative purposes.[26] This practice not only facilitates the learning and understanding of curricular content but also promotes greater awareness among students of the need to continue developing their media skills.[25]

According to Mateus & Quiroz-Velasco[27], media education has not occupied a priority place in school training in our country. It is essential to train teachers so that they can take advantage of digital tools and guide their students in this new scenario.[22]

Critical Pedagogy Approach

The approach aimed at examining and modifying educational systems that maintain social inequalities was developed by[28], who proposes that traditional education is similar to a depository process, where students are passive recipients and teachers deposit knowledge. However, Freire advocates for a dialogic and participatory education. Regarding the theory of pedagogy as liberating praxis[29,30], it maintains the idea that teaching should empower students to question and transform their social reality.

This educational approach has gained global relevance due to the growing impact of the media on the formation of opinions and social behaviors.[31] The United Nations Educational, Scientific and Cultural Organization[32] took the first step toward global media education in 1982 with the Grunwald Declaration. Likewise, the urgency of training future generations to interpret and value the information they consume is highlighted, emphasizing the importance of incorporating media literacy into educational curricula at all levels.[8]

Instead of viewing bureaucracy as a burden, we can reimagine it as an opportunity to enrich pedagogical practices. By integrating administrative processes into our daily work, we can avoid monotony and foster creativity both personally and in students.[33] It is essential that we motivate our students to transcend the role of mere recipients of information and turn them into active agents of change.[34,35] By providing them with the appropriate tools, students can play a crucial role in transforming their environment. Through dialogue, reflection, and joint action, we can cultivate critical minds and citizens committed to their communities.[36]

Literacy and Schooling: The Technological Components of Literacy

Traditionally, literacy instruction in schools and higher education has emphasized reading and writing as key skills; however, the rise of digital communication technologies has reconfigured these competencies.[3,31,37] The shift to digital forms poses additional challenges, particularly as young people increasingly begin their literacy

journey on screens before moving to paper, reversing the pattern of previous generations.

Brief textual interactions, the use of abbreviations, and the use of small screens for urgent reasons challenge traditional notions of written language.[38] According to Suarez and Garcés [28], even basic tasks such as online research have transformed literacy practices, demanding rapid and thoughtful reading, selectivity, and ways of filtering relevant information from distractions.[39,40]

The decline of conventional forms, such as letters and telegrams, and the development of mediated communication through social media represent a shift in the very definition of communication. Social media favors brevity and immediacy over depth and argumentation. This research examines the current challenges of MIL through a systematic and theoretical review that analyzes methodological approaches, theoretical frameworks, and gaps in literature.

Epistemological and Methodological Challenges of the Review

The development of this systematic review is not without methodological and conceptual challenges. First, simultaneously addressing three complex variables—MIL, information overload, and critical thinking—requires the articulation of multiple disciplines such as education, communication, cognitive psychology, and information science. This multidisciplinarity requires rigorous theoretical integration to avoid conceptual contradictions and achieve a holistic understanding of the phenomenon.[13,41] Furthermore, the lack of consensus on the definitions of key terms represents a significant limitation, as different studies use different nomenclatures, such as digital literacy, media literacy, or cognitive overload, which can affect the comparability of findings. Another significant challenge is access to and rigorous selection of valid scientific sources, as the proliferation of studies not peer-reviewed or published in predatory journals can distort conclusions if a critical assessment of methodological quality is not performed. Finally, the speed with which the digital information ecosystem evolves means that many studies quickly become obsolete, necessitating special consideration of the most recent publications and the adoption of well-defined time criteria.[42,43]

Methodological Approach of the Systematic Review

To address the stated objectives, the methodology of a systematic review of scientific literature was chosen, using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol as a guiding framework. This methodology guarantees a transparent, reproducible, and rigorous process of searching, selecting, evaluating, and synthesizing previous research. The review began with the formulation of the research questions that guided the analysis, followed by the definition of the inclusion and exclusion criteria, which limited the sample to peer-reviewed academic articles published between 2015 and 2025 that explicitly addressed one or more of the main variables. The databases consulted were Scopus, Web of Science, ERIC, Scielo, and Google Scholar, using Boolean operators and controlled descriptors such as “media literacy,” “critical thinking,” “information overload,” “misinformation,” “digital competence,” among others. The selected articles were evaluated for their methodological quality, conceptual clarity, theoretical coherence, and thematic relevance. Finally, the findings were coded and thematically analyzed, allowing for the identification of recurring patterns, predominant methodological approaches, and gaps in literature. This was achieved with the goal of constructing a critical and integrated overview of the state of knowledge in this field.[14,44,45]

METHOD

This research adopts a documentary approach, conducting a systematic review of the scientific literature to analyze the relationship between Media and Information Literacy (MIL), information overload, and critical thinking in educational and social contexts. To ensure transparency, rigor, and reproducibility, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol was applied, which structures the search, selection, evaluation, and synthesis of scientific studies.

Inclusion criteria:

- Scientific articles were published between 2020 and 2025.
- Empirical, theoretical, and/or mixed studies related to the study variables.
- Peer-reviewed publications available in full text.
- Studies in Spanish, English, and Portuguese.
- Articles indexed in reliable academic databases: Scopus and Web of Science.

Exclusion criteria:

- Duplicate or non-academic works (blogs, non-refereed conferences, unpublished theses).
- Publications prior to 2020.
- Studies not directly related to the variables under study.
- Documents that did not offer clear empirical and/or theoretical evidence.

The systematic search was conducted between March and April 2025, using key terms and Boolean operators such as:

("media literacy" OR "media literacy") AND ("critical thinking" OR "critical thinking") AND ("information overload" OR "information saturation").

The PICO questions was: Does the implementation of media and information literacy (MIL) programs improve critical thinking skills in individuals exposed to high levels of information saturation compared to those who are not exposed to such interventions?

Initially, 327 scientific articles were identified. Therefore, the software Rayyan QCRI was employed for the screening and management of records. This tool facilitated the identification and removal of duplicates, as well as the coding and annotation of articles based on thematic relevance. It also allowed blind independent screening by multiple reviewers, thus reducing potential bias.

Duplicates were automatically detected and removed using Rayyan's built-in algorithm, which identifies exact and near-exact matches based on titles, authors, DOIs, and abstracts. This initial step significantly reduced the number of redundant entries prior to manual screening.

All researchers reviewed all retrieved articles at different stages: title and abstract screening, and full-text assessment. It applied predefined inclusion and exclusion criteria such as relevance to research topic, publication year and study type to ensure methodological consistency.

In cases where disagreements occurred regarding the eligibility or relevance of a study, the reviewers engaged in a discussion to reach consensus. This process ensured objectivity and minimized the risk of reviewer bias. Finally, 78 scientific articles were selected for detailed analysis and interpretation, meeting the standards of quality and thematic relevance, as shown in figure 1.

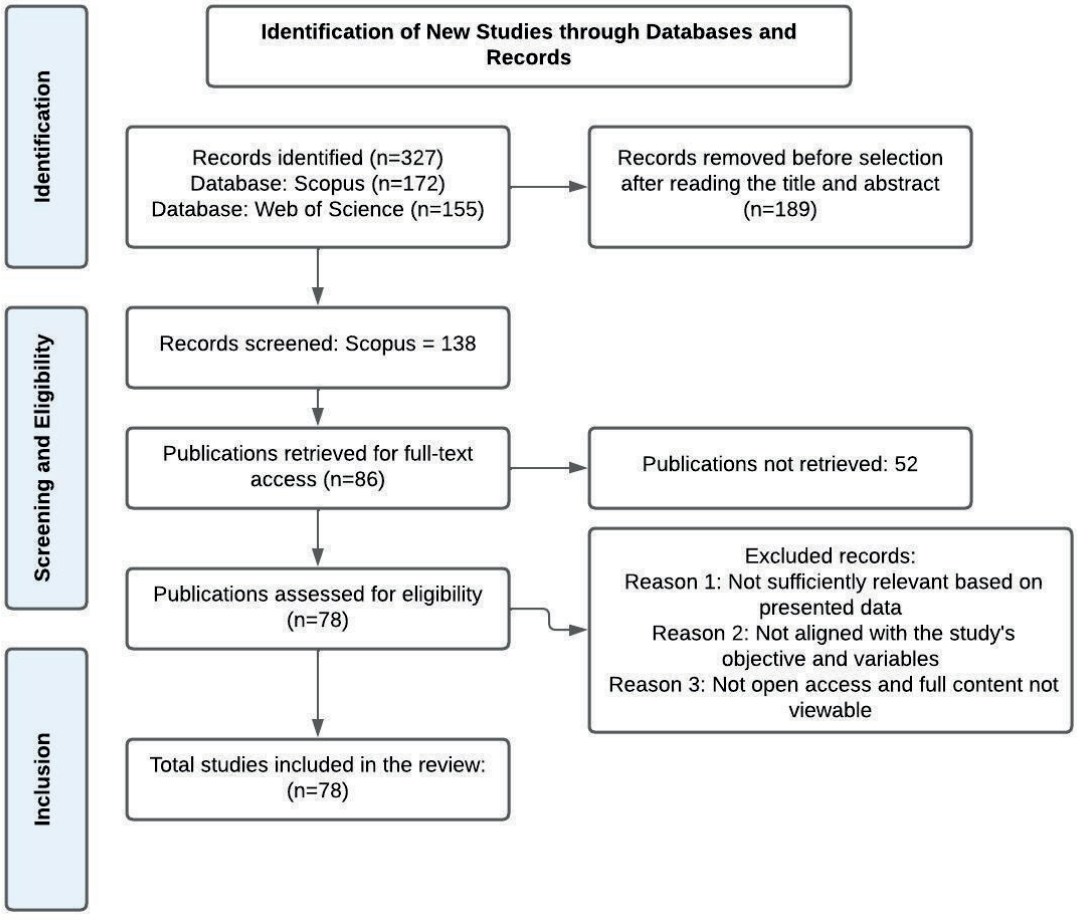

Figure 1. PRISM Flowchart

RESULTS AND DISCUSSIONS

MIL and Critical Thinking in Formal Education

A significant portion of the reviewed literature agrees on the close relationship between media and information literacy (MIL) and the development of critical thinking in educational settings. For example, Herrera-Lillo and Urrejola-Contreras[9] analyze the level of digital competence in health science students, highlighting the need

to integrate critical thinking as a cross-cutting component of professional training. Likewise, Mango-Quispe et al.[8] emphasize that initial teacher training in Peru still lacks a robust pedagogical strategy for developing critical skills mediated by MIL, which limits the ability of future educators to navigate information-saturated environments.

In the context of elementary and secondary education, Luo et al.[10] and Chesire et al.[46] present successful pedagogical interventions, such as the Superpowers Program and Informed Health Choices, which have demonstrated positive impacts on the development of critical judgment from an early age, even in low-resource contexts such as the Philippines or Kenya. These results are complemented by the findings of Suárez-Perdomo et al.[28], who conducted a systematic review of how adolescents build their media literacy in school environments, revealing uneven progress according to region. Finally, Afrilyasanti et al.[16] show how integrating media literacy into English classes can transform teaching towards a more critical and reflective pedagogy.

Information Saturation and Disinformation

A second body of research focuses on the impact of information saturation and disinformation, increasingly common phenomena in digital contexts. Wang et al.[11] propose a deep learning model (BERT-LSTM) to improve users' ability to identify fake news on mobile networks, highlighting the urgency of designing technological tools that support information literacy. Along similar lines, Molina et al.[44] explore the neurophysiological basis of disinformation processing, finding that brain complexity is reduced when people process false content, which could directly affect critical judgment.

Lipińska et al.[13], analyze UFO-related conspiracy theories, exposing how certain authority figures are exploited to legitimize unsubstantiated information. These narratives contribute to information saturation and erode public trust in scientific knowledge. Finally, Zimmermann and Tomczyk[47], warn that adolescents are constantly exposed to contradictory content on social networks, which requires a stronger training intervention to avoid misinformation and cognitive exhaustion.

Resilience and Media Literacy

A third line of analysis revolves around digital resilience as a key competency for addressing information overload. Naeem and Mushibwe[12] review strategies used by university students to navigate social media safely and critically. Their findings suggest that digital resilience, understood as the ability to adapt and respond critically to the information environment, is becoming an essential skill in higher education.

This approach is also reflected in Matthews et al.[48], who discuss the design of digital devices that promote curiosity and social interaction from childhood, which could lay the foundation for more critical media literacy. In another context, Aremu and Udofia[49] highlight that digital skills directly influence university academic performance in Nigeria, showing that digital literacy and cognitive resilience go hand in hand. Finally, Hecht et al.[50], examine how ideological factors, institutional distrust and gender affect the perception of digital citizenship and civic education in the United Kingdom, demonstrating that resilience also implies a critical stance towards political and media discourse.

Emerging Technologies (AI, AR, Video Games) and Critical Thinking Skills

A significant portion of the reviewed research emphasizes how emerging technologies can be used to enhance critical thinking and other 21st-century skills. Liamruk et al.[14], developed an augmented reality game that improves cultural and cognitive competencies, while Zhang and Miao[45] explored how immersive technologies such as AI, AR, and virtual reality foster engagement and motivation in English as a foreign language learners.

In the field of gamification, Wang et al. [41] and Wu y Zhang[51] show that educational video games, when combined with formative assessment systems such as two-tiered tests, can activate metacognitive processes and complex thinking skills. On the other hand, studies such as Kooli et al.[52] warn about the potential risks of excessive use of generative AI, while Oliveira et al.[53] evaluate how students perceive the critical thinking stimulated by these technologies.

The proactive approach of Mack et al.[54] and Pant[38] is also highlighted, who defend the need for a balance between human interaction and technology, while Sakitri et al.[31] relate technological use with professional preparation in the 4.0 era. In general terms, these studies show that technology can be an ally of critical thinking if used with pedagogical intentionality, although its implementation must consider ethical, cognitive and emotional aspects.

Acceptance and Perception of the Use of Technologies

Finally, some research focuses on the acceptance and perception of the use of educational technologies by students and teachers. Rap and Blonder[43] examine how technology acceptance influences the teaching of climate change, revealing that the level of trust in digital tools affects teacher engagement. Zhou et al.[42] conduct a bibliometric review that shows the exponential growth of online project-based learning and its

implications for critical thinking.

Meanwhile, Slimi et al.[15] and Haroud y Saqri[37] investigate student and teacher perceptions of generative AI, finding that while its usefulness for repetitive and support tasks is recognized, there is skepticism regarding its role in developing critical thinking. Trust, institutional context, and the level of digital literacy are determining factors in the adoption of these technologies.

This group of studies highlights that the psychological and cultural disposition toward technology is as important as infrastructure or access, and that critical thinking cannot fully develop if educational stakeholders do not understand or trust the available tools.

Table 1 below summarizes some relevant aspects based on the studies found, considering that the topics related to the variables analyzed have been broken down.

Table 1. Table of comparison of scientific articles

Thematic line	References	Main topic	Coincidences / Detailed observations
MIL and Critical Thinking in Education	[8,9,10,16,28,46,55,56,57,58,59]	Assessment and development of critical thinking and media and information literacy in students.	All studies agree that media literacy (MLI) improves critical analysis skills, particularly in the face of fake news and manipulated content. For example,[8,16] highlight its role in initial teacher training and English language teaching, while[46] demonstrates how structured health programs enable sustained improvements in critical judgment.[10] highlights MLI even from the preschool level. Together, they suggest that early and sustained educational intervention is key.
Information saturation and misinformation	[11,13,44,47,60,61,62,63]	Impact of misinformation and information overload on decision-making and cognitive development.	Information overload is observed to generate confusion, reduce attention, and impair the quality of critical judgment.[11] applies models such as BERT-LSTM to mitigate this, while [44] offers neurophysiological evidence of how misinformation affects cognitive complexity.[13] connects belief in conspiracy theories with a lack of critical thinking, and [47]suggests that adolescents should be provided with tools to filter the volume of digital content. They agree that not only access to information is required but also training in discernment.
Digital resilience	[12,29,67,48,49,50,58,63,64,65,66]	Skills to navigate critically and safely in digital environments.	Digital resilience emerges as an emerging skill in the face of the complexity of the information environment. [12] identifies useful strategies among university students, while [49] links digital skills with better academic performance.[48] indicates that, from childhood, friendly digital environments that enhance curiosity and critical thinking should be promoted. [50] provides a social perspective: institutional trust and ideological thinking also influence how these skills develop. In short, everyone agrees that digital resilience is essential but underestimated in educational policies.
Emerging technologies (AI, AR, games, apps)	[14,15,31,38,41,45,47,51,52,53,54,67,68,69,70,71]	Using AI, AR, video games, and other technologies to develop critical thinking, creativity, and 21st-century skills.	[14,45,51] show that immersive technologies and AI can be powerful allies in fostering motivation and critical thinking, provided they are used for clear purposes. [38,41] advocate for active and well-balanced learning experiences. However,[52] warns about a new form of addiction to generative AI, and [53] detects ambiguous perceptions in students regarding the use of these tools. All agree that technology does not guarantee critical development per se, and must be mediated by conscious pedagogical design.
Technological perception and acceptance	[15,33,35,37,42,43,72,73,74,75]	Attitudes and perceptions of students and teachers about AI and technology in education.	There is a direct relationship between the perception of usefulness, institutional trust and willingness to use educational technologies critically.[15,37] find that students accept AI when they perceive support and usefulness, while [43] analyzes how climate change can be a catalyst issue for accepting technology.[42] points out that technological adoption continues to grow but still lacks critical integration. They agree that acceptance depends on institutional, emotional and cognitive factors and that critical thinking must be developed alongside technological familiarity.

The findings of this systematic review are critically relevant in a global context marked by the massive proliferation of information, misinformation, and the increasing use of smart technologies. The identification of 78 recent scientific studies (2020-2025), selected using the PRISMA criteria provides an updated and rigorous overview of how MIL and information overload directly or indirectly impact the development of critical thinking at different educational levels and sociocultural contexts. This empirical evidence is essential for informing future public policies, educational programs, and pedagogical strategies based on real and consistent data.[76,77]

Furthermore, the results highlight a common thread: media and information literacy acts as a positive catalyst for critical thinking, providing students and citizens with cognitive and metacognitive tools to analyze, interpret, and evaluate information reflectively. At the same time, it is confirmed that information overload, when not properly managed, erodes critical thinking, induces confusion, and facilitates the spread of erroneous beliefs, especially among populations with less media literacy. These conclusions not only reaffirm the study's initial hypotheses but also reveal an urgent need for curricular interventions at all educational levels.

Finally, the importance of these results lies in their multidimensional nature and practical applicability. It is not only a matter of understanding an academic phenomenon, but also of proposing viable solutions to a problem that affects both personal development and collective and democratic well-being. Strengthening MIL and developing institutional mechanisms to mitigate the effects of information overload are key measures to ensure a critical and resilient citizenry capable of making informed decisions. Consequently, this review provides not only scientific knowledge but also strategic input for designing contextualized, sustainable, and evidence-based educational interventions.

CONCLUSIONS

The systematic review provides a clear and affirmative response to the central research question: How do media and information literacy (MIL) and information overload influence the development of critical thinking?

The findings demonstrate that MIL plays a crucial role in equipping individuals with the cognitive tools needed to analyze, interpret, and critically evaluate information. In today's educational and social settings, where exposure to excessive information is constant, these competencies are essential to mitigate the effects of misinformation and cognitive fatigue.

Although information overload poses a significant threat to individuals' ability to think critically, it is not an irreversible condition. The acquisition and strengthening of MIL skills can counterbalance its adverse effects, fostering more reflective, autonomous, and critically engaged individuals. Educational interventions that incorporate MIL across curricula have shown positive outcomes, particularly in enhancing learners' analytical and evaluative capacities.

In conclusion, critical thinking development does not rely solely on individual aptitude, but emerges within a broader ecosystem shaped by social, institutional, and technological factors. Therefore, education, public policy, and technology must work together to create sustainable learning environments that empower citizens to face the complex challenges of the information era.

REFERENCES

1. Hampton J. Report: 80% of Global Workers Experience Information Overload. BIGDATAWIRE. 2022. https://www.datanami.com/2022/08/18/report-80-of-global-workers-experience-information-overload

2. Thomson H. 'Don't ask what AI can do for us, ask what it is doing to us': are ChatGPT and co harming human intelligence?. The Guardian. 2025. https://www.theguardian.com/technology/2025/apr/19/dont-ask-what-ai-can-do-for-us-ask-what-it-is-doing-to-us-are-chatgpt-and-co-harming-human-intelligence

3. Staff P. Survey identifies media literacy skills gap amidst rise in AI-generated content. Poynter. 2023. https://www.poynter.org/fact-checking/media-literacy/2023/adults-worry-misleading-ai-images-lack-media-literacy

4. Pardo J. Desconfiados. El País. 2025. https://elpais.com/chile/2025-06-01/desconfiados.html

5. Domaika E. Simón Peña: "Los periodistas pueden tener sesgo político, pero siempre ofrecen información confiable, contrastable y con responsabilidad". Cadenaser. 2024. https://cadenaser.com/euskadi/2024/10/21/simon-pena-los-periodistas-pueden-tener-sesgo-politico-pero-siempre-ofrecen-informacion-confiable-contrastable-y-con-responsabilidad-ser-vitoria

6. Romero A. Retos para el fortalecimiento de la alfabetización mediática en Perú y en América Latina. Observatorio de medios. 2023. https://www.observatoriodemedios.pe/retos-para-el-fortalecimiento-de-la-alfabetizacion-mediatica-en-peru-y-en-america-latina

7. UNESCO. La Unesco fomenta en Perú la alfabetización mediática para afrontar la desinformación digital. Laboratorio de Periodismo Fundación Luca de Tena. 2024. https://laboratoriodeperiodismo.org/la-unesco-fomenta-en-peru-la-alfabetizacion-mediatica-para-afrontar-la-desinformacion-digital

8. Mango-Quispe P, Pérez-Postigo G, Turpo-Gebera O. Alfabetización mediática y pensamiento crítico en la formación inicial de docentes. Eur Public Soc Innov Rev. 2024 Sep 23;9:1–15. https://epsir.net/index.php/epsir/article/view/1548

9. Herrera-Lillo A, Urrejola-Contreras G. Assessing Digital Competence Among Health Science Undergraduates: a Critical Analysis. Rev Investig e Innovación en Ciencias la Salud. 2024 Dec 16;7(1):1–18. https://riics.info/index.php/RCMC/article/view/349

10. Luo R, Sun SZ, Carter E, Hopfenbeck TN. Building resilience, emotional regulation, kindness, and critical thinking in the digital age: An evaluation of the Superpowers Program on Philippine kindergarteners. Int J Educ Res Open. 2025 Dec;9:100479. https://linkinghub.elsevier.com/retrieve/pii/S2666374025000445

11. Wang J, Wang X, Yu A. Tackling misinformation in mobile social networks a BERT-LSTM approach for enhancing digital literacy. Sci Rep. 2025 Jan 7;15(1):1118. https://www.nature.com/articles/s41598-025-85308-4

12. Naeem N-K, Mushibwe CP. Navigating digital worlds: a scoping review of skills and strategies for enhancing digital resilience among higher education students on social media platforms. Discov Educ. 2025 Feb 19;4(1):39. https://link.springer.com/10.1007/s44217-025-00432-7

13. Lipińska M, Kotula N, Jemielniak D. Exploring expert figures in alien-related UFO conspiracy theories. Humanit Soc Sci Commun. 2025 Apr 15;12(1):535. https://www.nature.com/articles/s41599-025-04799-8

14. Liamruk P, Onwong N, Amornrat K, Arayapipatkul A, Sipiyaruk K. Development and evaluation of an augmented reality serious game to enhance 21st century skills in cultural tourism. Sci Rep. 2025 Apr 18;15(1):13492. https://www.nature.com/articles/s41598-025-95615-5

15. Slimi Z, Benayoune A, Alemu AE. Students' Perceptions of Artificial Intelligence Integration in Higher Education. Eur J Educ Res. 2025 Mar 6;14(2):471–84. https://www.eu-jer.com/students-perceptions-of-artificial-intelligence-integration-in-higher-education

16. Afrilyasanti R, Basthomi Y, Zen EL. Fostering creativity and critical literacy: transforming EFL classes with engaging critical media literacy integration. Asian Educ Dev Stud. 2025 Mar 25;14(2):133–51. https://www.emerald.com/insight/content/doi/10.1108/AEDS-06-2024-0124/full/html

17. Smeplass E, Rapp AC, Corral-Granados A. Understanding how institutional dynamics can contribute to educational inequality in Nordic cities. Oxford Rev Educ. 2024 Mar 3;50(2):290–307. https://www.tandfonline.com/doi/full/10.1080/03054985.2023.2274027

18. Suhendi A, Purwarno P, Chairani S. Constructivism-Based Teaching and Learning in Indonesian Education. KnE Soc Sci. 2021 Mar 11;76–89. https://knepublishing.com/index.php/KnE-Social/article/view/8668

19. Drotner K, Kobbernagel C. Toppling hierarchies? Media and information literacies, ethnicity, and performative media practices. Learn Media Technol. 2014 Oct 2;39(4):409–28. https://www.tandfonline.com/doi/full/10.1080/17439884.2014.964255

20. Altamirano V. Gestión administrativa y calidad del servicio percibidas por usuarios de consulta externa de la Unidad Anidada Hospital Baba, Ecuador, 2020. Universidad César Vallejo; 2020.

21. Ferreiro E. Research perspectives in beginning literacy. Methodological and epistemic dichotomies / Prospectivas en investigación sobre alfabetización inicial. Dicotomías metodológicas y epistemológicas. Infanc y Aprendiz. 2019 Jan 2;42(1):1–36. https://journals.sagepub.com/doi/full/10.1080/02103702.2018.1550174

22. Altamirano Galván SG. Estrategia para fortalecer el perfil de Alfabetización Mediática de Estudiantes y Docentes de Educación Superior. Diálogos sobre Educ. 2021 Jun 30;(23). http://dialogossobreeducacion.cucsh.

udg.mx/index.php/DSE/article/view/940

23. Mateus J-C, Quiroz-Velasco M-T. Future Peruvian teachers and media education: between debt and hope. Diálogos sobre Educ. 2022;13(24):1–12. https://www.redalyc.org/journal/5534/553474080016/html/

24. Van de Vord R. Distance students and online research: Promoting information literacy through media literacy. Internet High Educ. 2010 Jun;13(3):170–5. https://linkinghub.elsevier.com/retrieve/pii/S1096751610000266

25. Li H, Sakamoto Y. Computing the Veracity of Information through Crowds: A Method for Reducing the Spread of False Messages on Social Media. In: 2015 48th Hawaii International Conference on System Sciences. IEEE; 2015. p. 2003–12. http://ieeexplore.ieee.org/document/7070052/

26. Washburn J, Myers S. Adolescents' perspectives about their digital and connective literacies. J Adolesc Adult Lit. 2023 Jul 24;67(1):12–21. https://ila.onlinelibrary.wiley.com/doi/10.1002/jaal.1300

27. Mateus J-C, Quiroz-Velasco M-T. Future Peruvian teachers and media education: between debt and hope. Diálogos sobre Educ. 2021;1(24):1–12. https://www.redalyc.org/journal/5534/553474080016/html/

28. Suárez-Perdomo A, Garcés-Delgado Y, Arvelo-Rosales CN. Systematic review on adolescents' construction of media literacy in educational settings. Rev Educ. 2025 Apr 3;13(1). https://bera-journals.onlinelibrary.wiley.com/doi/10.1002/rev3.70048

29. Recio Moreno D, Gil Quintana J, Romero Riaño E. Impact and engagement of sport & fitness influencers: A challenge for health education media literacy. Online J Commun Media Technol. 2023 Jul 1;13(3):e202334. https://www.ojcmt.net/article/impact-and-engagement-of-sport-fitness-influencers-a-challenge-for-health-education-media-literacy-13309

30. Cabero-Almenara J, Gutiérrez-Castillo JJ, Palacios-Rodríguez A, Guillén-Gámez FD. Digital Competence of university students with disabilities and factors that determine it. A descriptive, inferential and multivariate study. Educ Inf Technol. 2023 Aug 1;28(8):9417–36. https://link.springer.com/10.1007/s10639-022-11297-w

31. Sakitri W, Kardoyo K, Tusyanah T, Setiaji K. Determinants of work readiness as a teacher for higher education students in industry revolution of 4.0. J Appl Res High Educ. 2025 Apr 8;17(3):1099–108. https://www.emerald.com/insight/content/doi/10.1108/JARHE-12-2023-0592/full/html

32. UNESO. Alfabetización Mediática e Informacional. UNESO. 2025. https://www.unesco.org/es/media-information-literacy

33. Maiti M, Priyaadharshini M, S H. Design and evaluation of a revised ARCS motivational model for online classes in higher education. Heliyon. 2023 Dec;9(12):e22729. https://linkinghub.elsevier.com/retrieve/pii/S2405844023099371

34. Yang Y, Xu M, Gong B, Yang L, Zang Y. Leveraging science fiction to enhance technological literacy and critical thinking in higher education. Educ Inf Technol. 2025 Apr 21; https://link.springer.com/10.1007/s10639-025-13501-z

35. Feijoo B, Zozaya L, Sádaba C. Do I question what influencers sell me? Integration of critical thinking in the advertising literacy of Spanish adolescents. Humanit Soc Sci Commun. 2023 Jun 30;10(1):363. https://www.nature.com/articles/s41599-023-01872-y

36. Nichols P, Joffe A, Pillay R, Tladi B. Teacher-team reflections on the quality and modes of thinking in Writing Intensive courses at the University of the Witwatersrand during the first year of the global COVID-19 pandemic. Crit Stud Teach Learn. 2023;11(1):68–95. https://cristal.ac.za/index.php/cristal/article/view/583

37. Haroud S, Saqri N. Generative AI in Higher Education: Teachers' and Students' Perspectives on Support, Replacement, and Digital Literacy. Educ Sci. 2025 Mar 21;15(4):396. https://www.mdpi.com/2227-7102/15/4/396

38. Pant P. Balancing Screen Time and Human Interaction in Blended Learning. In: Blending Human Intelligence With Technology in the Classroom. IGI Global; 2025. p. 119–56. https://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/979-8-3373-0771-8.ch006

39. Lin C-H, Zhou K, Li L, Sun L. Integrating generative AI into digital multimodal composition: A study of multicultural second-language classrooms. Comput Compos. 2025 Mar;75:102895. https://linkinghub.elsevier.com/retrieve/pii/S8755461524000719

40. Rahimi AR, Mosalli Z. The role of 21-century digital competence in shaping pre-service language teachers' 21-century digital skills: the Partial Least Square Modeling Approach (PLS-SEM). J Comput Educ. 2024 Jan 6;12(1):165–89. https://link.springer.com/10.1007/s40692-023-00307-6

41. Wang M, Zhu J, Gu H, Zhang J, Wu D, Wang P. Optimizing experiential learning in science education: The role of two-tier testing in digital game-based learning. Entertain Comput. 2025 Jun;54:100960. https://linkinghub.elsevier.com/retrieve/pii/S1875952125000400

42. Zhou G, Liu W, Guo S, Lin Y. Where Are We in Online Project-Based Learning? Evidence From a Visualized Bibliometric Review (2013–2023). Comput Appl Eng Educ. 2025 May 7;33(3). https://onlinelibrary.wiley.com/doi/10.1002/cae.70044

43. Rap S, Blonder R. Technology Acceptance When Teaching Climate Change. J Sci Educ Technol. 2025 Jun 6;34(3):521–30. https://link.springer.com/10.1007/s10956-024-10125-9

44. Molina R, Crespo Y, Árbol JR, Arias-Orduña AV, Ibáñez-Molina AJ, Iglesias-Parro S. Exploring the neurophysiological basis of misinformation: A behavioral and neural complexity analysis. Behav Brain Res. 2025 Jun;487:115592. https://linkinghub.elsevier.com/retrieve/pii/S0166432825001780

45. Zhang Y, Miao Z. Enhancing <scp>EFL</scp> Learners' Engagement and Motivation Through Immersive Technologies: The Role of Artificial Intelligence, Augmented Reality, Virtual Reality, and Mobile Applications. Eur J Educ. 2025 Jun 19;60(2). https://onlinelibrary.wiley.com/doi/10.1111/ejed.70128

46. Chesire F, Kaseje M, Gisore V, Mugisha M, Ssenyonga R, Oxman M, et al. Effects of the Informed Health Choices secondary school intervention on the ability of lower secondary students in Kenya to think critically about health choices: 1-year follow-up of a cluster-randomized trial. Trials. 2025 Apr 7;26(1):125. https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-025-08810-0

47. Zimmermann E, Tomczyk S. Using Social Media to Promote Life Skills Among Adolescents: A Debate on Opportunities, Challenges, and Implications for Health and Education. J Prev. 2025 Apr 28;46(2):201–11. https://link.springer.com/10.1007/s10935-025-00826-1

48. Matthews S, Nicholas M, Paatsch L, Kervin L, Wyeth P. Social and curious: Lessons in designing digital manipulatives for young children. Int J Child-Computer Interact. 2025 Jun;44:100725. https://linkinghub.elsevier.com/retrieve/pii/S2212868925000054

49. Aremu VI, Udofia IG. Impact of Digital Literacy Skills on Undergraduate Performance in Nigeria. AFRICAN J Appl Res. 2025 Apr 29;11(2):210–9. https://ajaronline.com/index.php/AJAR/article/view/1031

50. Hecht A, Obradović S, Andreouli E. Supportive but suspicious: Ideology, institutional trust, electoral participation and gender shape public opinion on citizenship education in the <scp>UK</scp>. Br Educ Res J. 2025 Apr 10;51(2):848–68. https://bera-journals.onlinelibrary.wiley.com/doi/10.1002/berj.4101

51. Wu D, Zhang J. Generative artificial intelligence in secondary education: Applications and effects on students' innovation skills and digital literacy. Ayanwale MA, editor. PLoS One. 2025 May 9;20(5):e0323349. https://dx.plos.org/10.1371/journal.pone.0323349

52. Kooli C, Kooli Y, Kooli E. Generative artificial intelligence addiction syndrome: A new behavioral disorder? Asian J Psychiatr. 2025 May;107:104476. https://linkinghub.elsevier.com/retrieve/pii/S1876201825001194

53. Oliveira L, Tavares C, Strzelecki A, Silva M. Prompting Minds: Evaluating how Students Perceive Generative

AI's Critical Thinking Dispositions. Electron J e-Learning. 2025 Apr 29;23(2):1–18. https://academic-publishing.org/index.php/ejel/article/view/3986

54. Mack NA, Tandjong CW, Adeleke MB, Ballou E, Harry A, Panton J. Revolutionizing Culturally Relevant Math Education Through AI and Co-Designing Strategies. In: Proceedings of the Extended Abstracts of the CHI Conference on Human Factors in Computing Systems. New York, NY, USA: ACM; 2025. p. 1–6. https://dl.acm.org/doi/10.1145/3706599.3719835

55. Hoesin CFIS, Poplavskaya N V. Building media literacy in Indonesia with the support of international organizations. Rudn J Stud Lit Journal. 2023 Dec 15;28(4):818–29. https://journals.rudn.ru/literary-criticism/article/view/38104

56. Wei Z. Navigating Digital Learning Landscapes: Unveiling the Interplay Between Learning Behaviors, Digital Literacy, and Educational Outcomes. J Knowl Econ. 2023 Oct 7;15(3):10516–46. https://link.springer.com/10.1007/s13132-023-01522-3

57. Iqbal J, Shaikh AA, Jamal WN, Akhtar K, Rahim R, Kousar S. Exploring the generic skills required for the employability and professional wellbeing of Pakistani Millennials: The employers' perspective. Front Psychol. 2023 Jan 5;13. https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1070267/full

58. McKenzie B. Dungeons and dragons and digital writing: A case study of worldbuilding. J Univ Teach Learn Pract. 2023 Jan 1;20(2). https://open-publishing.org/journals/index.php/jutlp/article/view/638

59. Suwono H, Rofi'Ah NL, Saefi M, Fachrunnisa R. Interactive socio-scientific inquiry for promoting scientific literacy, enhancing biological knowledge, and developing critical thinking. J Biol Educ. 2023 Oct 20;57(5):944–59. https://www.tandfonline.com/doi/full/10.1080/00219266.2021.2006270

60. Mun LK, Luu J. Re-inventing Critical Thinking and Writing Tasks Using a CDL Approach. Int J TESOL Stud. 2022 Dec 6;5(1):5–21. https://www.tesolunion.org/attachments/files/IWBN2M23NTGX6MWM13OTU56YJE13NZYW5N2FIFOTYZ6OGVJ1NGQ36Y2Q16YZMY2LJKY6OTU56MZGWFLMJM.pdf

61. Alexandropoulos G. Teaching the political speech at secondary level schools. Towards critical and digital literacy.. CALR Linguist J - Issue 14. 2023 Dec 30;14. https://web.aou.edu.lb/research/online-journals/PublishingImages/Pages/CALR-Issue-14/Article 6.pdf

62. Arafah B, Hasyim M. Digital Literacy: The Right Solution to Overcome the Various Problems of Meaning and Communication on Social Media. Stud Media Commun. 2023 Mar 14;11(4):19. https://redfame.com/journal/index.php/smc/article/view/6003

63. Brajdić Vuković M, Bilić P. Being Media Literate in Croatia. Rev Sociol. 2023 Aug 31;53(2):241–70. https://hrcak.srce.hr/file/446173

64. Kholifah N, Majid NWA, Subakti H, Putri GE, Suyitno S, Zuhri MT. Contribution of Local Product Purchase Policy to Improvement of the 21st Century Learning. WSEAS Trans Syst. 2023 Mar 15;22:231–41. https://wseas.com/journals/systems/2023/a485107-2031.pdf

65. Omoera OS, Uwalaka T. Fake News as Disruptive Media: A Digital Age Challenge in Nigeria. Stud Media Commun. 2023 Jul 11;11(6):208. https://redfame.com/journal/index.php/smc/article/view/6240

66. Dilekçi A, Karatay H. The effects of the 21st century skills curriculum on the development of students' creative thinking skills. Think Ski Creat. 2023 Mar;47:101229. https://linkinghub.elsevier.com/retrieve/pii/S1871187122002309

67. Morgado M, Vesala-Varttala T. Digital storytelling as practice-based participatory pedagogy for English for specific purposes. Lang Learn High Educ. 2023 May 25;13(1):175–200. https://www.degruyter.com/document/doi/10.1515/cercles-2023-2014/html

68. Imjai N, Yordudom T, Yaacob Z, Saad NHM, Aujirapongpan S. Impact of AI literacy and adaptability on financial analyst skills among prospective Thai accountants: The role of critical thinking. Technol Forecast Soc

Change. 2025 Jan;210:123889. https://linkinghub.elsevier.com/retrieve/pii/S0040162524006875

69. Wang X. What Influences Students' Digital Literacy: A Meta-Analysis. New Rev Inf Netw. 2024 Jul 2;29(1–2):101–17. https://www.tandfonline.com/doi/full/10.1080/13614576.2025.2501638

70. Mansour RF, Fatouh AH. Measurement of Bias in the Contents of Web Search for Health Information Retrieval. J Scientometr Res. 2023 Nov 30;12(3):621–30. https://jscires.org/article/6724

71. Kiersch C, Nowicki K, McDermott M, Gullekson N. Flossing Your Teeth and Adopting a Puppy: In-Class Exercises for Developing Critical Thinking in a Digital Age. Manag Teach Rev. 2023 Sep 8;8(3):233–45. https://journals.sagepub.com/doi/10.1177/23792981221076118

72. Rusandi MA, Ahman, Saripah I, Khairun DY, Mutmainnah. No worries with ChatGPT: building bridges between artificial intelligence and education with critical thinking soft skills. J Public Health (Bangkok). 2023 Aug 28;45(3):e602–3. https://academic.oup.com/jpubhealth/article/45/3/e602/7136742

73. Castonguay A, Farthing P, Davies S, Vogelsang L, Kleib M, Risling T, et al. Revolutionizing nursing education through Ai integration: A reflection on the disruptive impact of ChatGPT. Nurse Educ Today. 2023 Oct;129:105916. https://linkinghub.elsevier.com/retrieve/pii/S0260691723002101

74. Rissone KA, Arruabarrena VM. Educational innovation with artificial intelligence and augmented reality. EthAIca. 2024; 3:107. https://doi.org/10.56294/ai2024107

75. Chan CKY, Lee KKW. The AI generation gap: Are Gen Z students more interested in adopting generative AI such as ChatGPT in teaching and learning than their Gen X and millennial generation teachers? Smart Learn Environ. 2023 Nov 15;10(1):60. https://slejournal.springeropen.com/articles/10.1186/s40561-023-00269-3

76. Rissone KA, Arruabarrena VM. Artificial Intelligence, Chat GPT, and Virtual Reality in Education. EthAIca. 2024; 3:118. https://doi.org/10.56294/ai2024118

77. Pierre – Robertson P. #SuperLibrarian – the evolving role of librarians in technology spaces. Digit Libr Perspect. 2023 Nov 16;39(4):620–7. https://www.emerald.com/insight/content/doi/10.1108/DLP-04-2023-0026/full/html

FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

None.

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