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Artificial Intelligence in Teaching and Research: Tools, Challenges and Benefits from a Knowledge Organization Perspective

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Abstract

Artificial Intelligence (AI) has become a structuring force in the production, organization, and circulation of academic knowledge. In educational and research contexts, its integration is reshaping practices of mediation, analysis, and knowledge generation. This study examines the tools, challenges, and benefits associated with AI in teaching and scientific research, with particular attention to implications for Information Science education and the epistemological foundations of Knowledge Organization. The research adopts a qualitative, exploratory, and descriptive design based on a narrative literature review and content analysis of peer-reviewed publications indexed in SciELO. The findings indicate widespread use of conversational agents, intelligent tutoring systems, and generative models, especially in tasks related to synthesis, classification, and academic writing support. While these technologies enhance personalization, productivity, and analytical capacity, they also raise ethical and epistemological concerns, including bias, opacity, inequalities of access, and questions of authorship and intellectual autonomy. The study argues that AI does not replace human judgment but redefines its role, requiring critical curation, algorithmic literacy, and stronger engagement with the conceptual foundations of Knowledge Organization in professional education

Keywords: Artificial Intelligence. Knowledge Organization. Higher Education.

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1.0Introduction

In its early development, Artificial Intelligence sought to model processes such as pattern recognition, learning, problem solving, and decision making through computational simulation. The growth of computational capacity and the availability of large-scale datasets have significantly expanded its presence across multiple domains, including higher education, scientific research, and Knowledge Organization (KO) practices.

In the educational field, the expansion of AI has been reshaping teaching practices and learning experiences, fostering personalization, tutoring support, and diversification of resources. When incorporated into activities related to information search, analysis, and synthesis, these tools contribute to more dynamic and adaptive learning environments that respond to individual needs (Barrios-Tao, Díaz, and Guerra 2021; Monge Mata and Ávalos Dávila 2020).

At the same time, the pedagogical, ethical, cognitive, and epistemological implications of algorithmic mediation remain under discussion, particularly regarding intellectual autonomy, critical judgment, and the foundations of Knowledge Organization, whose practices have historically relied on deliberate analysis and intellectual curation.

Within this context, this study asks how AI tools have been incorporated into teaching and research practices and what challenges and implications they generate for education in Information Science and for the epistemological foundations of Knowledge Organization. The objective is to analyze the uses, benefits, and limitations of these technologies in academic settings, identifying patterns of adoption and their impact on professional competencies. The study seeks to map tools, emerging practices, and constraints, contributing to a critical examination of the role of AI in educational and scientific environments.

This research is justified by the need to understand how algorithmic mediation, already integrated into everyday academic life and widely used for synthesis, analysis, organization, and circulation of knowledge, affects core values of Knowledge Organization, such as human judgment, epistemic diversity, domain analysis, and intellectual curation. By mapping these uses, the study identifies both opportunities and risks associated with AI, offering conceptual support for epistemological, curricular, and professional reflection within Information Science.

2.0 Education in Information Science in the Age of AI: Challenges for Knowledge Organization

The incorporation of AI tools into teaching, research, and knowledge management has been reshaping the foundations of education in Information Science, as it directly affects formative processes and the epistemological assumptions of Knowledge Organization (KO). Generative models increasingly perform tasks such as summarization, classification, and semantic reorganization, which are central to KO practice. While these tools expand possibilities for information mediation, they also place pressure on its conceptual foundations.

Since its classical formulations, KO has been understood as the deliberate construction of conceptual structures, grounded in domain analysis and human judgment (Dahlberg 1993). This orientation underlies competencies related to categorization, terminological control, and intellectual curation. The partial automation of these functions by algorithmic systems redistributes responsibilities between humans and machines, requiring a critical reassessment of the formative role of the field.

In this context, Russell and Norvig (2021) define AI as the science and engineering devoted to the creation of intelligent machines, centered on inference, knowledge representation, and decision making. This perspective highlights the structural proximity between AI and KO, particularly in conceptual modeling and in the inferential processes that sustain information organization and retrieval.

The growing complexity and volume of data in educational and scientific environments increase the demand for efficient methods of organization and analysis, a context in which AI is often presented as a promising solution. However, its impact on formative practices, transparency, and accountability in decision making still requires critical reflection within Information Science and KO. In education, the integration of AI challenges institutions to reconsider pedagogical approaches, while also fostering more personalized and adaptive learning experiences (Barrios-Tao, Díaz, and Guerra 2021; Monge Mata and Ávalos Dávila 2020).

Discussions therefore intensify regarding the competencies required to operate in AI-mediated sociotechnical ecosystems. García Marco (2025) proposes the notion of knowledge organizational literacy, aimed at the interpretation and critical evaluation of algorithmic decisions, articulating semantics and knowledge organization systems. This proposal shifts the focus from technical operation toward understanding the cognitive, epistemological, and ethical effects of algorithmic mediation.

In a convergent direction, Qin (2020) argues that KO increasingly operates through an algorithmic lens, combining classification, ontologies, and machine learning. This development calls for an adaptive epistemology and for the recognition of forms of co-authorship between humans and systems in the production and organization of knowledge. Punziano (2025) further notes that the probabilistic character of AI-generated responses demands ongoing reflection on their limits and implications. Ghafouri (2025), in turn, warns of

the risk of informational homogenization, whereby generative systems may reduce conceptual diversity. For KO, whose mission includes the representation and preservation of epistemic plurality, this constitutes a central challenge, particularly regarding bias detection and the maintenance of conceptual diversity.

Taken together, these contributions indicate that education in Information Science must incorporate a broader understanding of AI's role in the organization and mediation of knowledge. Beyond technical proficiency, professional formation requires the capacity to critically analyze the impact of these technologies on teaching, research, and information organization, acknowledging both their potential and their limitations. By examining the use of AI in academic contexts, this study identifies emerging competencies, epistemological challenges, and formative opportunities aligned with the foundations of Knowledge Organization.

This section therefore connects contemporary KO literature with the emergence of AI, especially generative models, and provides the theoretical basis for the empirical analysis that follows.

3.0 Methodology

In light of the conceptual and formative transformations discussed in the previous section, this study adopts a qualitative approach of an exploratory and descriptive nature, based on a narrative literature review. The review does not aim at exhaustiveness or statistical generalization. Its purpose is to map how AI has been incorporated into teaching and research practices, as well as to identify the challenges and benefits associated with these uses. The qualitative orientation is grounded in the content analysis of selected documents, enabling an in-depth understanding of concepts, practices, and trends related to the use of AI in educational and scientific contexts.

3.1 Procedures of the Narrative Literature Review

The methodological procedures of the narrative literature review were organized into two main stages: (1) bibliographic search and (2) literature analysis.

3.1.1 Bibliographic Search

Data collection began with a search conducted in the SciELO database in June 2024, using the search strings "artificial intelligence AND teaching" and "artificial intelligence AND research." This initial search retrieved 157 documents.

Inclusion criteria were applied concerning publication recency (last ten years), peer review, relevance to the use of AI in teaching and research, open access availability, and removal of duplicates. Titles, abstracts, and keywords were examined in order to assess relevance.

This process resulted in the selection of 36 documents to compose the analytical corpus.

The choice of SciELO is justified by its relevance in the Ibero-American context and its commitment to open access. The adoption of a narrative review is consistent with the exploratory nature of the research topic.

3.1.2 Literature Analysis

The analysis of the selected documents followed the methodological proposal outlined by Gil (2002), structured in four stages, as presented in Table 1.

Table 1 – Method for the Analysis of Collected Material

Step	Description
A) Exploratory reading	General overview of each work to verify whether it addresses the research question, identifying approaches, concepts, and implications of AI use in teaching and research for Knowledge Organization.
B) Selective reading	More detailed examination of the studies identified during exploratory reading to determine which effectively contribute to answering the research question. This stage is not definitive and may require returning to previous texts.
C) Analytical reading	Critical examination aimed at organizing and categorizing collected data, synthesizing key ideas relevant to the research question through a comprehensive reading of each work.
D) Interpretative reading	Attribution of broader meaning to the findings, relating collected data to prior knowledge and to new insights generated through the analysis of the selected material.

Source: Carneiro (2022, pp. 64–65), based on Gil (2002).

According to Gil (2002), these stages are not strictly linear and may involve returning to the texts when necessary. The guiding research question was: How has AI been incorporated into teaching and research, and which tools, challenges, and benefits emerge from these uses?

During the exploratory reading of the 36 documents, alignment with the research problem was verified and initial patterns were identified. In the analytical stage, data were organized in a spreadsheet including year and authorship, content synthesis, context of application (teaching or research), AI tools identified, challenges, and benefits. Finally, the interpretative reading sought to critically examine the findings and their implications for education in Information Science and for Knowledge Organization.

4.0 Discussion of Results

The analysis of the 36 documents shows that AI is already widely integrated into educational and scientific ecosystems. Most of the studies focus on teaching contexts (24), followed by research-centered investigations (8) and hybrid approaches (4). Overall, AI is employed to optimize processes, personalize experiences, and automate analytical tasks, thereby expanding academic productivity, particularly in activities related to synthesis, classification, and information organization. For education in Information Science, this development reshapes practices and the epistemological foundations of Knowledge Organization, as it introduces systems that also produce and reorganize knowledge.

The diversity of tools identified demonstrates the breadth of AI's impact in educational and scientific settings. In teaching, conversational agents, intelligent tutoring systems, and generative models are prominent. These are integrated into virtual learning environments and data analytics platforms, mainly to support personalized learning, monitor interactions, and generate feedback in face-to-face, remote, or hybrid modalities.

In scientific research, the studies report the use of generative models and computational analysis tools, as well as assisted writing and automated revision systems. Such resources indicate a context in which tasks such as textual analysis, classification, and synthesis are increasingly shared with algorithmic systems, redefining practices traditionally attributed to researchers.

This central role of AI in synthesis, classification, and decision support reinforces its relevance for Knowledge Organization, as part of the organizational function is transferred to automated systems. This shift calls for new professional competencies in Information Science, particularly in relation to curation, supervision, and auditing of algorithmic inferences, as discussed by Hjørland (2023) and García Marco (2025).

4.2 Identified Challenges

The main challenges identified include ethical-pedagogical and methodological-epistemic dimensions.

Ethical and pedagogical tensions concern the preservation of critical reflection, the risk of technological dependence, and the possible symbolic replacement of the teacher's role (Campos and Lastória 2020). Inequalities in access and the need for adequate infrastructure are also highlighted. Ethical concerns include algorithmic bias, data privacy, model opacity, reproduction of stereotypes, misinformation, and the inappropriate use of AI in academic assessment (Rodrigues and Rodrigues 2023; Barrios-Tao, Díaz, and Guerra 2021). There is also the risk of analytical superficiality due to the limitations of AI systems in handling complex conceptual nuances (Finger 2021). These aspects require teacher education oriented toward critical integration of AI, supported by clear institutional guidelines and the development of digital

competencies (Pereira and Moura 2023), which are particularly relevant for Knowledge Organization given its central role in knowledge mediation and representation.

In the scientific research domain, challenges include dependence on robust databases, issues of reliability, authorship, and validation of results, as well as the limitations of virtual assistants (Prates et al. 2023; Vasconcellos 2023). In fields such as biomedicine, demands for transparency and methodological quality are emphasized (Ramos et al. 2022; Arencibia-Jorge et al. 2023). More broadly, these concerns converge with the warnings raised by Ghafouri (2025) and Punziano (2025) regarding the risk of informational homogenization and reduction of epistemic diversity, reinforcing the need for critical literacy to interpret, supervise, and audit algorithmic inferences.

4.3 Identified Benefits

The most frequently reported benefits of AI in teaching include personalization of learning, content adaptation, immediate feedback, support for students with specific needs, gamification, increased student engagement, and optimization of teaching activities (Silva, Viana, and Vilela Jr. 2020; Monge Mata and Ávalos Dávila 2020; Tramallino and Zeni 2024). AI also contributes to content organization, text production and revision, task management, and monitoring of academic performance, thereby strengthening practices of knowledge organization and mediation.

In scientific research, reported benefits include predictive analysis, identification of complex patterns, advanced data visualization, reference management, assisted scientific writing, image-based diagnosis, and acceleration of knowledge discovery (Ramos et al. 2022; Oliveira and Neves 2023).

From a Knowledge Organization perspective, these benefits indicate that AI expands human capacities to organize, interpret, and synthesize knowledge, provided that it is integrated into educational processes that promote critical awareness of its limitations, biases, and epistemological implications.

4.4 Analytical Synthesis

The integrated analysis of the 36 documents made it possible to identify recurring patterns in the incorporation of AI into teaching and research, as well as the principal challenges and benefits associated with these uses. To synthesize these findings, Table 2 was developed, organizing the results into central categories related to tools, challenges, and benefits across educational and scientific domains.

Table 2 – Synthesis of the Analyzed Literature

Category	Examples	Frequency in the Sample
AI tools in teaching	ChatGPT, ITS, neural networks,	24 documents

	generative models, tutoring systems, gamification	
AI tools in research	BERT, GPT, Python/SPSS, semantic extraction, plagiarism detection, predictive analysis	12 documents
Pedagogical and ethical challenges	algorithmic bias, privacy, inequality, teacher training, analytical superficiality	20 documents
Methodological and epistemic challenges	reliability, data representativeness, model opacity, scientific authorship	18 documents
Benefits in teaching	personalization, feedback, gamification, content organization	28 documents
Benefits in research	multidimensional analysis, diagnostic precision, productivity, textual synthesis	18 documents

Source: research data (2026).

The presence of AI in educational and scientific practices constitutes a structuring condition in which tools, challenges, and benefits are interrelated. Although AI expands possibilities for personalization, analysis, and productivity, its adoption also generates ethical, pedagogical, and epistemological tensions that require specific critical competencies in Information Science and Knowledge Organization. Strengthening education that integrates informational and algorithmic literacy is therefore essential, enabling professionals to interpret, supervise, and guide the use of AI in an ethically grounded and epistemologically informed manner.

5.0 Final Considerations

The incorporation of AI into teaching and research reshapes the academic ecosystem by directly influencing pedagogical practices, investigative processes, and the dynamics of knowledge organization. The review demonstrates that these technologies, ranging from virtual assistants to generative models, operate not only as instrumental support but as mediators of core activities related to analysis, synthesis, and the circulation of information. This development has direct implications for education in Information Science and for Knowledge Organization.

The identified benefits include the personalization of learning, support for teaching activities, automation of routine tasks, and the expansion of analytical capacity in scientific research. From a Knowledge Organization perspective, such advances enhance processes of representation and

synthesis, provided they are accompanied by critical competencies related to curation, validation, and supervision of algorithmic inferences.

At the same time, ethical, pedagogical, and epistemological challenges emerge, including the preservation of intellectual autonomy, mitigation of bias, model opacity, inequalities of access, and issues of authorship and scientific responsibility. These concerns directly affect foundational values of Knowledge Organization and require educational approaches that integrate epistemological foundations, ethical reflection, and algorithmic literacy.

The findings reinforce that AI does not replace human judgment but redefines its role within a sociotechnical ecology in which humans and systems co-produce classifications and knowledge representations. For education in Information Science, this implies shifting the focus from mere technical instrumentalization toward a critical and reflective approach to AI use.

As a limitation, the study is restricted to documents indexed in the SciELO database, which may constrain the international scope of the analysis. Future research may expand the corpus and develop empirical investigations that directly examine the integration of AI into Knowledge Organization education, exploring curricular experiences, emerging competencies, and AI-mediated pedagogical practices.

This study seeks to contribute to ongoing discussions on the role of AI in education and research by offering conceptual support for strengthening Information Science education. Such education must be capable of responding, in a critical and ethically grounded manner, to the transformations that affect Knowledge Organization.

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