

INTEGRATING AI IN ONLINE LEARNING IN HIGHER EDUCATION: A LITERATURE REVIEW

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Artificial intelligence (AI) is rapidly being adopted within higher education and online learning contexts. Online instructors are utilizing the affordances of AI technologies in teaching and learning. They are simultaneously grappling with issues of privacy, data storage, and ethical implications through considerations of how to design and support learning with selected AI tool(s). This literature review focuses on how AI technologies are integrated into online learning environments in higher education. Using a two-pronged critical literature review approach, 207 citations were initially identified and resulted in 63 citations selected in the final review. The resulting four key themes are discussed and reflect the complexity of AI integration in online learning: (i) Types and purpose of AI integration; (ii) pedagogical approaches (e.g., use of AI literacy); (iii) benefits of using AI in online learning; and (iv) challenges of using AI in online learning. Notably, these themes overlap and reflect an interconnection. Implications for practice, policy, and research are provided.

KEY WORDS: artificial intelligence, higher education, learning, online learning

1. INTRODUCTION

Artificial intelligence (AI) is a rapidly evolving technology that is impacting all aspects of society, including education. Within online learning in higher education, students and instructors are learning to use these technologies while grappling with the ethical and privacy issues associated with the use of AI. Specific to online learning environments, the affordances of AI technologies present a new learning landscape requiring instructors to (re)think the use of selected AI tool(s) and their role of supporting learning online. As instructors embrace the integration of these technologies, they are also confronted with the challenges particular to these tools and ask, “Will we be part of shaping this future or will we be left behind?” (Humble et al., 2024, p. 25).

The purpose of this article is to share findings from a literature review designed to address the question, how is AI integrated into online learning environments in higher education? From the review, we discuss four resulting themes: (i) Types and purpose of AI integration; (ii) pedagogical approaches; (iii) benefits of using AI in online learning; and (iv) challenges of using AI in online learning. We conclude the article by discussing implications for practice, policy, and research.

1.1 Artificial Intelligence

The development of AI began in the mid-twentieth century with the exploration of machine intelligence (i.e., the 1950s Turing Test) and its potential for sentience. UNICEF (2021) refers to AI as machine-based systems that can, given a set of human-defined objectives, make predictions, recommendations, or decisions that influence real or virtual environments. AI systems interact with us and act on our environment, either directly or indirectly. Often, they appear to operate autonomously and can adapt their behavior by learning about the context (UNICEF 2021, p. 16).

According to UNESCO (2019) Commission on the Ethics of Scientific Knowledge and Technology, there is no one definition of AI. Rather, it is commonly agreed upon that machines that are based on AI, or on *cognitive computing*, are potentially capable of imitating or even exceeding human cognitive capacities, including sensing, language interaction, reasoning and analysis, problem solving, and even creativity. Moreover, such “intelligent machines” can demonstrate human-like learning capabilities with mechanisms of self-relation and self-correction, on the basis of algorithms that embody “machine learning” or even “deep learning,” using neural networks that mimic the functioning of the human brain (UNESCO, 2019, p. 3).

These definitions describe machine-based systems developing human-like capability to learn. Specifically, Nilsson (2009, p. xiii) suggests AI “is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment.”

AI is the term for “a system that thinks humanly, acts humanly, thinks rationally, or acts rationally” (Tussyadiah, 2020, p. 2). AI systems are primarily built “(i) through the use of rules provided by a human (rule-based systems) or (ii) with machine learning algorithms” (Ruiz and Fusco, n.d.). AI programmers consider multiple components that influence the development of the AI system, “including machine learning, natural language processing, and computer vision—[which] remain crucial foundations in understanding AI” (Bae et al., 2024, p. 134).

Important to the context of this review, as AI and AI systems develop, we need to consider how and where they can be used in online learning. As this technology is becoming more mainstream in how we design, facilitate, and assess learning in online environments, we need to work from research-informed practices. Although much research focuses on the different types of AI technologies available for educational use, there is minimal research examining how to pedagogically implement these technologies. And it is here that we begin

our literature inquiry into examining the online pedagogical practices for using AI technologies for online learning in higher education.

2. LITERATURE REVIEW: METHOD

The review follows Creswell and Guetterman's (2019) six steps in conducting a literature review:

- 1 Identify key terms.
- 2 Locate literature.
- 3 Critically evaluate and select the literature.
- 4 Organize the literature.
- 5 Synthesize the literature.
- 6 Write a literature review (Creswell & Guetterman, 2019, p. 80).

This critical literature review inquiry was guided by the question, how is AI integrated into online learning environments in higher education? From this question, we selected the key terms that were used for search terms such as higher education, online, and AI. Search terms are noted in Table 1. We developed and used the following secondary questions to help inform the work, such as the following:

What are the online pedagogical practices that are being implemented when using AI?

What are the advantages and challenges of using AI in online learning?

TABLE 1: Search terms for literature review

Search Terms	Additional Search Terms
Higher education	Post-secondary education, tertiary, university, college, polytechnic
Online	Synchronous, asynchronous, online learning
AI	GenAI, ChatGPT, chatbots

Inclusion criteria for the search included published English texts in refereed national and international journals, books and book chapters, and papers in conference proceedings from 2020 to 2025. All studies needed to be within a higher education context. Exclusion criteria were non-refereed resources and presentations.

A two-pronged approach was used for the initial search. First, the following databases were searched: ProQuest Search, ProQuest Dissertations & Theses @ University of Calgary, ProQuest Dissertations & Theses Global, ERIC (EBSCO and U.S. Dept. of Education), Education Research Complete, and Academic Search Complete. Second, the authors created a list of 16 identified journals focused on educational technology that were searched (e.g., *Australian Journal of Educational Technology*; *British Journal of Educational Technology*; *Canadian Journal of Teaching and Learning*; *International Review of Research in Open and Distributed Learning*).

Creswell & Creswell (2023) identified the importance of using a rigorous approach when synthesizing and evaluating articles for a literature review. Therefore, we recorded all data from our initial review (i.e., 207 citations) in a MS Excel spreadsheet. Using this list, the authors conducted a title and abstract analyses for each of the citations to ensure all three terms were integrated as the focus of the document (i.e., AI, higher education, online). This resulted in 63 citations selected for the final literature review. As a team, we identified key themes (e.g., types of AI, purpose of AI, pedagogical approach/strategies for using AI, benefits/advantages, and challenges/difficulties) from these citations and reported them in a second MS Excel spreadsheet. Our spreadsheet, rather than a visual diagram as noted by Creswell & Guetterman (2019), is where we documented the synthesis of the literature. Themes are discussed in the Section 3.

The 63 citations provide a global representation (see Table 2) from 32 countries in which AI and online learning were occurring in higher education. Five citations did not provide geographical data for where the study was conducted.

TABLE 2: Categorization of citations by continents

Continents	No. of Citations
Africa	5
Asia	19
Oceania	4
Europe	17
North America	7
South America	1
Multiple continents	5
Not listed	5
Total	63

3. DISCUSSION OF FINDINGS

From the thematic analysis of the 63 citations, the following four themes are discussed: (i) Types of AI integration, (ii) pedagogical approaches, (iii) benefits of using AI in online learning, and (iv) challenges of using AI in online learning.

3.1 Types of AI Integration

Fifty-four articles reviewed contained specific examples of various ways in which AI technology is used in online learning in higher education. In these articles, AI integration was found classified as follows: AI teaching assistance/machine teachers; automated AI monitoring; AI-driven surveillance; algorithms, generative AI (GAI), large language models, machine learning, prediction model performance (i.e., adaptive modeling), and other (i.e.,

generally referring to AI or when there was a combination of AI being examined in the article) (see Table 3).

TABLE 3: Types of AI reported in 54 citations

General Description	Examples of Some Specific Descriptions	Citation
AI Teaching Assistant/Machine Teachers	Dahlia	Kim et al. (2022), Pelzer & Turner (2022), Spence et al. (2024)
Automated AI Monitoring	Remote Proctored Exams	Gudiño Paredes et al. (2021)
AI-Driven Surveillance	Proctorio, Turnitin, Perusall	Swartz & McElroy (2023)
Algorithms	Big data, Learning analytics	Hou et al. (2021), Maune (2024), Ouyang et al. (2023), Prinsloo et al. (2024)
GAI	Intelligent tutoring, content creation, and automated grading	Bozkurt & Sharma (2023), Kumar et al. (2024); Oc & Hassen (2025), Olojede (2024), Suliman et al. (2024)
Language Support Models	Presentation Translator and voice assistants (e.g., Siri, Cortana)	Osorio et al. (2024)
Large Language Models	Q-Module-Bot, chatbots, ChatGPT	Allen et al. (2024), Bae et al. (2024), Hew et al. (2023), Humble et al. (2024), Ilieva et al. (2023); Kayalı et al. (2023), Naidu & Sevnarayan (2023), Ndunagu et al. (2025), Neo (2022), Rädcl-Ablass et al. (2025), Saleem et al. (2024), Stanoyevitch (2024), Susnjak & McIntosh (2024), Tan (2024)
Machine Learning	Student feedback creation, decision trees	Dann et al. (2024), Lu et al. (2020), Mehrabi et al. (2024), Mutawa & Sruthi (2024), Osorio et al. (2024), Saad & Tounkara (2023)
Prediction Model Performance (i.e., Adaptive Systems)	Learning Intelligent System and EWS	Bañeres et al. (2023), Chen et al. (2022), Guerrero-Roldán et al. (2021), Rodríguez et al. (2022), Tan et al. (2022)
Other: Generally referring to AI (no one type of AI or a Combination of Technologies in the Study)		Enakrire et al. (2024), González-Rico & Lluch Sintes (2024), Jin et al. (2023), Nagro (2021), Betancourt Ramirez & Fuentes Esparrell (2024), Seo et al. (2021), Shi et al. (2025), Shuliar et al. (2023), Singh et al. (2025), Sîrghi et al. (2024), Susnjak (2024), Tapalova & Zhiyenbayeva (2022), Tonbuluğlu (2023), Triberti et al. (2024)

In these studies, AI was used in various ways to support student learning and to assist with online teaching. For example, AI technology was used to provide support for learning through AI teaching assistants or machine teachers (Kim et al., 2022; Pelzer & Turner, 2022; Spence et al., 2024) while Gudiño Paredes et al. (2021) reported its use in remote proctored exams (RPEs). Additionally, predictive models of performance were used to support student learning and to predict student success (Chen et al., 2022; Rodríguez et al., 2022; Tan et al., 2022). The use of big data and learning analytics were reported in four studies: Hou et al. (2021), Maune (2024), Ouyang et al. (2023), and Prinsloo et al. (2024).

The most common AI technology reported involved large language models with the use of chatbots and ChatGPT (Allen et al., 2024; Bae et al., 2024; Hew et al., 2023; Humble et al., 2024; Ilieva et al., 2023; Kayalı et al., 2023; Naidu & Sevnarayan, 2023; Ndunagu et al., 2025; Neo, 2022; Rädcl-Abllass et al., 2025; Saleem et al., 2024; Stanoyevitch, 2024; Susnjak & McIntosh, 2024; Tan, 2024). For example, Q-Module Bot was used to provide students with feedback on their inquiries related to course materials (Allen et al., 2024). Alternately, Hew et al. (2023) reported on how chatbots were used to support student goal setting and for fostering online presence. The use of these two chatbots helped to foster greater online engagement.

In another example, an AI-based bot was used in a role-play where instructors provided a “platform for students of different health study programs to engage in complex patient-health professional conversations, offering an alternative to traditional role plays with actors or real patients” (Rädcl-Abllass et al., 2025, p. 1). Together, these studies provide evidence of how various forms of AI can be integrated into online learning environments to support teaching and learning in higher education.

3.2 Pedagogical Approaches

AI is impacting how we design online learning in higher education. Careful consideration is needed regarding how this rapidly changing technology can be integrated to support student learning and instructors' teaching approaches. From the review, the following three sub themes were identified: AI literacy, pedagogical strategies, and self-directed or self-regulated learning (SRL).

First, the review showed that concepts of digital literacy and AI literacy are similar, yet different. From their study, Salimi et al. (2025, p. 165) found that “digital literacy is essential for developing digital learning in higher education” and it is a strong “predictor of academic success” (Salimi et al. 2025, p. 178). Furthermore, they argued that “improving students' digital literacy and knowledge sharing can enhance their performance in online learning environments, and it is a recommendation for university educators and educational technologists” (Salimi et al. 2025, p. 165).

AI literacy extends beyond digital literacy. AI literacy, according to Crabtree (2023) “is a multifaceted concept... AI literacy involves the having the skills and competencies required to use AI technologies and applications effectively.” When planning to use AI in teaching and

learning, the institution has a role to help individuals (i.e., students and instructors) to develop their AI literacy. Crabtree (2023) noted “it’s about viewing these technologies critically, understanding their context, and questioning their design and implementation. It is also about being able to discern the benefits and challenges of AI while making informed decisions about its use.”

In their study, Bae et al. (2024) found there is a strong need to focus on AI literacy development with pre-service teachers. Pre-service teachers were in a unique role as they learned to use AI technology while learning how to use it in their teaching. They were active users engaged in critical reflection on the practical and ethical factors when using such technology in instructional practice. As such, pedagogical strategies need to be implemented that not only have students using the technology but also developing soft skills such as digital literacy. Furthermore, AI literacy is to “prepare students more comprehensively to meet the challenges of the 21st century and to thrive in an increasingly digitized and globalised environment” (González-Rico & Lluçh Sintès, 2024, p. 9). Similarly, Xiao et al. (2024) emphasized “the significant influence of AI literacy on the academic well-being of undergraduate students... Students with higher levels of AI literacy are likely to be more adept at navigating the growing number of AI-driven tools being integrated into educational environments. This will likely lead to increased success and well-being in the digital age” (Xiao et al. 2024, p. 194). Together, this suggests the development of AI literacy will help students thrive in a digital age.

Second, careful consideration needs to be given to pedagogical strategies when choosing to use AI technologies. For online instructors, who have a familiarity and confidence in using digital technologies, AI technologies can be used in various ways to support online learning. For example, with strategic integration of AI in pedagogy, instructors can avoid “repetitive and time-intensive tasks and help them concentrate on higher-value education work... break down assignments into smaller components that are easily understandable. These systems are of much help for international students who have language barriers” (Treve, 2022, p. 223). As a pedagogical strategy, AI can be used to help instructors in preparing instructional materials and lectures.

Bozkurt & Sharma (2023, p. i) noted that GAI technology can reduce “transactional distance by increasing the dialogue and autonomy and lessening the structure, which further requires redesigning the learning.” Additionally, it can be used to offer “personalized and adaptive learning experiences that can be tailored to the needs and preferences of each student” (Bozkurt & Sharma, 2023, p. vi). Embracing the affordances of these technologies will require instructors to shift their thinking in terms of how and why various AI technologies can be integrated into the online learning environment.

With a shift in instructor mindset, AI technologies can be pedagogical catalysts for changing how we create online learning environments. For example, Ilieva et al. (2023, p. 1) reported that chatbots can “transform pedagogical activities” through “personalized tutoring and homework assistance to administrative tasks and student grading. Opening new possibilities for creativity and innovation in education, AI chatbots have the potential to reshape the educational landscape” (Ilieva et al., 2023, p. 12). In addition, chatbots can play a role in

supporting personalized tutoring (González-Rico & Lluch Sintes, 2024; Osorio et al., 2024). For example, with the “AISEC tools, which combine AI, simulation, and E-collaboration technologies... AI tools support students with different linguistic backgrounds and analytical competencies by offering personalized learning experiences, intelligent tutoring systems, predictive analysis, and adaptive assessments” (Osorio et al., 2024, p. 18).

AI can be integrated to support role play and simulation. With role play, Rädell-Abläss et al. (2025) reported on using a chatbot “as a learning tool for anamnesis conversations, embodying the role of a patient. This mirrors realistic scenarios where patients may not always provide accurate information, offering valuable learning opportunities for students” (Rädell-Abläss et al., 2025, p. 9). Role play offers students opportunity to improve “communication skills, professional conduct, and empathetic behavior of students” (Rädell-Abläss et al. 2025, p. 10). Furthermore, AI can be used in simulating complex, immersive learning experiences in which content can be tailored to individual needs and transform traditional educational practices to more flexible and intelligent environments (Seren & Ozcan, 2021).

Third, affordances of AI can be a mechanism to create a shift in teaching philosophy. Specifically, a heutagogical design (Blaschke, 2012; Hase & Kenyon, 2000) enhances learner autonomy and can foster critical thinking. Therefore, shifting towards the inclusion of AI in one's teaching philosophy suggests more focus can be given to a heutagogical approach that is focused on learner-directed, self-directed or SRL. For example, using ChatGPT as a mentor, Saleem et al. (2024, p. 5) found the technology empowered “medical students to engage with educational content at their own pace, fostering a more inclusive learning environment that caters to diverse educational needs.” Similarly, Jin et al. (2023, p. 17) argued that “learners perceived AI applications as useful for supporting metacognitive, cognitive, and behavioral regulation across different SRL areas, but not for regulating motivation.” From their study, “three pedagogical and psychological aspects (i.e., learner identity, learner activeness, and learner position) were found to be necessary for the development and utilization of AI applications to support learners' SRL” (Jin et al., 2023, p. 17). Together, these articles reflect the need for intentional pedagogical integration of AI in online learning.

3.3 Benefits of Using AI in Online Learning

AI tools offer diverse functionalities to support innovation and online learning in higher education. The review identified key benefits when using AI in online learning include personalization of learning, predictive analytics, and potential reduction in instructor time on tasks, which can allow instructors to focus on addressing students' higher-order learning needs (Osorio et al., 2024; Singh et al., 2025). For example, GenAI technologies are transforming online learning by providing contextualized and democratized learning experiences, automating feedback and support, and facilitating personalized engagement through realistic, domain-specific learning environments (Kayalı et al., 2023; Cacho, 2024; González-Rico & Lluch Sintes, 2024; Hew et al., 2023; Olojede, 2024; Singh et al., 2025;

Sîrghi et al., 2024). As well, a language learning model, such as ChatGPT, can facilitate personalized engagement through simulated conversations, contextualized learning, adaptive feedback, scenario-based learning, and role-playing opportunities (González-Rico & Lluch Sintes, 2024). Overall, these studies suggest the use of immersive and interactive learning experiences can promote deeper learning and engagement.

3.3.1 Personalization of Learning

Personalization is a product of specialized AI applications that can support specific needs such as adoption of tools (e.g., Presentation Translator and voice recognition tools) to promote accessibility (Osorio et al., 2024). Personalization extends beyond accessibility as emphasized by Ouyang et al. (2022, p. 7907) who found “AI systems or techniques can positively influence student's online engagement through providing personalized resources, automatic assessment, and timely feedback.” Furthermore, online students' perspectives examined by Hew et al. (2023, p. 62) highlighted how AI allowed them to “learn with the chatbots and receive teacher-design feedback without time and location limits.” Overall, Hew et al. suggested the use of chatbots can positively impact students' goal setting as well as their social engagement when learning online. Similarly, González-Rico & Lluch Sintes (2024, p. 5) found students who used ChatGPT alongside teacher tutoring experienced a “greater perception of learning and improvement of their skills” than those merely using ChatGPT by itself. An additional example of personalized learning was presented by Pelzer & Turner (2022) who featured multipurpose AI platforms such as Dalia, which supported learners through real-time feedback and progress monitoring, thereby reducing instructors' workload in assessment preparation. These articles, and others (Cacho, 2024; Singh et al., 2025) further support how AI can enhance personalized learning for students and simultaneously support instructors permitting adjustments in real time based on learner data.

Feedback generated by AI technologies is also part of adaptive instruction for personalized learning (Betancourt Ramirez & Fuentes Esparrell, 2024; Rodríguez et al., 2022; Saad & Tounkara, 2023; Seo et al., 2021; Singh et al., 2025). In their study, Tapalova & Zhiyenbayeva (2022) explored how artificial intelligence in education (AIED) can be used for building personalized learning systems for students. The benefits of personalized learning pathways supported “access to training in 24/7 mode, training in virtual contexts, adaptation of educational content to personal needs of students, real-time and regular feedback, improvements in the educational process and mental stimulations” (Tapalova & Zhiyenbayeva, 2022, p. 639).

Furthermore, research by Betancourt Ramirez & Fuentes Esparrell (2024) suggests AI can be used to personalize and foster adaptive learning experiences, which can improve academic engagement and reduce cognitive load. In these contexts, personalized instruction is tailored to the learner and adaptive instruction changes in response to the learner. This posits administrative decision-making, supportive diverse learning paths, and enablement of real-time data-driven learning interventions. With access to AI technology, students can gain real-time personal support (i.e., from chatbots), experience reduced transactional distance 24/7

and deeper learning engagement due to AI designs integrating adaptive and conversational interfaces (Triberti et al., 2024). This suggests that “AI modules can help the teacher ensure a personalized approach and ongoing support that may not be feasible for a human teacher” (Triberti et al., 2024, p. 6).

AI applications also support specific needs, such as adoption of specialized assistive tools. For example, presentation translators, voice recognition as well as screen readers or translation tools can be used to promote accessibility (Osorio et al., 2024). Ouyang et al. (2022, p. 7907) emphasized, “AI systems or techniques can positively influence student's online engagement through providing personalized resources, automatic assessment, and timely feedback.” Complementing this, Hew et al. (2023, p. 62) examined online student perspectives and highlighted how AI allowed them to “learn with the chatbots and receive teacher-design feedback without time and location limits.” They suggested the use of chatbots can positively affect students' goal setting as well as their social engagement when learning online. Building on this, González-Rico & Lluch Sintés (2024, p. 5) found students who used ChatGPT alongside human teacher tutoring experienced a “greater perception of learning and improvement of their skills” than those using ChatGPT by itself.

An additional example of personalized learning was presented by Pelzer & Turner (2022) who featured multipurpose AI platforms, such as Dalia, to support learners through real-time feedback and progress monitoring, thereby reducing instructors' workload in assessment preparation. Other research that integrated GenAI (Cacho, 2024; Singh et al., 2025) further support personalized learning for diverse students and guided instructors by using learner data and student profiles to make pedagogically proficient adjustments in real time.

3.3.2 Predictive Analyses

The function of machine learning to analyze and examine large datasets and relationships creates opportunities to implement pedagogically beneficial practices for learners. Examining machine learning capacity, Dann et al. (2024, p. 1) suggested AI can be used to “make sense of data, with capacity for prediction and classification, by consuming vast amounts of structured and unstructured data sets.” In this context, AI can analyze a large data corpus to help understand student experience and inform future programming and pedagogical practice. Similarly, Bozkurt & Sharma (2023) used AI driven algorithms to facilitate contextualized and democratized learning by offering flexible, need-based content delivery. AI's capacity to identify relationships between large amounts of datasets results in diverse opportunities that contribute to informed teaching and learning practices.

Intelligent learning systems are AI-based technology tools that enable personalized, responsive, and flexible learning experiences. For instance, AI-driven early warning systems (EWS) can enhance the student journey by detecting learning challenges early and supporting timely interventions that improve personalization and communication between students and educators (Rodríguez et al., 2022). For example, in online business and economics classes, the use of adaptive intelligent systems strongly supported the

personalization of feedback to students to reduce attrition and improve student performance outcomes (Guerrero-Roldán et al., 2021). In the context of online medical education, AI-powered chatbots simulate patient case histories, allowing students to engage in diverse and meaningful educational role-plays, asynchronously while also providing instructors with systematic recording and reviewing of student-AI interactions to assess progress (Rädel-Abläss et al., 2025). Exploring creative media courses Neo (2022) identified chatbots' positive impact for online students' learning processes when used with virtual reality technologies. Overall, the research strongly suggests instructors can leverage AI to provide tailored support that empowers students to engage in active, self-directed, and personalized learning.

Predictive and prescriptive uses of AI data syntheses can benefit online student learning beyond the scope of learning analytics. For example, reviewed articles indicated that predictive analytics offer the ability to forecast academic performance, identify students at risk of dropping out, and recommend timely assessments based on student engagement trends and learning progress (Bañeres et al., 2023; Nagro, 2021; Parra & Chatterjee, 2024). Ouyang et al. (2023, p. 5) suggested “an integration of AI and [learning analytics] LA can help move from the AI model perspective to the educational application perspective.” In addition, predictive models can incorporate behavioral and process-oriented data to personalize or adapt the learners' journey—such as participation frequency and discussion depth—to generate meaningful insights (Ouyang et al., 2023) and successfully guide learners according to need (Nagro, 2021). Prescriptive analytics extends beyond predictive analytics by using algorithms to produce evidence-based feedback and seeks to adjust students' learning behaviors for better outcomes (Mutawa & Sruthi, 2024; Susnjak, 2024). Similarly, Tan et al., (2022, p. 5914) used an intelligent tool for early drop out prediction and reported it is possible to minimize attrition through large data analytics with which “instructors and tutors can better estimate the probability of drop-out and make proper intervention.” Collectively, the review suggests potential beneficial shifts include: the use of AI as a primarily technical tool to purposeful integration in learning environments (Rangel-de Lázaro & Duarte, 2023), and the fusion of learning analytics with predictive and prescriptive analytics AI to accomplish beneficial implementation of online learning (Susnjak, 2024).

3.3.3 Potential Reduction in Instructor Time on Tasks

AI applications can assist in streamlining instructors' time-intensive tasks, such as grading, scheduling, and feedback delivery, to support more focus on more meaningful teaching activities (Allen et al., 2024; Bozkurt & Sharma, 2023; Nagro, 2021). Incorporating GenAI into assessment design improved exam quality and efficiency and saved exam creation time (Oc & Hassen, 2025). In addition, AI chatbots (machine teachers) are well received by students. They offer immediate, personalized one-on-one interactions anytime and enhance communication with reduced wait times (Hew et al., 2023; Neo, 2022). Time-saving benefits further allow instructors to redirect time from repetitive tasks to higher cognition activities and to improve instructional design and contribute to responsive and engaging learning environments.

Overall, the reviewed literature shows strong support for the use of AI tools to personalize learning, use of predictive analytics to support learners, and identified potential for reduced time used in administrative or repetitive tasks. Research suggests reduced cognitive load that can result in higher-order thinking with the “potential to reinvent traditional teaching processes” (Rangel-de Lázaro & Duarte, 2023, p. 17), increase personalized engagement, save time, and address educational inequities (Mehrabi et al., 2024; Pelzer & Turner, 2022). However, as noted by Humble et al. (2024), the same features that ease efficiency can be used for academic dishonesty and suggest the need for established approaches for ethical use.

3.4 Challenges of Using AI in Online Learning

The literature review highlighted notable tensions between benefits and challenges of integrating AI in online learning. The difficulties involve the complex, interconnected layers surrounding (i) academic integrity, (ii) equity and bias, (iii) ethical issues, and security and privacy concerns and (iv) institutional supports, accountability and policy gaps.

3.4.1 Academic Integrity

When the pandemic forced a rapid shift from traditional assessment practices toward RPEs, institutions became highly concerned about academic dishonesty and inflated exam results underscoring issues of cheating and compromised academic integrity (Humble et al., 2024; Sîrghi et al., 2024; Stanoyevitch, 2024; Susnjak & McIntosh, 2024; Treve, 2021). Conveying the lack of AI-capable detection software, Sîrghi et al. (2024) noted that existing plagiarism software, such as Turnitin or Copyscape, were insufficient to monitor distance students who had unsupervised access to tools, such as ChatGPT, Grammarly, or DeepLWrite. Gudiño Peredes et al. (2021) reported that student participants who responded to a research questionnaire criticized the use of institutional reliance on live video and learning analytics to police and monitor RPEs. Survey findings suggested AI technology should be recognized as a tool beyond punitive measures. These students also criticized the institutional focus on cheating prevention while their instructors defaulted to memory-based assessments at the expense of authentic and active learning. Conversely, Humble et al. (2024) aligned student misuse of AI tools with integrity and learning challenges. They noted students who used ChatGPT to produce content, without first engaging in the underlying learning process, masked their learning and obstructed personal cognitive development.

Misuse of AI innovation can also result in negative outcomes for learners. In their writing, Swartz & McElroy (2023) shared a vignette wherein a student overhears a teaching assistant disclose how convenient it is to apply an AI algorithm to assess and provide comments—“You just click release scores to students, you don't even have to read the comments” (Swartz & McElroy, 2023, p. 278). This vignette provides evidence of how automated AI evaluation without instructor engagement or human-in-the-loop undervalues both instructor-student

interactions and the positive role of human-to human engagement. Notably, AI innovation can create challenges that students, instructors, and institutions must be aware of limitations to mitigate issues.

3.4.2 Equity and Bias

The literature review identified multidimensional and interrelated concerns around issues of equity, bias, AI literacy, and human-to-human interaction needs. For example, Rodríguez et al. (2022) reported systemic inequality issues when AI implementation does not support all students equitably and result in knowledge gaps among learners. They suggested that technologies do not support all students equitably and can produce knowledge gaps among learners. Their study indicated AI “nudges rarely produce positive effects for all learners” (Rodríguez et al., 2022, p. 42). With respect to AI-driven assessment, the review suggests there is potential for inherent systemic biases in the training data which can create impersonal feedback systems. For instance, natural language processor technology, which functions under a machine-derived set of instructions, can be delegated to mark student assignments, yet it can introduce algorithmic bias that penalizes cultural differences and non-native language speaker inputs (Treve, 2021). Furthermore, Sîrghi et al. (2024) suggested equity disparity can originate from the potential of AI to increase cognitive demand and cognitive overload when users are unfamiliar with the technology. Rather than enhancing learning, complex AI systems can introduce an additional layer of intellectual demand for some users (Triberti et al., 2024).

Studies further outlined unreliable content generated by AI. For example, Kayalı et al. (2023) and Olojede (2024) pointed to the frequency of untrustworthy responses and frequent errors, which large language models, such as ChatGPT, can generate. Together, this suggests the innovation's potential for systemic inequity and knowledge disruption for learners, especially when there is a lack of access to human supports at the instructional or institutional level.

Several studies warned about the introduction of biases in algorithmic metrics containing personal, academic, or behavioral details that can be used—or misused—to influence learners' educational outcomes (Bozkurt & Sharma, 2023; Saleem et al. 2024; Singh et al., 2025; Tapalova & Zhiyenbayeva, 2022). Metrics applied without safeguards pose risks to fair and accurate educational practices (Humble et al., 2024; Pelzer & Turner, 2022; Susnjak & McIntosh, 2024). As Swartz & McElroy (2023, p. 279) noted, “AI platforms can cause students to feel confused, ambivalent or anxious.” Unfortunately, the presence of AI can have a negative effect since reliability is inherently dependent on the metrics used—this further confirms the need for considered implementation. Stakeholders need to be aware of such limitations.

Equity challenges associated with AI literacy were recognized by Kumar et al. (2024) and Suliman et al. (2024), who suggested unreliable instructor support for learners is often derived from educators' limited AI literacy. They acknowledged a need for faculty to bridge the gap between AI adoption and instructional quality to secure equitable learning acknowledging

some may be resistant to change (Treve, 2021). Notably, complications further arise when AI is systemically embedded and over-standardized in online learning environments, which can lead to the erosion of key human qualities such as empathy and originality for students (Suliman et al., 2024) and to a reduction of meaningful human-to-human interactions negatively affecting cognitive development and balanced learning (Olojede, 2024; Osorio et al., 2024; Seo et al., 2021; Singh et al., 2025; Sîrghi et al., 2025). Studies further highlighted AI's potential to displace the instructor-implied concern about the future of the instructor and the importance of interpersonal interactions (i.e., teachers and students, students, and other students) in learning (Enakrire et al., 2024; Seren & Ozcan, 2021; Suliman et al., 2024).

From a psychological perspective, Treve (2021) warned AI-dominated instruction can result in negative consequences in students' motivation and output. Similarly, Jin et al. (2023) found AI tools ineffective in supporting motivational regulation. This challenge was also supported by Triberti et al. (2024, p. 3) and described the diminishing use of a chatbot use due to a “novelty effect.” As instructors and students work with AI, psychological implications need to be considered and addressed in order to ensure learning environments promote inclusion and equal opportunities for all learners.

3.4.3 Ethical Issues, and Security and Privacy Concerns

AI use in online learning introduces a range of ethical issues and risks that require further attention to ensure fairness, privacy and informed use. For example, biases can be a byproduct of AI's heavy collection and heavy reliance on personal, academic, and behavioral data. Researchers agree that unreliable and inaccurate data can become a source of ethical threats, which results in biases (Bozkurt & Sharma, 2023; Saleem et al., 2024; Singh et al., 2025). Noting how unreliability can arise from the mechanisms used to train AI chatbots, Ndunagu et al. (2025) found biases can be expressed in their responses and exacerbated by a lack of safeguards. Widespread data collection was also linked to a normalization of surveillance, lack of transparency, and privacy loss (Dann et al., 2024; Spence et al., 2024; Swartz & McElroy, 2023; Triberti et al., 2024).

When it comes to vulnerable students, Prinsloo et al. (2024) and Kayalı et al. (2023) identified challenges to student agency and identified concern for digital well-being urging instructors to question the impact of increasing levels of digital surveillance and loss of autonomy. Bozkurt & Sharma (2023) and Saleem et al. (2024) cautioned how data collected further compromised privacy and security challenges. Singh et al. (2025) found that even with continued exposure to AI, stakeholders such as students, administrators, and institutions lacked awareness and understanding about the negative effects of mass data collections and potential for bias and privacy breaches. These challenges underscore the imperative of recognizing risks, ensuring transparent data collection and use, and contextualizing AI implementation in pedagogically driven ways to mitigate potential learning risks.

3.4.4 Institutional Supports, Accountability, and Policy Gaps

There are emerging gaps in policy accountability and institutional supports for AI integration in online learning in higher education. From the review, it was identified that there are systemic barriers such as a lack of infrastructure and limited system level backing for accountable deployment and resilient AI implementation (Enakrire et al., 2024; Holmes et al., 2023). This is likely due to the rapid emergence of the field and a lack of clarity about who is responsible for AI outcomes in higher education institutions (Rädel-Ablass et al., 2025). Hew et al. (2023), Ouyang et al. (2022), and Tapalova & Zhiyenbayeva (2022) reported concerns that higher education institutions often lack frameworks and guidelines to manage AI effectively. Challenges resulting from ambiguous policies related to data ownership and data retention timelines increased unauthorized access or misuse of data “for targeted advertising or sold to third parties” (Singh et al., 2025, p. 1434). Adding to this concern, Gudiño Paredes et al. (2021) stressed that AI implementation in absence of sound educational principles will deteriorate learning since these tools can directly shape learning processes and environments. AI integration in online learning is not without challenges. Actions need to address these interconnected and multifaceted challenges in order to create and foster rich online learning experiences.

4. IMPLICATIONS

From the review of the literature, it is evident careful consideration needs to be given to implications for practice, policy, and research with regard to AI integration in online learning in higher education. First, an implication for practice is the development of AI literacy for both students and instructors. It requires not only effectively using AI technologies but also keen discernment when making decisions about how AI is being used (Crabtree, 2023). As argued by Parra & Chatterjee (2024), instructors need to learn how to teach their students to be responsible users of these technologies and to observe ethical guidelines when using the AI in their learning. They recommend that assignments be designed to engage students in critical thinking as part of their learning.

With the development of AI literacy, instructors need to learn how to design and facilitate learning and assessment to purposefully integrate selected AI technologies. Although we need to be focused on the pedagogy and the design of learning, Parra & Chatterjee (2024) argued intentional selection and integration of AI technologies is critical. As such, educational development needs to be provided to support instructors to effectively design and facilitate learning that purposefully integrates AI technologies. From their research, Kumar et al. (2024, p. 207) presented three relevant themes regarding instructional designers' integration of GenAI: “(a) the use of GenAI for instructional design; (b) collaborative guidance for faculty integration of GenAI; and (c) training, resources, and guidelines on the integration of GenAI.” Specific areas to be addressed in educational development learning include introductions to AI, using AI for course development or assessment, using AI in teaching (showing/helping faculty with student use of AI), using AI for image generation and customization, and student-

focused training on AI use. Participants emphasized the need for sharing and collaboration as well as active use and participation among trainees (Kumar et al., 2024, p. 222).

Although we need to focus on pedagogy and the design of learning, Parra & Chatterjee (2024) cautioned that intentional selection and integration of AI technology is critical. They advocated that the focus needs to be on people and relationships and “never let the robots take over! If the robots take over, shame on us! For we did not do enough to humanize education” (Parra & Chatterjee, 2024, p. 11). The paramount human dynamic cannot be lost. Rather we may need to reconceptualize the role of the instructor in the teaching and learning relationship in online learning environments.

Second, implications for policy need to guide the how, what, and why across the use of AI technologies in online learning. With respect to AI data collection, privacy, and surveillance, Swartz & McElroy (2023, p. 279) noted, “These technologies threaten many of the fundamental principles associated with higher education, including academic freedom, freedom to protest, individual control over intellectual property, autonomy, and privacy.” Policies need to be developed to address data security and storage, along with ensuring ethical practices. As we embrace AI technologies, we need to think carefully in terms of the role they can play in online learning. Student-facing policies are also important consideration in institutional plans. This can help “familiarise students with the real benefits of AI for stimulating and supporting learning, before the actual implementation of the technologies” (Sîrghi et al., 2024, p. 67) in classes. This may require introducing more flexible and adaptable guidelines in how AI can be used within rich technology-enabled learning environments. As we look at the affordances, we must also factor in the constraints, bias, and potential for harm when exploring the use of AI in online learning in higher education.

Third, implications for research needs to shift the focus beyond the creation and/or implementation of AI technologies to emphasize *how* we are designing, facilitating, and assessing learning within AI-enhanced learning environments. When creating such AI learning environments, key questions to consider include the following: What changes in terms of the role of the instructor, and what is the nature of the relationship between student, instructor, and the technology, especially with AI technology?

Parra & Chatterjee (2024, p. 9) argued “transparent institutional policies should be established, allowing for research and experimentation.” This call for further research is a notable outcome from this literature review with regard to more researched informed practice and policy.

5. LIMITATIONS AND CONCLUSION

There were two limitations with this review. First, the critical analysis of the literature allowed us to examine terms and themes. To strengthen the work a future systematic or scoping review framework is recommended. Second, to broaden the scope of the review, additional databases need to be considered.

As evidenced in this review, there is an array of AI technologies available to support online learning. Consequently, these technologies are changing the nature of how we design and

support online learning in technology-enabled learning environments. It requires students, instructors, and institutional leaders to be open to both the affordances of such technologies and to develop the needed knowledge and skills to work with it in meaningful and ethical ways. It is evident that higher education institutions need to: (i) foster AI literacy development with students and instructors and (ii) to offer instructors greater opportunities for educational development in order to better to understand and intentionally integrate AI in meaningful ways. The intentional integration of AI technologies requires attention to research-informed policies, procedures, and practices.

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