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Implementing Artificial Intelligence (AI) in Higher Education: A Narrative Literature Review

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Abstract: Artificial Intelligence (AI) is a rapidly emerging field with the potential to impact higher education (HE) significantly. However, the pedagogical advantages and meaningful impact on teaching and learning in HE still need to be made clear to educators. This narrative literature review of 46 articles published from 2019 to 2023 summarizes and analyzes the existing research on AI applications in the academic world, exploring the possibilities, obstacles, and recommendations for integrating AI into HE. The content explores the utilization of AI tools, including General Artificial Intelligence (GAI), machine learning, and deep learning in the context of teaching and learning. Additionally, it investigates personalized learning, virtual assistants, AI applications for automated grading, and learning analytics. While addressing ethical considerations and faculty development, the review searches for best practices and challenges associated with integrating AI into curricula and research. Finally, the review discusses current AI policies and guidelines for further research to thoroughly understand current practices, challenges, and opportunities in AI within the HE sectors. It also explores the implications of AI on the future labor market, providing an in-depth analysis of its potential impact.

Keywords: Artificial Intelligence, Higher Education, Pedagogical, General Artificial Intelligence, Machine Learning, Deep Learning, Ethics.

Introduction

Artificial intelligence (AI) in higher education (HE) has risen quickly in the last five years, with a proliferation of new AI tools available (Crompton & Burke, 2023). The authors stated that this trend is supported by a systematic review that found a significant increase in AI-related publications in 2021 and 2022 compared to previous years. AI extends human ability to solve complex problems and quietly disrupts various routine activities in HE, such as administrative functions, teaching, learning, and research activities (Abdous, 2023). Furthermore, AI holds great promise for academia, offering opportunities to help students choose the right college, learn more efficiently, graduate on time, and enter the job market (Hutson et al., 2023). For instance, besides chatbots and virtual assistants, AI can provide highly personalized college recommendations tailored to individual profiles by meticulously analyzing comprehensive datasets, including academic performance, extracurricular activities, interests, and career aspirations. Undoubtedly, AI will have a lasting impact on HE, fundamentally transforming the nature of teaching and learning, continuing to influence tertiary education, and reshaping the academic landscape.

Implementing AI in HE is a topic that has gained significant attention due to its potential to transform various aspects of the educational landscape. A narrative literature review provides a comprehensive overview of existing research and insights into the rationale behind incorporating AI in HE. This review aims to discuss the rationale and development of AI, disclose the nature and scope of AI applications across disciplines, illustrate the advantages and disadvantages of implementing AI in HE, and confer the impact on policy and future integration of emerging AI technologies. It provides an overview of AI's development, nature, and effects in HE, as well as the potential impact on policy and future AI assimilation. This review also describes the technical challenges, the need for regulations in implementing AI, and the impact on teaching and learning in postsecondary education. In short, this review serves multiple purposes: enhancing the overall learning experience, administrative efficiency, research capabilities, and globalization efforts.

Rationale for Supporting AI Literacy

AI has the potential to revolutionize education, including individualized learning, improving student engagement, streamlining administrative functions, and labor market preparation. By analyzing student data and learning patterns, GAI (general artificial intelligence) algorithms can customize learning for each student's strengths, needs, skills, and interests, ensuring students receive content and instruction tailored to their abilities and interests (Srinivasa et al., 2022; GGI Insights, 2023). By

harnessing AI-driven algorithms and data analytics, educators can tailor learning experiences to students' unique needs, preferences, and learning journeys and use them as a tutoring mechanism (Srinivasa et al., 2022). Furthermore, AI-powered tools like speech recognition, text-to-speech converters, and language translation apps can help students with disabilities or those who speak different languages (Chiancone, 2023). Specifically, Natural Language Processing (NLP) enables language models to understand and generate human-like text. This technology can create interactive and engaging educational content, making learning more enjoyable and effective (Khurana et al., 2022).

Educators can use AI to enhance learning outcomes and equip students with the knowledge and skills they need to excel in the digital world (Marquis, 2023). Concurrently, Liu's (2023) paper explored the profound impact of AI on the labor market, highlighting how AI advancements enhance productivity by automating tasks, leading to job displacement while also creating a demand for new skills, emphasizing the need for individuals and organizations to adapt through continuous learning to thrive in a future where AI and human collaboration coexist harmoniously. Indeed, AI is anticipated to significantly influence various facets of HE and workplaces, marking a transformative shift in the educational landscape.

In the current stage of development, AI-powered assessment tools not only enhance learning by bringing more efficiency, creativity, and engagement but also enable the personalization of quizzes and tests based on a learner's skills, knowledge, and capabilities (Hooda et al., 2022). Similarly, Bagunaid et al. (2022) noted that AI algorithms can analyze data on students' responses to assessment questions to adjust the difficulty level of subsequent questions, ensuring that each student is challenged appropriately and accurately. AI can also automate the grading of multiple-choice questions, freeing up faculty time to focus on more complex assessments (Jimenez & Boser, 2021). Furthermore, AI can create a wide range of assessments, including formative and summative assessments and assessments that measure higher-order thinking skills (Hooda et al., 2022). Using AI to analyze student work and provide real-time feedback allows students to make corrections and improve their work more quickly. In short, faculty can adopt evolved pedagogical models that use AI to develop skills in personalizing assessments, automating assessment, natural language processing, and delivering instant feedback.

Empowering students to harness the potential of AI is becoming increasingly crucial, given its transformative impact on higher education (HE) and the workplace. Letting students understand how AI can improve their learning experiences, educators can introduce AI applications, such as academic advising, predicting when students might fail or drop a course, and alerting faculty and staff before problems arise (Hutson et al., 2023). Allowing students to design their learning journeys in AI can be a great way to help them develop digital literacy skills and succeed in their academic

and professional careers. Educators can also provide AI tools to students, such as ChatGPT (chatbot), MidJourney (generating images from natural language descriptions), Stable Diffusion (creating photorealistic images, videos, and animations from text and image prompts), and other Generative AI tools that can help students design their learning plans and enhance project creations (Adiguzel et al., 2023). As the landscape of HE undergoes a transformative shift, developing students' proficiency in AI becomes increasingly crucial. The evolving role of AI in academia underscores the need for educational institutions to equip students with the skills necessary to navigate and leverage these technological advancements effectively.

Development of AI in the Academic World

AI in academia has seen prominent progress, evident in a growing number of publications and increased adoption of tools, with primary applications in HE, including predictive modeling, intelligent analytics, and adaptive learning technologies **(**Crompton & Burke, 2023). The driving force is attributed to the emergence of various AI technologies such as machine learning, natural language processing, computer vision, and robotics (Soori et al., 2023). Furthermore, the integration of AI in HE has prompted a reassessment of educational pathways to prepare students for a hybrid labor market, where AI will have a significant impact (Abdous, 2023). This development involves carefully analyzing how AI will affect the future labor market and the development of educational programs that equip students with the necessary skills. As AI becomes more integrated into technology tools and workplaces, colleges and universities recognize the need to adapt and prepare their students, faculty, and staff for an AI-infused future. (Hodges & Ocak, 2023).

A systematic review from the International Journal of Educational Technology in Higher Education found that the number of publications on artificial intelligence in HE rose nearly two to three times in 2021 and 2022 compared to previous years **(**Crompton & Burke, 2023). In addition to the Journal of Computers & Education: Artificial Intelligence, the International Journal of Artificial Intelligence in Education (IJAIED) has been a significant platform for research in this area (Zawacki-Richter et al., 2019). The geographical distribution of AI in higher education publications has shown a shift from the US to China, leading in the number of publications, with research conducted on six of the world's seven continents **(**Crompton & Burke, 2023). The shift in the development and prominence of AI from the US to China can be attributed to several complex and interconnected factors, such as government support and investment, data accessibility, talent pool, corporate investment, and strategic vision and policy implementation (Filgueiras, 2022). Crompton and Burke's (2023) study also reveals that the author's disciplinary affiliations have evolved, with researchers from education departments becoming the most dominant. This

surge in publications reflects the increasing importance of AI in HE and the growing interest in its potential applications within educational technology (Zawacki-Richter et al., 2023).

There is a growing interest in integrating generative AI into HE as stakeholders foresee its profound impact on academia over the next three to five years, with the prevailing belief that its use offers more benefits than drawbacks (Hodges & Ocak, 2023). However, integrating AI into academia requires understanding its potential benefits and ethical considerations. The responsible implementation of AI in HE involves addressing challenges and opportunities related to ethics, security, privacy, academic integrity, and ethical concerns, including bias, discrimination, and the potential for AI to replace human teachers, which need to be addressed (Chan, 2023). It is critical to consider the ethical implications of AI in education to ensure that it is implemented responsibly and trustworthy. After all, ethical principles play a crucial role in guiding the development and use of AI systems in education to ensure that they align with ethical standards and contribute to the overall well-being of students and educators (UNESCO, 2023).

Nature and Scope of AI Applications

According to a framework proposed by Inside Higher Ed, the stages of AI in education move from defensiveness to avoidance to acceptance (Maloney, 2023). It suggests a progression from initial resistance to the eventual incorporation of AI into educational practices across different fields/categories. The categorization of AI within specific disciplinary areas is essential for understanding its applications and impact; some specific categories of AI applications in education include language, engineering, mathematics, business, and medicine **(**Crompton & Burke, 2023). The authors implied that AI's interdisciplinary nature is evident from its wide-ranging applications and the integration of knowledge from various fields, contributing to its diverse uses and implications. For instance, in the financial industry, AI is employed for fraud detection, activity monitoring, and trading optimization (Frankenfield, 2023). The impact of AI's stages of development on higher education is significant, as it requires educators and institutions to adapt to and integrate AI into teaching and learning across different disciplines.

AI is increasingly being employed across diverse sectors, such as education, collaborative learning, STEM (science, technology, engineering, mathematics) education, scientific research, and the financial industry. In STEM education, AI applications include student behavior detection, learning prediction, instructional technology systems (ITS), automation, and educational robots (Xu & Ouyang, 2022). Furthermore, in scientific research, AI is extensively used in medical image analysis for classification, detection, and segmentation tasks (Xu et al., 2021). Specifically, the role of AI in medical image analysis involves leveraging advanced algorithms and

machine learning techniques to assist healthcare professionals in interpreting and extracting valuable insights from various medical imaging modalities, such as X-rays, MRIs, and CT scans, thereby enhancing diagnostic accuracy, efficiency, and overall patient care (Barragán-Montero et al., 2021). Such integration of AI is driven by the desire for efficiency, personalization, collaboration, data-driven insights, and the ability to address complex challenges. Definitively, the diverse applications of AI are progressively becoming integrated into higher education, providing advantages to students, educators, institutions, and society at large; with ongoing technological advancements, the role of AI is poised to broaden even more, impacting various facets of our lives and industries (Cardona et al., 2023).

Actively creating avenues for teaching and learning about AI within the framework of professional practices, some institutions aim to equip students for the future, provide ongoing professional development for educators, empower learners across all levels, and delve into the latest advancements in the field of artificial intelligence (George, 2023; Southworth et al., 2023). Such training can help educators and students understand the transformative impact of AI on professional practices and develop essential AI literacy to build knowledge and gain experience (Chan, 2023). Specific applications of AI can also adapt instruction, provide customized feedback, develop assessments, and offer teaching assistants **(**Crompton & Burke, 2023). AI technology has already transformed many aspects of the teaching and learning processes, such as creating immersive virtual learning environments, producing "smart content," easing language barriers, filling gaps between learning and teaching, and creating specialized plans for each student (McFarland, 2023). Some examples of AI tools for teaching and learning across disciplines are summary in Table 1 as the following:

Table 1: AI Tools for Teaching and Learning

Study Disciplines	**AI Tools for Teaching & Learning**
Agriculture / Forestry	Self-learning forest growth models, data-driven decision-making and predictive analytics, precision agriculture, AI-based precision agriculture tools, and human-centered AI tools can be developed and implemented to optimize farming and forest management, reduce workloads, and improve accuracy through data analytics (Liang, 2023; Spencer, 2023; Walch, 2020; Holzinger et al., 2022).
Archaeology	Predictive modeling, classification of digitized artifacts, automated object identification, data analysis, digital documentation, and preservation of artifacts can analyze and interpret data, classify artifacts, and predict potential archaeological sites (Ghatak, 2023; Atchley, 2019; Hryshkevich, 2022).
Architecture	Maket.ai, Arkdesign.ai, ARCHITEChTURES, DALL-E 2, Midjourney, Spacemaker, and Sidewalklabs.com can help with problem-solving, concept generation, and productivity (ToolsAI.net, 2023; Arch2O, 2023).
Biology	BiologyBuddy.ai, Superbio, BioAutoMATED, ChatGPT, and Smodin Biology AI Homework Solver can help students and researchers in biology to simplify their work, automate tasks, and improve their understanding of complex concepts (Blackwell, 2023).
Chemistry	Molecule property prediction, molecule design, ChemDraw, IBM RXN for Chemistry, Chematica, Smodin's Chemistry AI Homework Solver,

	Syntelly, and ChatGPT can predict molecule properties, accelerate drug discovery, and assist in chemistry homework (ChemIntelligence, 2023; Somasundaram, 2023; Smodin, 2023; SYNTELLY, 2023).
Civil Engineering	Civils.ai, Autodesk Generative Design, Togal.AI, Flutura's Experience AI, HoloBuilder, **CivilVisor,** Tekla Structural Designer, SenseTime AI Construction, ClickUp, OpenSpace.ai, and Procore is reshaping project design, planning, and risk assessment, from advanced simulations to predictive analytics (ASTI Academy, 2023; **Baniyan, 2023**).
Communication / Media	AI Assistant Mediators, Wordtune, TalkingPoints, MagicSchool AI, ChatGPT, AI Teaching Assistants (Hawke, 2023; Murphy, 2023; Seo et al., 2021; Weisheit & Salger, 2023).
Computer Science	Unschooler, GitHub Copilot, Tabnine, CodeWhisperer, Replit, **CodeSculpt, CodeCraft,** (Blackmon, 2023; McFarland, 2023; Morris, 2023; **Baniyan, 2023**).
Earth Sciences	Earth Science Analytics, NASA Earthdata, Awesome-Earth-Artificial-Intelligence (EARTHDATA, 2023; Sun, 2023; Earth Science Analytics, 2023).
Economics	**AI Economist, Coursera, and Economic AI can** provide real-time insights, contextual assessment, and feedback (Heaven, 2020; Korinek, 2023; Niyazov, 2019).
Engineering	**Various AI tools are used in** aerospace / electrical/mechanical / robotics engineering applications, including **EngiMind, AutoCAD AI, RoboSimulate, AnalytiXpert, VirtuTech, CircuitGenius,**

	MatSciAI, StructuraNet, AeroFlow, PowerOptix, NanoDesign, SysDyno, ChemSynth, RoBotix, ElectraSim, ThermoAI, EngiDroid, RoboFab, AutoSimulate, DigiArchitect, AeroSim, 2MechMate, MateriAL, ChemExplore, Matlab, Apache MXNet, Expert systems, and Fuzzy logic control systems (Baniyan, 2023).
History	**Hello History** uses state-of-the-art AI technology to bring historical figures to life and authenticate conversations (hellohistory.ai, 2023).
Languages	**Duolingo, Babbel, Ling, Memrise, TalkPal, Langotalk, and Quazel** provide personalized learning experiences and instant feedback and help learners refine their pronunciation and intonation (Portakal, 2023; TalkPal, 2023; Ling, 2023).
Law	AI Lawyer, Lawgeex, CSDisco, Lex Machina, Latch, DoNotPay (Robot Lawyer), Westlaw Edge, Bigle Legal, Ghostwriter Legal, Amto AI, Law Support, and Ansarada offer an alternative to traditional legal consultations, helping users bypass long waiting times, high costs, and confusing legal jargon, and providing instant, easy-to-understand, and cost-effective legal solutions (*Renaissance Rachel*, 2023)
Mathematics	Wolfram Alpha, SymPy, Microsoft Math Solver, GeoGebra, SymbMath, Desmos, Photomath, Socratic, Mathway, Maple Calculator, CameraMath, Symbolab, Brilliant, and SnapXam (Mehmood, 2023; Blackwell, 2023; Slashdot, 2023).
Medicine / Health	Osmosis, StudyBot, IBM Watson, Anki, and Buoy Health can help acquire knowledge, plan personalized study, understand complex

	concepts, and improve diagnostic and problem-solving skills (Horesh, 2023; Pastest, 2023; Daley, 2023).
Music	Meta's AudioCraft, OpenAI's MuseNet, iZotope's AI Assistants, Aiva Technologies, Yousician, Tonora, Landr, and BABY Audio TAIP have revolutionized music composition, production, and learning (Schroer, 2023; Flores-Trevino, 2023; Ambroise-Thomas, 2023).
Performing Arts	Living Archive, AI-generated music, and Artbreeder serve as a tool to enhance the creative process in the performing arts, offering new possibilities for artists and students while complementing human creativity rather than replacing it (Jordan, 2020; Fawcett, 2020; Teodoresco, 2023).
Physics	Smodin Physics AI, KerbalEdu, Osmo Newton, Pocket Physics, ChatGPT, and Albert Einstein AI Tool offer personalized study paths, interactive simulations, and quick problem-solving assistance (Blackwell, 2023).
Visual Arts / Design	AI Graphic Design Tools: Adobe Sensei, Canva, AutoDraw, Uizard, Designs.ai AI Art Generators: Crayon (Formerly DALL•E Mini) and NightCafe Creator (Cooper, 2023; York, 2023; Mileva, 2023; McFarland, 2023).

Opportunities and Challenges of Implementing AI

Integrating General Artificial Intelligence (GAI), machine learning, and deep learning has revolutionized higher education by enhancing personalized learning experiences, automating administrative tasks, and enabling innovative teaching methodologies. GAI is a subset of AI that can

create new content, data, or outputs by learning patterns and structures from large datasets (Caspar, 2023). To improve student success, GAI can provide customized learning practices, enhance course contents, promote active learning, increase accessibility, foster inclusivity, and streamline the assessment process to identify areas where the student may need extra support (Marquis, 2023). By leveraging machine learning, AI analyzes extensive data on learners, teachers, and the dynamics of teaching and learning interactions, enabling educators to comprehend their students with greater precision and efficacy. Similarly, plagiarism detection mechanisms powered by deep learning algorithms can efficiently analyze vast amounts of text, identifying similarities and potential instances of plagiarism (University of San Diego, 2023). Furthermore, deep learning models can contribute to fraud prevention by recognizing unusual patterns or behaviors in academic assessments and curbing dishonest practices. These advanced technologies ensure the authenticity of academic work by implementing robust verification mechanisms, promoting a more trustworthy and reliable educational environment. However, current research on teaching and learning with AI tools is still in its infancy, and there is a need for more understanding of these tools' potential benefits and drawbacks in education.

Waugh's (2023) paper emphasizes the value of AI-powered virtual assistants in supporting students throughout the learning journey by guiding them, addressing queries, and providing additional resources to enhance their understanding of subjects. Virtual assistants, encompassing various types like chatbots and voice-activated assistants, are computer programs or AI systems specifically crafted to execute tasks and furnish information or aid to users (Luchaninov, 2023). Technically, virtual assistants utilize Natural Language Processing (NLP) to understand and interpret user input in a way that mimics human language. Empowered by machine learning algorithms, virtual assistants not only enable comprehension and response to diverse queries and commands but also continually refine their performance through learning from user interactions, automating repetitive tasks like scheduling appointments and setting reminders, ultimately enhancing efficiency and capability by integrating with various applications and services to access information from different sources. For instance, to reduce workload, Eastern International University, Vietnam, successfully utilized AI techniques and four robot systems to assist students, teachers, and staff on campus (Nguyen et al., 2022). By integrating virtual assistants into academic workflows, educators can efficiently streamline tasks, elevate productivity, and focus on their work's more intellectually demanding aspects. This integration significantly contributes to fostering a more efficient and enriched educational experience.

However, some faculty argue that using generative AI in education can lead to an overreliance on technology and bypass the learning goals and processes essential for students' development (D'Agostino, 2023). ChatGPT, DALL-E, and Bard use machine learning to generate content that students can use to generate essays, research papers, and other academic

content; however, this raises concerns about academic integrity, inclusion, and equity issues (Ghosal, 2023). AI technology could threaten educational equity for marginalized students, especially in developing countries where many students have no access to AI tools. Additionally, such a powerful change agent presents the education sector with unprecedented academic, ethical, and legal challenges, including bias and discrimination, and pushing the boundaries of human intelligence, making the future of tertiary education inextricably intertwined with AI (Abdous, 2023). Moreover, generative AI systems are trained on data that reflects the world's biases, which can lead to biased or unfair outcomes in education, such as the generation of content that perpetuates stereotypes or discriminates against certain groups (Center for Democracy & Technology, 2023). Students must use AI responsibly and have digital literacy to ensure that AI tools do not inadvertently cater to biases or become channels for malpractice and propaganda (Chiancone, 2023). The mention of propaganda emphasizes the need for students to be mindful of the ethical implications of using AI and to actively contribute to the responsible development and deployment of AI technologies. It is about fostering a sense of responsibility, critical thinking, and awareness of the potential impact of AI on society. These sources underscore the importance of addressing ethical, equity, educational, and collaborative aspects in future AI research for academia.

Gkrimpizi et al. (2023) identified 20 barriers to AI transformation in HE, including lack of digital literacy, resistance to change and risk aversion, lack of adequate IT infrastructure, budgetary constraints, lack of leadership for change, lack of strategic planning, security and privacy risk, and inadequate IT support service. The authors noted that resistance to change is a long-standing barrier that was often driven by fear of technology and concerns about job displacement; however, today, the resistance is more rooted in the need to adapt pedagogical approaches, redesign the curriculum, address faculty workload concerns, and manage cultural changes related to technology-based teaching and learning. This shift in resistance highlights the importance of introducing AI tools for its own sake and ensuring that its integration is thoughtful and purposeful and considers the broader context of teaching and learning. From "Ban It Till We Understand It," Lau and Guo (2023) synthesized diverse open research questions regarding developing, deploying, and evaluating AI coding tools for computing education. Concurrently, Southworth et al. (2023) stated that the University of Florida (UF) incorporates AI into every academic field, encouraging students to engage in AI literacy. The "AI Across the Curriculum" initiative strives to make AI education a fundamental opportunity for students across diverse disciplines at UF. Such approaches may shed light on overcoming the barriers to AI adoption. Engaging proactively with AI now is critical because digital skills and AI adoption constitute a significant issue of our time.

Impact on Policy and Future Integration of AI

The impact of AI on higher education (HE) is significant, leading to the need to develop comprehensive AI policies. Nevertheless, academic perceptions about AI's future integration vary globally. Some academics perceive threats to education from AI and form alliances as a survival mechanism in American universities; however, others are uncertain and anxious about the role of AI in teaching and learning (D'Agostino, 2023). The author argued that this uncertainty might lead to oppositional, values-based social groups. In Europe, attitudes toward AI applications are diverse and influenced by various factors, including the need for guidelines, policy implications, and a better understanding of the implications of AI implementation in academia (Irfan & Murray, 2023). On a different note, Knox (2023) stated that education in China is currently experiencing the impact of AI development in two main ways. First, central and regional governments actively guide educational institutions toward strategic AI research and training. Second, the corporate sector, which is increasingly influential, is developing AI applications that have the potential to standardize further and intensify the already competitive education system—a strong interest in private enterprise drives this development. AI is transforming HE differently worldwide and emerging as one of academia's most potent agents of change.

The educational potential of AI is widely acknowledged, but it is also widely recognized that AI should not replace human teachers. The role of educators remains crucial in guiding and mentoring students, fostering critical thinking skills, and providing emotional support (Cohen, 2023). While AI can deliver standardized content and assessments tirelessly, it lacks the empathy and emotional intelligence necessary for effective teaching and learning (Chan & Tsi, 2023). Yang et al. (2023) argued that the combination of AI and teachers' "human touch" holds the most promise for the future of education, as AI can assist with tasks like grading and personalizing learning materials. Most educators agree that the social and interpersonal nature of education and teachers' irreplaceable role emphasizes that AI should not replace human teachers but rather complement and enhance their roles in the educational process (Chan & Tsi, 2023). The current trend shows that the faculty role is becoming more like facilitators, guides, and mentors, leveraging AI tools to enhance instruction (AlDhaen, 2022).

To strike a balance when integrating AI into HE, institutions must adopt a strategic and cautious approach that enhances the quality of education, improves student learning, fosters innovation, and guarantees data privacy and security. Some considerations are essential, such as faculty training and support, responsible use of AI, adapting to technology, enhancing learning environments, and holistic approach by fostering collaboration and partnership between faculty from different disciplines (Hié & Thouary, 2023). Slagg (2023) also stressed the need for guardrails

to keep AI technologies mission-centered, the importance of equity, transparency, and effectiveness as goals when using AI in education, and the recommendation to keep a human in the loop in the building, deployment, and governance of all education-focused automated systems. Additionally, universities must teach students the skills they will need to thrive when AI is widely adopted in professional settings and identify ways to equip students with durable skills that are in high demand from employers and that enable graduates to perform tasks and adopt responsibilities that cannot be left in the hands of AI systems (Genone & Hughes, 2023). Ultimately, to effectively incorporate AI-related skills into university programs, institutions should embrace an interdisciplinary approach, integrate foundational AI courses into core computer science programs, consider specialized AI concentrations, explore integration across diverse disciplines, include courses on the ethical implications of AI, emphasize hands-on projects and labs for practical experience, and foster industry collaboration for alignment with market demands.

Conclusion

The current utilization of General Artificial Intelligence (GAI), machine learning, and deep learning in classrooms and courses worldwide has revolutionized higher education (HE), representing a present reality rather than a future technology (Coffey, 2023). Postsecondary institutions must digitally transform themselves and provide services that are fit for the future. Training educators to use AI tools skillfully and ensuring equitable access to these technologies are essential considerations in the integration process. The collaboration among technology experts, educators, and policymakers is crucial to maximizing the benefits of AI adoption. Implementing AI into HE requires a balanced approach that leverages the values of AI while ensuring that the role of human educators remains central to the learning experience. It involves providing faculty with the necessary support, developing accountable AI policies, and preparing students for an AI-infused future. Empowering students in the digital age is a necessary aspect of modern education, and institutions need to take practical steps to close the gap and keep pace with the rate and scale of technological innovation.

Implementing AI in HE faces challenges and barriers, including lack of skilled personnel, ethical concerns, digital divide, data privacy, and security issues, costs and budget constraints, integration with existing systems, lack of standardization, regulatory and policy challenges, and complexity of AI Systems. It primarily presents risks to academic integrity, overreliance on technology, exacerbated inequality, ethical concerns, and potential biases in AI systems. Leaders are confronted with cultivating academic policies and practices that not only bolster the equity and quality of education but also elevate learning outcomes, encourage innovation, and

meticulously evaluate the future impact of AI on the labor market. Moreover, as educators navigate the implementation of AI, resolving challenges related to academic integrity, student motivation, and the demonstration of learning remains unresolved and requires careful consideration and determination. Conclusively, AI's current practices, challenges, and opportunities for HE requires further research to be fully understood.

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