# AI AND LIFELONG LEARNING: OPPORTUNITIES FOR INTERNATIONAL ADULT EDUCATION

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AI, and provides insights into emerging trends. The article consists of five sections. The introduction provides a rationale as to why AI should be integrated into adult education. Second, it describes evolving AI technologies such as Large Language Models (LLM) for personalized learning, Machine Learning Algorithms for adaptive learning systems, Virtual Reality (VR) and Augmented Reality (AR) for immersive learning experiences, Chatbots and virtual assistants for learner support and guidance, and Data Learning Analytics (DLA) for tracking learner progress and performance into adult education. Section three explores the ethical implications of AI in adult education, including academic honesty and integrity, data privacy, and algorithmic bias. In section four, emerging trends and future directions are discussed. The final section considers policy implications and makes recommendations for adult educators working to develop AI-enriched adult education.

According to the Organization for Economic Cooperation and Development (), AI can improve and replace current technologies in delivering training, spreading information on skill requirements and relevant training courses, and personalizing the matching of job seekers to available learning opportunities. Adult learners, as digital natives, are comfortable using generative AI tools to access information and with education institutions diving deep into the analyses of large databases to track their progress and performance (Impact Research, 2023).To prepare the global workforce to transition from an information society to an intelligent society, the United Nations Educational, Scientific and Cultural Organization (UNESCO) developed a global framework to help define and measure digital literacy. The framework has seven competency areas: devices and software operations, information and data literacy, communication and cooperation, digital content creation, safety, problem-solving, and career-related competencies, which suggest that AI's application in adult education is strategically significant to training an innovative, scientific, and technologically talented workforce. Such a move requires

educators to develop an open, flexible, active, and innovative adult education ecosystem to promote quality education and ensure education equity (Kang, 2023). In 2019, UNESCO published a report entitled "Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development," which highlighted the increasing role of AI in influencing students' access to education, learning performance, teaching andragogy, educational data analysis and management.The World Economic Forum (WEF) estimates that almost one-third of all jobs worldwide are likely to be transformed by technology in the next decade (Zahidi, 2020) and that essential technical and vocational skills are currently underemphasized in education systems (Strategic Intelligence, 2020). Consequently, there is an urgent need to replace the traditional andragogical model of adult training with a new dynamic structural model (Storey & Beeman, 2023), more suited to creating new learning content. Generative AI tools are ideally positioned to fill this role, given their ability to access and synthesize a wide range of human knowledge into specific outputs (Leiker et al., 2023). However, it is challenging to create this new path as it depends on adult educators having the required knowledge and skills. It is, therefore, incumbent on all educators to continue their learning to adapt, overcome barriers, and effectively integrate AI into programs for future developments (Kaliisa et al., 2022).The subsequent sections of this article are organized into four distinct parts. Section 2 presents an overview of AI-driven educational technologies within the context of adult learning and discusses the challenges of integrating AI into adult education. Section 3 explores the ethical implications of AI in adult education, including academic integrity, data privacy, algorithmic bias, and copyright. Section 4 is focused on emerging trends and future directions for adult education. Finally, policy implications and recommendations for adult educators are made to develop AI-enriched adult education.

Chatbots can help support teaching (Gimpel et al., 2023) and assist with routine tasks like scheduling, grading, and providing differentiated materials (Labadze et al., 2023). Gimpel et al. (2023) argue that teachers/instructors may use Chatbots to develop lecture ideas, draft plans and module descriptions, and craft announcement texts. In addition, Mollick and Mollick (2022) suggest using Chatbots

to support learners with knowledge transfer by applying acquired knowledge to different situations, raising awareness of the limitations of their knowledge, and encouraging critical thinking about the information.ChatGPT, for example, requires adequate prompts from the user to generate valuable results. Gimpel et al. (2023) argue that crafting such prompts, as much as evaluating the quality of the results, requires users to logically organize and categorize information coherently, which can help structure the learners' thinking, and that multiple Chatbot interactions on the same topic can help refine the text-generation process. Rice et al. (2024) advise that ChatGPT could help students in the research process by identifying relevant literature, evaluating sources, extracting, synthesizing, and summarizing information from those sources, helping identify research gaps, generating hypotheses, and aiding researchers in developing well-defined questions to guide further research. Moreover, ChatGPT can provide data collection techniques and sampling strategies by considering research objectives, constraints, and ethical considerations. Najafali et al. (2023) suggest that ChatGPT can aid in crafting the abstract and different parts of a research grant (e.g., aims, hypothesis, and significance of the proposed project).Jill Watson is an example of an early Chatbot as both a teacher/instructor and student assistant. Developed by the Georgia Institute of Technology (Goel, 2016), Jill's job was to respond to students' basic online questions without the students realizing that it was software. This app later acquired additional functionalities, such as linking students with their peers, to increase motivation and support networks to help reduce the high dropout rates in online courses (Georgia Tech, 2020). Today, Chatbots are among the most widely used AI-based applications to answer general students' academic or social queries. Institutional admissions-related queries, guidance through admission procedures, and selecting and registering for the courses that best suit their educational and career goals can all be managed by a Chatbot.The findings from a study by Leiker et al. (2023) that compared newly created course content using LLMs with traditional, human-created content found the two courses almost identical. The researchers concluded that LLMs can be a viable tool for making accurate and explicit educational content. Grounded on the outcome of this study, the researchers

argue that AI, specifically LLMs, will reshape the adult learning, training, and upskilling landscape.While LLMs, like ChatGPT, open new learning possibilities, they present new demands and challenges relating to assessment (Impact Research, 2023). For example, two months after ChatGPT's introduction (January 2023), Stanford University's school paper, The Stanford Daily, conducted an "informal poll" that showed 17% of 4497 respondents had used ChatGPT on their final exams. Most (59.2%) indicated they used the chatbot for brainstorming, outlining, and forming ideas, according to the poll; another 29.1% used it to answer multiple choice questions; and while 7.3% submitted written material from ChatGPT with edits, 5.5% said they submitted written material from ChatGPT unedited (Cu & Hochman, 2023). Educators, specifically adult educators, have an ethical responsibility to develop a student's moral compass for using generative AI tools.

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