**AI in education**

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Artificial Intelligence (AI) is now finding a multitude of applications across different educational levels – from primary schools to universities – for enhancing teaching, learning and research processes.

One of the remarkable applications of AI in education is its capacity to facilitate personalized learning experiences. Adaptive learning platforms such as ‘DreamBox’ that utilize AI algorithms to adapt content and assignments according to students’ unique learning styles and progress have been developed. For example, DreamBox offers math lessons that dynamically adjust difficulty levels based on each student’s responses, ensuring that students are consistently challenged but according to their capabilities and absorptive capacity.

AI-powered adaptive learning platforms, such as ‘Knewton’ and ‘Smart Sparrow’, offer personalized learning experiences by dynamically adjusting content based on students’ performance. These platforms analyze students’ responses and progress to tailor subsequent lessons. They thus ensure that the students receive content that aligns with their current understanding and challenges them appropriately.

Khan Academy has developed ‘Khanmigo’ that offers personalized tutoring services. Starting this October, a popular introductory coding course at Harvard University CS50 will be taught by an AI instructor because it is far cheaper and more effective than using human teachers. Companies such as ‘Quantiphi’ have emerged that offer large-scale AI-based tutors that assist students across multiple learning contexts and domains, evaluating coursework and providing real-time feedback, creating a personalized learning experience.

AI-driven language learning applications like ‘Duolingo’ can provide interactive and personalized language instruction. Some institutions such as Georgia State University have implemented chatbots like ‘Pounce’ which assists students in navigating campus resources, scheduling appointments and accessing academic support services. This enhances students’ self-reliance and their ability to access timely assistance.

Over the past two years, a new ecosystem of artificial intelligence systems known as ‘generative AI’ has also emerged. This form of AI is creative in nature, creating original materials, like humans do. The products range from music to visual art, from writing original pieces of literature to creating new software codes, materials that rival the originality of skilled human experts. Other recently developed tools include ‘Decktopus’ that can create amazing presentations. ‘Paper Digest’ can prepare summaries of academic papers within seconds. ‘Litmaps’ will carry out a fast literature review. ‘Quillbot’ can rewrite text for you so that it is paraphrased using better vocabulary.

‘GPT-4’, released by OpenAI in December 2022, is now just one of the many tools available to students and researchers, many being based on OpenAI’s base models or those of competitors like Anthropic. Today, students are able to effortlessly transform a single sentence into photo-realistic images (Midjourney), videos (Synthesia), software code (GitHub CoPilot), or even to musical compositions (MusicLM) comparable to those of experienced artists and practitioners.

Many plugins for GPT-1 and other tools that allow access to real-time information online are emerging. Others, such as ‘Code Interpreter’, enhance the capabilities of these tools such as analyzing and visualizing data, extracting text from images and editing videos.

AI’s role in fostering collaborative learning experiences is exemplified by initiatives like Carnegie Mellon’s ‘Open Learning Initiative’. AI algorithms analyze students’ interactions within online learning environments to identify compatible group formations suitable for collaborative projects. This allows the coming together of diverse perspectives, enhances problem-solving skills and encourages cooperative learning.

Teachers can save valuable time by utilizing AI-driven tools for grading answer sheets of students to assignments given. Thus, Turnitin’s ‘Feedback Studio’ and ‘Gradescope’ employ AI algorithms to provide detailed feedback on assignments and essays. They can analyze not only grammar and spelling but also content quality and originality. The advent of AI-powered virtual classrooms has revolutionized the way education is being delivered in many schools, particularly in remote areas.

Platforms like ‘Classcraft’ integrate AI so that the learning experience becomes fun, thereby enhancing student motivation and engagement. AI-enabled virtual classrooms can also perform tasks such as automated attendance tracking, real-time translation of lectures, and sentiment analysis to gauge students’ emotional states. AI’s predictive capabilities are helping to enhance student success. The University of Texas uses AI algorithms to predict students at risk of academic challenges or dropping out. This is achieved by careful analysis of historical academic data, attendance and engagement. This allows teachers to intervene in a timely manner and provide targeted support.

In the realm of research, AI offers an invaluable asset by expediting data analysis and pattern recognition. For instance, in social sciences, sentiment analysis algorithms can process large volumes of text from social media, news articles and surveys to gauge public opinions on various issues. This analysis can provide insights into societal trends and public sentiment that were previously difficult and time-consuming to extract.

AI tools such as ‘Zotero’ and ‘Mendeley’ have made managing citations and references more efficient for researchers. These tools use AI algorithms to automatically organize references, generate citations in different styles, and even suggest relevant sources based on the content of a research paper. This streamlines the often-tedious process of compiling references, allowing researchers to focus more on their analysis and content creation.

AI-driven platforms like ‘Iris.ai’ are transforming the way researchers conduct literature reviews. By inputting research topics or questions, these platforms use AI algorithms to identify relevant papers, articles and resources. This significantly expedites the literature review process, enabling researchers to access a wider array of sources and enhance the quality of their research. AI is also contributing to teachers’ professional development.

Platforms like ‘Reflect’ use AI to analyze classroom interactions and offer insights to educators, enabling them to refine their teaching methods. However, while these tools are powerful, they do pose challenges that need to be addressed. Data privacy concerns, potential bias in AI algorithms, and the need for proper training for educators to effectively integrate AI tools into their pedagogy are some of these challenges.

While AI tools can support teaching and learning practices, the real challenge for Pakistan today is to give the highest national priority to quality school, college and university education and bring them to the highest international standards. It is only then that we can attend to core issues like poverty, freezing exports, joblessness and growing crime.

Unfortunately, we have gone in the opposite direction with universities being systematically and deliberately being transformed into low-level colleges. University budgets have been frozen for the last six years while real costs have tripled due to the nose diving of rupee against dollar, tripling of electricity rates and huge inflation.

As India joins an elite club of technologically advanced countries with capabilities of landing spacecraft on the moon and its IT exports reach $150 billion annually, Pakistan can only boast of having some 25 million children deprived of school education. A change in the quality of leadership is urgently needed.

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founding chairman of theHEC. He can be reached at: ibne\_sina@hotmail.com