

Implementing extended reality (XR) and artificial intelligence (AI) in health professions education in southern Africa

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Background. The rapid uptake and pace at which digital transformation tools have impacted educational provision in health professions education (HPE) may reshape our teaching and learning practices in southern Africa. This article explores some ideas about the implementation using extended reality (XR) and artificial intelligence (AI) in HPE.

Objectives. The objective of this article is to offer potential uses for implementing XR and AI in HPE in the southern African context.

Methods. This article used a desktop approach to curate some novel ideas regarding the use of XR and AI in HPE.

Results. The outcome of this article presents 10 novel ideas to implement XR and/or AI in the classroom, such as delivery of quality education, personalised learning and simulation and training.

Conclusion. The use of XR and AI may improve training of students, improve patient outcomes, and ensure adequate professional development of staff in HPE.

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Digital transformation can be applied to various areas in learning and teaching and, as such, holds an opportunity to develop more efficient and effective practices, processes and methods to meet an institution's strategic needs.^[1] Innovations such as robotics, big data, artificial intelligence (AI), extended reality (XR) and other digital technology may facilitate diagnosis, therapeutics and other preventative health strategies through digital transformation in education (United Nation's Sustainable Development Goal (SDG) 3) and health (SDG 4). Although technology is changing the pace of our lives, health professions education (HPE) has been rather slow in adopting new technologies. Accordingly, there is a need for higher education institutions to respond to some of the initiatives to effect positive social change within HPE. Health professions educators have an opportunity to make changes to the strategic positioning of their curricula while cultivating opportunities for students to develop the capacity to function as 21st-century digital citizens. Thus, the use of XR and AI in HPE is well worth some scrutiny as higher education institutions (HEIs) embrace new technologies and change their learning and teaching practices.^[1]

XR is an umbrella term that covers virtual reality (VR), augmented reality (AR) and mixed reality (MR). When using XR technologies, an individual is immersed in a virtual environment where they are able to use their senses to interact with a virtual environment. VR is immersive where the user dons a headset and interacts with an entirely computer-generated environment, such as a simulation of dissecting a human body. AR uses a headset or a smartphone to overlay images or other content onto the physical world and layers information over physical spaces and objects. Currently, in education, the online and offline worlds are an emerging environment known as mixed reality (MR), where digital and physical objects coexist. MR is a blend of the digital and the physical world, and is an umbrella term which encompasses a range of technologies, including AR and VR. The use of VR and AR in

education may lead to increased student engagement, interactivity and enjoyment. As health science students must gain many skills and acquire vast arrays of knowledge throughout their time at university to become competent practitioners, anatomy in particular is one of the cornerstones of health education, where AR and VR are deemed to be acceptably told to reach these outcomes.^[3]

XR is still currently viewed as a novel approach to learning and teaching in higher education while, at the same time, traditional learning spaces in HPE require tremendous input to ensure the integration of clinical competencies. The use of XR in HPE has the potential to provide quality content generation and learning opportunities for students and staff in HPE spaces. While the use of XR technologies has been growing at a rapid rate, and the adoption in some industries has been at a rapid pace, the implementation of XR in HPE has not been well documented.^[4]

Health professions educators need to spend more time preparing students to work with technologies that use AI.^[1] These applications use big data to replicate human cognition as closely as they possibly can, given the fact that there are human biases that also need to be taken into account. This aspect may cause exacerbated health disparities owing to algorithms used in AI, and therefore educators need to be aware of the limitations in these technologies.^[1] Therefore, health professions educators need to ensure that students are trained and prepared for the eventuality of using AI in the workplace.

The use of AI and more notable applications such as ChatGPT may have an impact on teaching and learning in HPE. ChatGPT is a large language modelling application that curates large volumes of internet text which could offer insight into healthcare in a short time. Over the past few years, AI has been increasingly lauded for its potential to improve services and productivity, save cost and create more efficient and streamlined processes. ChatGPT was launched in November 2022 and is one of many large

language models (LLMs) based on AI, that understands and communicates in human language. HEIs have been approaching this AI-based tool with much trepidation, fear, curiosity and mixed emotions as there appears to be a challenge related to integrity and the inability of academics to detect academic dishonesty in student work. ChatGPT is but one such application; there are many more such as Gemini, Claude, Copilot, etc. Some early adopters in the health sector have started using ChatGPT to do tasks such as writing patient letters or letters to medical insurance, which has assisted in alleviating some of the administrative tasks and increasing the amount of time one can spend with a patient. Thus, the use of AI technologies also offers the best opportunities and the worst challenges across many sectors of society. However, there is a recognition in the health professions sector that AI plays a role in performance. AI-mediated performance and transformation may allow long-term sustainability owing to the performance measures and metrics in clinical settings.^[5] The evolution of HPE and the use of AI is linked to effectively learning and experimenting with appropriate uses for AI in the HPE classroom.

Ten potential uses and implications for XR and AI in HPE

There are a number of ways that XR and AI can be used in HPE and it is prudent to consider the potentials as well as some of the challenges of their use.

- 1. Delivery of quality healthcare education.** The use of XR and AI can provide high-resolution, interactive learning at a lower cost by reducing the need for physical infrastructure. There is also no need to offer expensive wet samples and laboratories when these could be accessed in a virtual world.
- 2. Simulation and training.** Technologies that use XR can be used to create simulations and immersive training activities for health professions students. In a controlled environment, students can practise clinical skills, work on communication skills, and develop decision-making skills without risk to a real patient. In addition, given the popularity of remote learning environments, XR and AI can support remote learning and telemedicine for students who are unable to physically participate on the clinical platform.
- 3. Personalised learning.** AI can be used to adapt to the learning styles and needs of health science student. Using chatbots or virtual assistants, they could receive personalised feedback and guidance regarding clinical procedures which they are learning. However, as educators, we need to be aware of the bias that exists in these large language models.
- 4. Patient education.** XR and AI technologies could be used to develop interactive learning materials to help patients understand medical procedures they may need to undergo. Students could be trained to do this and learn how to communicate with patients in these scenarios.
- 5. Diversification of assessment.** The opportunity exists to develop assessments that will counteract the fear of students being dishonest in their assignments without compromising the quality of education.
- 6. Shorter and more accurate time for diagnosis.** Clinicians and HPEs can harness the potential of AI to collaboratively work on diagnosis with AI. This has been deemed successful when diagnosing breast cancer using machine learning where the accuracy of the diagnosis was greater when the clinician, combined with AI, produced a final diagnosis.
- 7. More time with the patient.** Health professions educators could explore ways to teach students to enhance the relationship with their patient by allowing AI to complete patient forms and other administrative tasks.
- 8. Electronic health records.** Health professions educators and other stakeholders on the clinical platform should develop electronic health records (EHRs) with built-in early-warning systems that are easily accessible. AI can also be used to analyse big data sets from electronic health records, and search medical literature and other sources to identify patterns and insights that can inform medical education. This may help educators to develop more effective and evidence-based curricula and, on a clinical platform, could use the same EHRs to recruit and enrol patients into clinical trials.
- 9. Triaging patients.** AI could be used to assist with triaging patients in settings where resources are limited.
- 10. Democratisation of healthcare.** The democratisation of healthcare implies that patients have the agency, through knowledge systems, to take responsibility for their own care. The use of AI in the field of healthcare could lead to improved health outcomes of patients if they know and understand what they need for their own healthcare.

Conclusions

There are a number of challenges related to the use of XR and AI in HPE, of which some are linked to academic integrity and plagiarism in higher education.^[6] However, there are also ethical implications which students in HPE need to be taught when a lecturer or a student gets into a relationship with a machine, as the issue of confidentiality of the patient is a grey area as a healthcare worker/student may be discussing a patient with a machine which does not have a 'right' to the information.^[7] Another challenge is the gap in technological expertise among HPE educators.

Reflecting on these technologies, and the potential impact on HPE, due consideration should be given to how these technologies could disrupt our practices not only in the healthcare system, but also in the classroom. Furthermore, we would need to be aware of the impact that these digital transformation disruptions will have on students. The application of these XR and AI may be useful to augment the traditional models of teaching and learning and could be incorporated into our pedagogical models. Overall, the use of XR and AI may improve training of students, improve patient outcomes and ensure adequate professional development of staff in health professions education.

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