

SoTEL Symposium 19 April 2024

Implementing Augmented Reality and Virtual Reality for authentic healthcare education: Technology enhanced healthcare education for low resource settings with a focus on Australasia

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Keywords: Augmented Reality, Virtual Reality, Healthcare Innovation, Sustainable Development Goals, Health Education

Abstract

Augmented reality (AR) and virtual reality (VR) technologies have demonstrated immense potential to transform fields like education and healthcare through immersive and interactive virtual environments (Bower et al., 2014; Dhar et al., 2023; Moro et al., 2021)). However, high costs of proprietary headsets and content platforms have inhibited widespread adoption of these technologies in resource-constrained contexts, especially in developing countries (Karre et al., 2019).

Augmented reality (AR) and virtual reality (VR) have the potential to transform how we approach education and healthcare, enhancing access and outcomes especially in developing countries. AR/VR furthers United Nations (UN) Sustainable Development Goals (SDGs) 3 and 4 through inclusive, equitable education and healthcare (United Nations, 2016). VR can simulate immersive learning environments, providing hands-on medical training to healthcare workers in regions with limited resources. By using VR for anatomy and surgery education, healthcare professionals can gain experience without risk to patients. This improves local healthcare capacity and retention of health workers in remote areas. Similarly, AR and VR can enable experiential learning for students without access to labs or materials (Sinou et al., 2023). This facilitates authentic learning for financially or geographically constrained students (van der Meer et al., 2023). AR/VR health interventions can also improve patient diagnosis and care (Sureja et al., 2023). AR glasses for doctors could display patient vitals or past records during examinations to improve diagnostic capabilities. Remote consultations can connect rural healthcare workers with urban specialists via AR assistive tools during complex treatments. AR/VR distraction therapy has also proven effective during painful procedures for children and the elderly (Vaillant-Ciszewicz et al., 2022). Such solutions enhance community health literacy and comfort with medical services, a key challenge in developing contexts.

This presentation proposes a practical methodology for opportunities to expand access to AR/VR healthcare and education tools in low-resource settings through three pathways - utilising low-cost VR headsets, employing inclusive user interface design, and using participatory methodologies during content development. The Educational Design Research (EDR) methodology will guide the project through four main phases (McKenney and Reeves, 2020; Kartoğlu et al., 2020):

1. Analysis and Exploration Phase

- Conduct a literature review on AR/VR adoption in healthcare education.
- Engage stakeholders (educators, students, industry partners) through focus groups and interviews.
- Analyze existing curricula, learning objectives, and assessment practices in healthcare education programs across Australasia.

2. Design and Development Phase

- Develop design principles and guidelines for creating effective AR/VR experiences in healthcare education.

- Collaborate with interdisciplinary teams to design and prototype AR/VR experiences aligned with learning objectives and assessment practices.
- Conduct iterative cycles of prototyping, testing, and refinement with stakeholder feedback.

3. Implementation and Evaluation Phase

- Implement the developed AR/VR experiences in selected healthcare education programs across Australasia.
- Evaluate the effectiveness through mixed methods, including quantitative measures of learning outcomes, engagement, and skill development, as well as qualitative analysis of user experiences.
- Conduct formative evaluations for improvement and refinement.

4. Reflection and Dissemination Phase

- Analyze and synthesize findings from the implementation and evaluation phases.
- Refine the design principles and guidelines based on research findings.
- Develop a comprehensive framework and guidelines for effective AR/VR implementation in healthcare education across Australasia.
- Disseminate research findings, framework, and guidelines through publications, conferences, workshops, and online resources.

The project will apply the principles of EDR, such as interdisciplinary collaboration, contextual adaptation, and iterative refinement, to develop a robust and contextualized solution for AR/VR adoption in healthcare education programs across Australasia.

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