Developing virtual collaborative health team educational environments

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In this short paper we introduce a conceptual framework that is under development to create virtual educational environments to simulate collaborative health team experiences. Building on our work of developing virtual environments for authentic Paramedicine education scenarios, we are extending the concept across the seven health disciplines at the university, beginning initially with a prototype involving three health discipline teams: Paramedicine, Nursing, and Physiotherapy. Using a design based research methodology we are developing prototypes of immersive simulated environments to simulate the real - world interaction between these three health teams for our students. We leverage a low cost mobile BYOD approach enabling rapid prototyping and development of these scenarios.

Introduction

A key determinant in successful patient clinical treatment and outcome is efficient and reliable transfer of patient care between the various health professionals involved in their care (Fletcher, Bedwell, Rosen, Catchople, & Lazzara, 2014; Shah, Alinier, & Pillay, 2016). Emergency care patients' journey to recovery begins with emergency services such as Paramedics, followed by handover to hospital services (including nursing), and finally through rehabilitation services such as Physiotherapy. Various approaches to improving the handover of patients between these health teams have been explored, including a recent popular communication model - Situation, Background, Assessment, Recommendation (SBAR) (Eberhardt, 2014). Simulating these health team handovers in health education ideally leads to improved interprofessional collaboration, and ultimately improved patient prognostic outcomes. However, authentic interprofessional collaboration and handover experiences are limited as a result of: physical dispersion of health disciplines across university campuses; silo allocation of resources; difficulties teaching across disciplines (e.g. nursing teaching interprofessional concepts to physiotherapy); and size and mix of health student cohorts (Year 1 nursing 117; physiotherapy 139; paramedicine 84; occupational therapy 92; midwifery 75; oral health 39; podiatry 32) total 578 year one students within the seven departments of one University's School of Clinical Sciences. Through the development of virtual reality (VR) simulations we are exploring authentic interprofessional handover experiences for our students in the disciplines of Paramedicine, Nursing, and Physiotherapy. Students from each health team will be able to authentically explore and critique the critical elements of the experience of a patient through the virtual handover of the same case scenario between these three teams.

Prototype scenarios of each of the three clinical steps in patient care have been developed using Seekbeak to create mobile BYOD immersive virtual environments for the three student discipline groups to explore and experience the health teams with whom they will collaborate in real world situations, for example:

- Paramedicine: https://seekbeak.com/v/2lVjKrZzBby
- Nursing/ICU: https://seekbeak.com/v/NYojXG69z8e
- Physiotherapy:https://seekbeak.com/v/GYbjNxLE1A7

Literature review

Interprofessional education (IPE) is critical in the preparation of healthcare students who can communicate clinically relevant information and work collaboratively for safe patient care (Cumin, Skilton & Weller, 2017; Stow, Morphet, Griffiths, Huggins & Morgan, 2017). One example of interaction between health disciplines is the handover of a patient, whereby clinical information is exchanged and responsibility and accountability for some, or all aspects of care for a patient is transferred to another interprofessional (Stow, et al., 2017). Ineffective communication, including the use of different professional "language" during clinical handover, impacts the continuity of patient care and contributes to adverse effects and potentially legal claims of malpractice (Thomas, Schultz, Hannaford & Runciman, 2013; Wong, Yee & Turner, 2008). Recent reviews of undergraduate interprofessional education found that there were few opportunities, other than clinical training on the wards, for handover practice between nursing, physiotherapy and paramedicine students (Gough, Hellaby, Jones, & MacKinnon, 2012; Reeves et al., 2013). This, along with the fast pace and high complexity of managing intensive and acute care patients, has led to healthcare students often feeling challenged and unprepared to practice in this environment (Thomas, Rybski, Apke, Kegelmeyer & Kloos, 2017; Reed, Hermelin, Kennedy & Sharma, 2017). With limited literature describing simulation between paramedicine, nurses and physiotherapy, the handover of a patient is viewed as a point of overlapping practice between these disciplines to develop interprofessional education (Stow, et al., 2017).

Interprofessional simulation can be delivered in many forms - from panels of discipline experts co-contributing to a case scenario, to clinical scenarios simulated in a simulation room with a manikin. Interprofessional simulation has demonstrated value in enhancing respect, collaboration, communication and understanding of roles between care disciplines (Bursiek, Hopkins, Breitkopf, Grubbs, Joswiak, Klipfel & Johnson, 2017; Jacobs, Beyer & Carter, 2017). Simulation can provide "hands-on" learning experiences that are realistic and help students to gain competence and confidence (Thomas, et al., 2017). As the virtual interprofessional environment can be interacted with individually, it can also provide flexible access to educational experiences, thereby improving the learning value from a more active involvement of non-technical skills (Reime, Johnsgaard, Kvam, Aarflot, Engeberg, Breivik & Brattebø, 2017). When developing simulation, the importance of piloting scenarios before use in larger scale has been emphasised in previous studies (Stow, et al., 2017).

Methodology

Informed by our literature review, our initial research question is: What are the key principles for creating an authentic virtual experience for health care students that simulates real world health-team patient handover using mobile VR?

The research project involves collaboration of clinical lecturers from three health disciplines at the university who will partner with the university's central teaching and learning research and support unit. Participants are drawn from students enrolled in the university's three and four-year degree programmes in Paramedicine, Nursing, and Physiotherapy. We utilise a design based research (DBR) methodology to guide the project development, that is informed by a framework for designing mobile VR environments for higher education (Cochrane et al., 2017). The design framework (Cochrane, 2016) employs a simple ecology of resources to capture and share user-generated VR environments. Health care environments are captured by a smartphone controlled 360-degree camera (e.g. LG360 cam- www.lg.com/us/mobile-accessories/lg-LGR105.AVRZTS-360-cam), then content is added through editing platforms (e.g. SeekBeak- www.seekbeak.com) to enable interaction in the clinical virtual environment. Authentically designed contexts can be viewed on the participant's smartphones using a Google Cardboard compatible Head Mounted Display (HMD). While DBR (used synonymously with Educational Design Research) involves three iterative stages (McKenney & Reeves, 2012), this paper focuses upon the design and prototyping stage, representing a design and construction study (Kopcha, Schmidt and McKenney, 2015) that presents the design frameworks along with theoretical and empirical grounding that gives it shape. Through several initial exploratory projects we have identified five design principles (DP1-DP5) that will be refined through the DBR research.

- DP1: Basing the project within a design-based research methodology (Bannan, Cook, & Pachler, 2015; Cook & Santos, 2016)
- DP2: Supporting the project through the establishment of a community of practice (Cochrane, 2014; Cochrane & Narayan, 2016)
- DP3: Using heutagogy (student-determined learning) as a guiding pedagogical framework (Blaschke & Hase, 2015; Hase, 2014)
- DP4: Designing around the authentic use of mobile devices and VR (Burden & Kearney, 2016; Cochrane & Narayan, 2017; Kearney, Schuck, Burden, & Aubusson, 2012)
- DP5: Integrate collaboration and team-work into the project activities (Kearney et al., 2012; OECD, 2015)

In addition to McKenney and Reeves (2012) three DBR stages, we add a fourth stage that emphasises the dissemination of the research through peer reviewed publications or the scholarship of technology enhanced learning (SOTEL), illustrated in Figure 1.

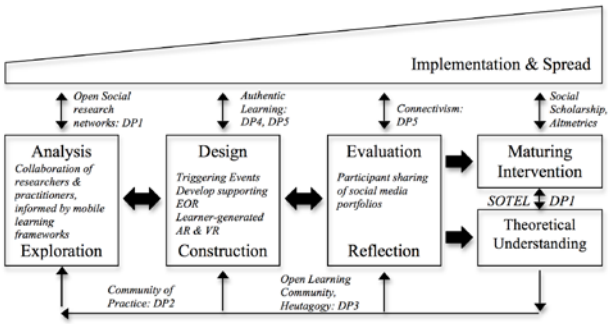

Figure 1: The four stages of DBR – modified from McKenney and Reeves, 2012; p159

Design and construction iteration 1

This paper outlines the first two DBR phases of each research project where we co-define the project problem and requirements, and develop prototype solutions based on existing design principles and technological innovation. Cormier (2008) refers to the design of a collection of tools to support learning as an ecology of resources (EOR). A generic mobile VR ecology of resources is designed to support each project consisting of a bricolage of mobile social media tools that facilitate five key elements associated with our identified design principles: (1) a participant team hub, (2) a mobile VR content creation platform, (3) a cloud-based VR content host, (4) VR content publication and sharing via social networks (SNS), and (5) a smartphone-driven head mounted display. In our case the ecology of resources utilised to support the projects include:

- Individual Wordpress blogs as project journals.
- A team Wordpress blog for publicising project outputs (for example: http://meshVR.wordpress.com).
- A shared Google Drive folder for project documentation, collaborative research writing, and collaborative curriculum brainstorming and redesign.
- A Google Plus Community.
- A project YouTube Channel.
- SeekBeak – VR creation and publication platform.
- A social media hashtag (for example: #mesh360).

The mobile VR ecology of resources provides both a bricolage of community building and nurturing tools for the projects, and provides a rich source of participant-generated artefacts and reflections from both lecturers and students. The mobile EOR supports the design of triggering events for stimulating student discussion and collaboration. In choosing platforms for each element of the framework we have focused upon selecting cross-platform tools that enable a rapid prototyping and development strategy enabling lecturers and students to create and share authentic scenarios quickly and easily. A simple and flexible delivery platform is key to making the project sustainable and affordable, and therefore we have chosen social media platforms such as YouTube and Seekbeak as suitable mobile VR content hosts that do not require any specialised institutional web server, minimises the project IT infrastructure, and provides the opportunity for either private or shared collaboration.

Conclusion

This paper highlights the initial development of virtual reality (VR) simulation of healthcare team handover and details the prototype design stage exploring whether the creation of an authentic virtual experience using mobile VR enhances interprofessional education. We have utilised five design principles to guide the implementation of a design-based research framework. Initial feedback from lecturers in the three discipline contexts of Paramedicine, Nursing, and Physiotherapy has been very positive, and the lecturers have been empowered to create and share their own custom designed mobile VR scenarios using Seekbeak as a rapid prototyping tool. The project has facilitated increased interprofessional collaboration, modelling real world health team interaction. Collaboration with educational researchers has provided a theoretically informed framework to guide the development of these scenarios. The next stages of the project will involve student participation, feedback, and evaluation.

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