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Virtual health education: Scaling practice to transform student learning

Using virtual reality learning environments in healthcare education to bridge the theory/practice gap and improve patient safety

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ABSTRACT

The advancements in and affordability of technologies offer increasing opportunities to modernise healthcare education into packages developed to meet the expectations and requirements of the digital generation. Purposefully designed and tested Virtual Reality Learning Environments (VRLE) can offer healthcare students the means to access and revisit learning materials in ways that enhance education and meet a range of needs; including those with specific learning differences and those who have traditionally been disenfranchised. Furthermore, this will make healthcare education much more readily available to those who have been previously marginalised by distance. This paper argues that Virtual Reality (VR) has the unique potential to transform healthcare education and suggests that more providers should consider collaborating with developers and investing in the technology.

1. Introduction

Technology is an established part of the landscape for many aspects of daily life including; social media, exercise, retail, banking, entertainment and marketing. The 'digital generation' has considerable confidence in and high expectations of technology to enhance both their personal and working lives. It is said that we are currently in the midst of a 4th industrial revolution; the pace of which is unlike any other and with it comes the potential and opportunities to influence all aspects of human experience.

Following the rapid increase in ownership and use of sophisticated handheld mobile devices there is now more opportunity than ever before to expand the reach and depth of technology in healthcare education, but this aspect has been slow to progress beyond the occasional foray into relatively passive blended and online learning (Vaughan, 2007). A comparatively recent development is the use of VR to create environments which closely simulate the real world. The obvious benefits being that students can practice in safe authentic environments, rehearse without fear, progress at their own pace, in locations of their own choosing and develop the confidence needed when faced with a live scenario, therefore potentially reducing the risk of errors and increasing the safety of patients. With careful collaborative co-design these VR healthcare learning environments have the potential for sustained use within face to face, flexible and distance health care programmes.

This paper examines the factors which have influenced the evolution of stimulation use in healthcare education, prior to discussing the learning from an exciting new VR product development; created through a partnership between a UK University and technology provider. We argue that for a relatively modest cost, VR has the potential to transform simulated learning and expand opportunities for personalised clinical education for healthcare students.

2. Perspectives on Simulation

The value and use of simulation, in the form of anatomical models has a long history within healthcare education; these models contribute to and are recognised as providing effective ways to enhance learning. Indeed, high fidelity costly manikins and other types of simulation support devices are extensively used today in face to face healthcare education in many countries, although work by Ferguson et al. (2014) in the United States maintains that sustained manikin use contributes to their limited lives and highlights the significant expense attached to replacement of out of date or damaged equipment. The face to face nature of their use also limits the possibility of sharing valuable teaching to a wider national and international learner population, which in turn, based on the disablement of distance, disadvantages students who would otherwise benefit. In contrast the advantages of the virtual experience is that it can provide students with a sense of accustomisation and belonging within their new placements, which may contribute to a reduction in anxiety and improve confidence when they are in real life clinical settings (Ferguson et al., 2014).

Despite the numerous advantages of using virtual reality technologies for education there has been relatively little development in this area. Not least due to the multiple barriers involved in their effective use, including; technical complexity, difficulty in establishing a sense of identity in collaborative virtual environments, the development of cliques amongst users of virtual technologies, time and money issues and the proliferation of platforms and standards that make interoperability between simulations difficult which, in turn, reduces opportunities for sharing these resources (Warburton, 2009). These obstacles combine with the continuing dialogue of a self-perceived lack of technological

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support and skills amongst some academic staff (Loughlin, 2017) and in some cases student competency; although this can be remedied with supportive guidance and clear instructions (Warburton, 2009).

Whilst development costs for simple VR simulations are not necessarily prohibitive, costs of development for the educational institution, and cost of devices capable of enabling students to use them are important issues. However the extensive ownership of mobile hand held devices amongst students has recently contributed to the enablement and personalised use of this technology. Whilst developments that provide online access to high quality education and practice simulation in the form of VR have the potential to widen access to healthcare education; development and deployment need to be undertaken with the above issues in mind.

3. Integrating Digital Capability

The current 4th industrial revolution provides the prospect of changing the focus in education from the teacher as the expert with students as passive learners who develop basic skills; towards teachers being facilitators who recognise students as lifelong learners who want personalised learning which can be accessed from anywhere, using any device (Kang, 2017). Within this technological advanced age VR has the potential to provide opportunities to enhance and develop this more personalised student centred style of learning.

Whilst the fee to build virtual reality learning environments may be comparatively costly for the initial design and build phase, the on-going outlay is relatively affordable, however this is dependent on the choice of platform. Additionally, the virtual environment facilitates and supports the learning of multiple students simultaneously, at locations throughout the world; with no requirement for lecturer engagement at the point of undertaking the learning or clinical skills practice.

Research by Falconer (2013) on the educational affordances of using virtual reality in education demonstrated that it can goes beyond monetary cost to enabling students to experience a sense of place in the virtual environment which influenced their studies in a wider context than the specific simulation. In this study, students applied concepts and theories from various areas of their study to the experienced virtual place. The ability for students to collaborate in a virtual environment further enhanced the sense of place they experienced, and also gave a sense of realism to their shared experiences. This, in turn, gave the students a sense of value in their learning, as they recognised that their virtual experiences would be of significant benefit in their professional practice after qualifying.

The potential benefits of place experience for healthcare students is significant; it can provide a range of place educational opportunities, including familiarisation experiences of their clinical work placements during academic theory blocks, even before they commence their very first clinical placements, or prior to subsequent placement areas, which demand different abilities. This feature allows students to practice aspects of skills they may find challenging, or as a method of refreshing previously acquired knowledge and skills. By offering healthcare students a means of bridging the theory-practice gap this technology provides opportunities to experience ‘safe fails’ which are vital in learning how to provide the gold standard of healthcare. Multiuser virtual reality learning environments offer students space to experience and engage in co-learning through uni-professional and or multi-disciplinary group working simulations within the virtual reality learning environments, for example undertaking emergency procedures with other real life healthcare workers such as student doctors, nurses, paramedics, support workers and those who are also logged in to the virtual reality environment.

Gameification principles are closely related to similar principles that have been proven to work in relation to behaviour change, such as challenges and effective motivation to maximise potential (Cugelman, 2013). Whilst the inherent competition within gaming is not suitable for healthcare education, it is clear that many of the other principles may be effective. Primarily this can be seen in relation to using mixed reality to engage healthcare students in taking ownership of their learning and also to stimulate the powerful team working perspective that is vital for time critical aspects of care and the resultant improvement to patient care and safety. Sharing healthcare experiences and practices with global professional participants enables the development of a range of learning including in public health settings; when it may be valuable to share current practice and knowledge quickly to ensure that practitioners working on the ground are best equipped to manage and contain outbreaks of infectious disease in a timely manner. This additional feature facilitates the benefit of sharing best practice in learning to students who live in many different areas of the world; thereby removing the expectation of students having to travel to other countries to gain high quality educational experiences.

Scaling up innovation in healthcare is a factor that has been flagged up as a critical outcome in a number of studies (Santos et al., 2016). These studies used healthcare as a key focus for a series of case study activities. Findings and recommendations suggested that a move to agile, stake-holder design solutions required a mind-set move in order to address complex problems. Successful scaling is more than just being about the number of users. It is also about the changes in practice an innovation can bring about and how valuable these changes are to stakeholders, whether such changes can be sustained over time, and the extent to which users and stakeholders are involved in co-creating the innovation to ensure its initial and continued value (Santos et al., 2016). Therefore scaling up technology for students as part of their studies; has the potential to contribute into international, national and healthcare policy agendas.

4. Collaborative Immersive Learning Virtual Reality Series (CILVRS)

It is against this backdrop that we discuss how we approached the development of a co-designed virtual reality learning environment (VRLE), created to enable healthcare students to access as part of their studies at a place and time of their own choosing, taking account of the desire of students to access real-world learning using their own hand-held devices. Thus we are addressing an aspect of learning that has been slow to progress beyond the occasional foray into relatively passive blended and online learning (Vaughan, 2007).

The CILVRS project at Bournemouth University is investigating the educational affordances of using immersive virtual reality learning environments to bridge the theory-practice gap for healthcare students. In doing so students will be able to increase their confidence when entering clinical practice and will be offered opportunities to experience ‘safe fails’ (being able to make mistakes in authentic virtual clinical simulations without harm to real life patients) which are vital in learning how to provide the gold standard of healthcare and explored student perception of VRLE impact on patient safety.

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A CILVRS project pilot and feasibility study has been developed in a virtual reality environment (Fieldscapes TM) which uses a Unity 3D platform. The urinalysis simulation consists of a single consulting room in which a student plays the part of a midwife awaiting the arrival of a patient. The patient avatar knocks on the door to begin the simulation, and from there the student has choices regarding how they would greet, interact with and inform the patient as the urinalysis simulation progresses. Students can experience the simulation on their mobile phones, on laptops or desktop computers or as a fully immersive experience using 3D VR headset and haptic (touch) devices. The simulation has been developed in collaboration with Daden Ltd., a specialist VR education company. The technical complexity of creating and running VR simulations means that partnerships with developer companies are often a feature of these approaches to educational uses of VR. These partnerships provide significant creative opportunities for the development of educational experiences, and also offer operational

opportunities for knowledge exchange between educators and developers. Careful co-design between technical researchers, healthcare academics and practitioners is required to ensure the created VRLE is sustainable, trusted and of value to all parties. Early findings from the pilot and feasibility study indicate that the students have found the option of VRLEs a valuable addition to their learning package, and that they feel VRLE will not only increase their confidence, knowledge and reasoning but that this also has an associated positive impact on their patient care in clinical practice. A more detailed manuscript will be written once this data has been fully analysed.

5. Conclusion

The technology to enable sophisticated VR simulations is now readily available and provides a unique opportunity to transform learning. The technology can be used to simulate any number of clinical practice scenarios and we suggest healthcare education provider institutions look to invest and become actively involved in this growing field. This is necessary in order to further develop and refine the technology in partnership with developer companies and to undertake wider research into the profound positive impact we believe VRLEs can have on nursing, midwifery and allied healthcare students' learning and subsequent patient safety.

References

Cugelman, B., 2013. Gamification: what it is and why it matters to digital health behavior change. JMIR Serious Games 1 (1), e3.
Falconer, L., 2013. Situated learning in accident investigation: a virtual world simulation case study. Int. J. Learn. Technol. 8 (3), 246–262.
Ferguson, T., Howell, T., Parsons, L., 2014. The birth experience: learning through clinical simulation. Int. J. Childbirth Educ. 29 (3), 66.
Kang, S.Y., 2017. Education to Learning 2030. Awaken Group, California, USA.
Loughlin, C., 2017. Staff perceptions of technology enhanced learning in higher education. In: Mesquita, A., Peres, P.A. (Eds.), Proceedings of the 16th European Conference on eLearning. ECEL2017. ACPI (Academic Conference Publishing International), Reading UK, pp. 335–343.
Santos, P., Dennerlein, S., Theiler, D., Cook, H., Treasure-Jones, T., Holley, D., Kerr, M., Attwell, G., Kowald, D., Lex, E., 2016. Going beyond your personal learning network, using recommendations and trust through a multimedia question-answering service for decision –support: a case study in the healthcare. J. Univ. Comput. Sci. 22 (3), 340–359.
Vaughan, N., 2007. Perspectives on blended learning in higher education. Int. J. E-Learning 6 (1), 81–94.
Warburton, S., 2009. Second life in higher education: assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. Br. J. Educ. Technol. 40 (3), 414–426.

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