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Article:

Can virtual reality really be used within the lecture theatre?

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Introduction

We present our initial experiences integrating Virtual Reality (VR) 360° viewable images within a University medical imaging teaching session and some general transferable learning points for the successful delivery of VR content.

VR has the potential to offer students an immersive educational experience but is not without its limitations. Our initial experience using VR with small groups (n<7) and larger groups (n<35) highlighted several obstacles which needed to be overcome to be able to successfully use VR in teaching. We found that requiring students to use their own devices to view VR content during teaching sessions (downloading the media content and loading it into a suitable app for viewing) presented a variety of problems, with pilot studies only a limited students successfully engaged with the VR content. The problems faced by students were a result of device compatibility (such as software versions, sensor capability such as lack of accelerometers), storage limitations app and browser capabilities (e.g. 360° video on YouTube is currently not supported by the Safari browser). The physical device size, button location, screen brightness caused issues when attempting to use some phones in consumer VR headsets.   A diversity in student's digital fluency impacted on the level of student support required in the classroom to ensure engagement, and also made the activity highly labour intensive. The assumption that undergraduates within Higher Education are proficient with mobile technology and its applications is not always true [1].

Following our initial experiences we therefore designed a teaching session in medical imaging with small numbers which incorporated VR under controlled conditions and allowed us to monitor engagement.   The session covered clinical X-ray imaging and its uses and relevant safety considerations to students in the early stages of their training as Assistant Healthcare Practitioners. Using 360° images and VR headsets students were able to explore and view a clinical X-ray imaging room. This approach was designed to allow students the opportunity to contextualise the scientific theory and principles delivered at the time of teaching; at time of delivery these students were unlikely to all have experienced the clinical X-ray room.

Methods

Following a lecture 17 Assistant Healthcare Practitioner students (split into two separate groups) were invited to evaluate VR 360° viewable images of the clinical setting using VR headsets. Students were all supplied with a smartphone (iPhone 5, Apple Inc, CA, USA) with all data and viewing applications preloaded onto them, and the iPhones were all fitted within a consumer level VR headset, making access to the VR content very simple for students.

Students were invited to complete a short anonymous questionnaire designed to determine whether using the VR headsets had improved their perceived confidence within, and understanding of the clinical setting. After reading the accompanying information sheet students could opt not to complete the questionnaire; we did not seek written consent; ethical approval was granted by the School of Medicines' research ethics committee (MREC16-100).

Results

All 17 students successfully used the VR headsets to view the content provided. Figure 1 shows students selecting a scene and using the headsets, along with an image as seen by the student showing part of the 360° content that students explore, and an example twin lens view displayed on the phone inside the headset. The students were asked the following questions: (1) having seen the clinically simulated X-ray room using the virtual reality equipment I would feel more confident in accompanying somebody going for an X-ray; (2) having seen the clinically simulated x-ray room using the virtual

reality equipment I would know where to stand when in an X-ray room when a patient was having an x-ray taken. Responses were on a Likert scale (strongly agree, agree, neither agree or disagree, slightly disagree, disagree). For both questions 16 out of 17 students (94%) agreed or strongly agreed, with 76% and 82% strongly agreeing for questions one and two respectively.

Discussion

Medical imaging plays a prominent role within the modern clinical environment, [2] and there are an increasing number of students groups accessing teaching within this field. It is therefore sometimes problematic to take all students to experience the clinical setting at the time of theoretical teaching due to clinical pressures and access issues. By supplying students with a pre-set mobile device and VR headset, thereby overcoming the barriers of technology and digital fluency our group successfully used VR 360° viewable images of the clinical setting accessed through VR headsets providing an immersive simulated clinical experiential learning opportunity.

Although the provision of these fully configured devices was time consuming and expensive (although cheaper mobile devices could have been used) the aim was to ensure that the students could engage positively with VR and evaluate it, and not have their ability to navigate the set up procedure influence their experience. The successful use of VR within a teaching session with completely pre-configured devices by all students contrasted strongly with our previous experience.

The positive student responses support the case that the use of VR in this setting provided an experiential learning [3] opportunity and supported students in the understanding of this topic and perceived confidence within this clinical setting. Further work is required to establish whether students can transfer this understanding and confidence into the clinical setting. In this group no student reported 'virtual reality sickness' [4] which would have impacted on their ability to access the learning opportunity; an alternative way of viewing the content should also always be available.

In conclusion we have shown it is possible to positively integrate VR into small group sessions within the natural time constraints of a University teaching session by providing completely pre-configured VR headsets. All of the students in this study were engaged with and enjoyed the VR experience, which is an essential prerequisite for the successful integration of VR into teaching. We are continuing to explore whether it is possible to extend this method of delivery into larger groups and whether students can transfer this learning and confidence into the clinical setting.

References

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Competing Interests Statement

There are no competing interests.

Contributorship Statement

AGD co-designed the student study, designed, prepared and ran a number of the teaching sessions, and revised the manuscript. NC conceived of using VR content in teaching, created the VR content, led a number of teaching sessions and revised the manuscript. LAT initiated and co-designed the student study, collected and analysed the data and drafted the manuscript. She is guarantor.

Figure Captions

Figure 1: Students preparing to use the headset (a) selecting the image to view, and (b) holding the headset to the head for viewing. An example image as seen by the students (c), and (d) the twin lens view actually displayed on the phone screen inside the viewer.