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The Use Of A Commercial Virtual Reality (VR) Software Package To Support Undergraduate Teaching Of Anatomy And Physiology

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Introduction

The use of VR in the teaching environment is in its infancy but several software companies have already invested heavily in producing visually rich simulated virtual teaching environments in which students can explore anatomically correct representations of the human body. The CHHS has recently purchased several high performance laptops and Oculus Rift virtual reality headsets to explore the potential of VR to support the learning of our students on a variety of undergraduate programmes. The commercially available software package 3D Organon was chosen based on the accuracy of its anatomical representations and the excellent feedback from pre-existing reviews of the software.



Using the Oculus Rift headsets users are immersed in a virtual environment where they can explore accurate, to-scale representations of the human body. Students can select which organ system they wish to view and using the Oculus Rift touch controllers remove, manipulate and examine individual organs. Unlike using traditional plaster and plastic anatomical models information is provided about both the structure and function of each organ and tissue as it is being examined in the virtual environment.

Objectives and Rationale

This academic year (2017/18) the 3D Organon VR environment has been made available to two current groups of students within the college (Osteopathy and Health and Social Care) as both a supplementary aid to teaching and as a resource to help with revision. Here we report our initial findings in relation to the Health and Social Care Undergraduate degree programme. Most Health and Social Care students enter onto their course with minimal education in the biomedical sciences and as a result many find the core year I module Foundations in Human Anatomy, Physiology & Pathophysiology (PPS107) very challenging. This has been reflected over the years in relatively low overall module scores compared to students on other programmes taking similar modules. VR teaching was initially introduced to these students in year I laboratory sessions exploring anatomy. Additionally two VR revision sessions were added at the end of the module to help consolidate the lecture material. All sessions were well received by the students as assessed by student questionnaires and 3 word, word-cloud responses.

Below: Year I Health and Social Care students using Oculus Rift headsets during A VR revision session in CHHS

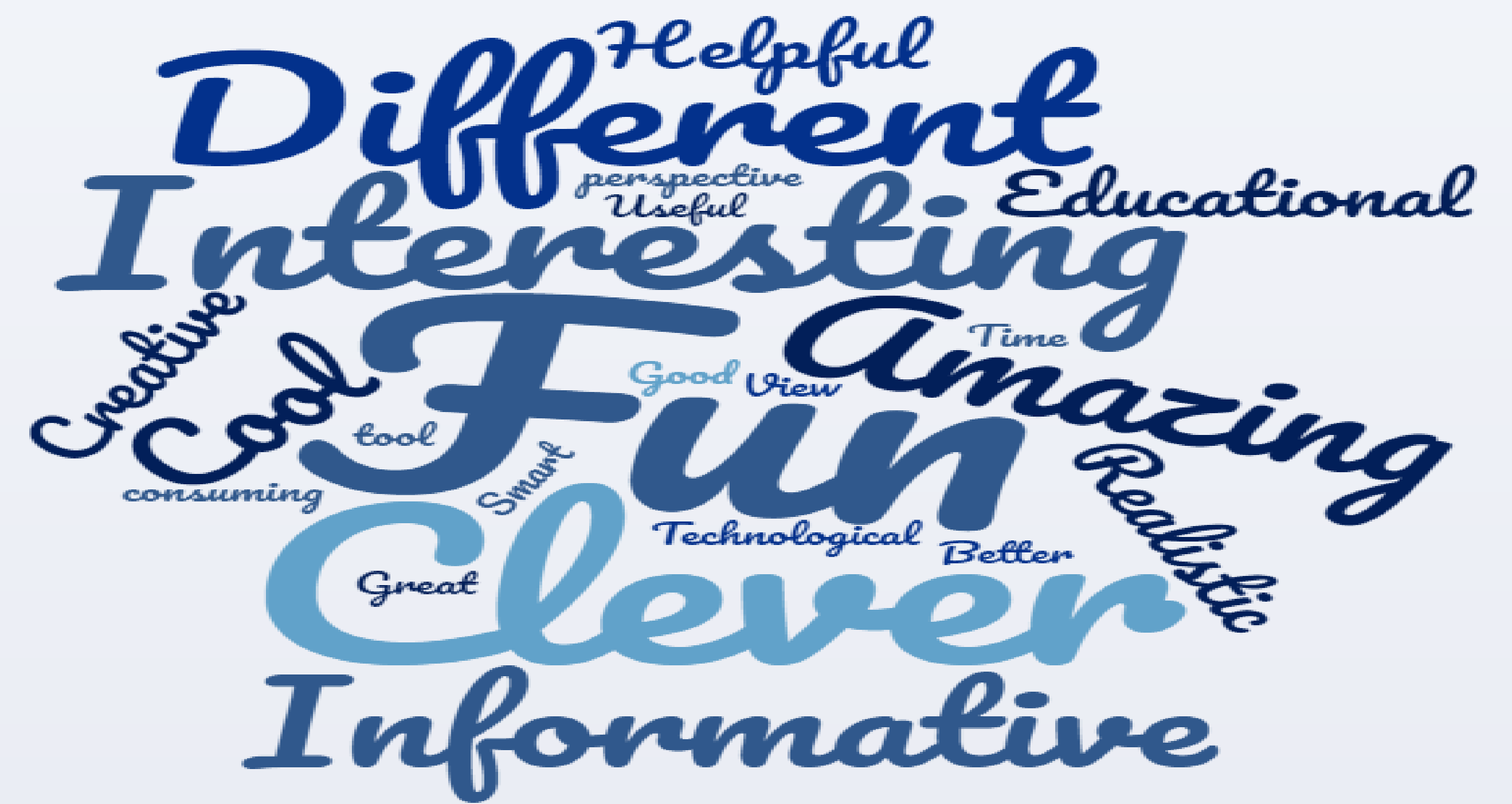


Student Opinions Of VR To Support Anatomy and Physiology Teaching

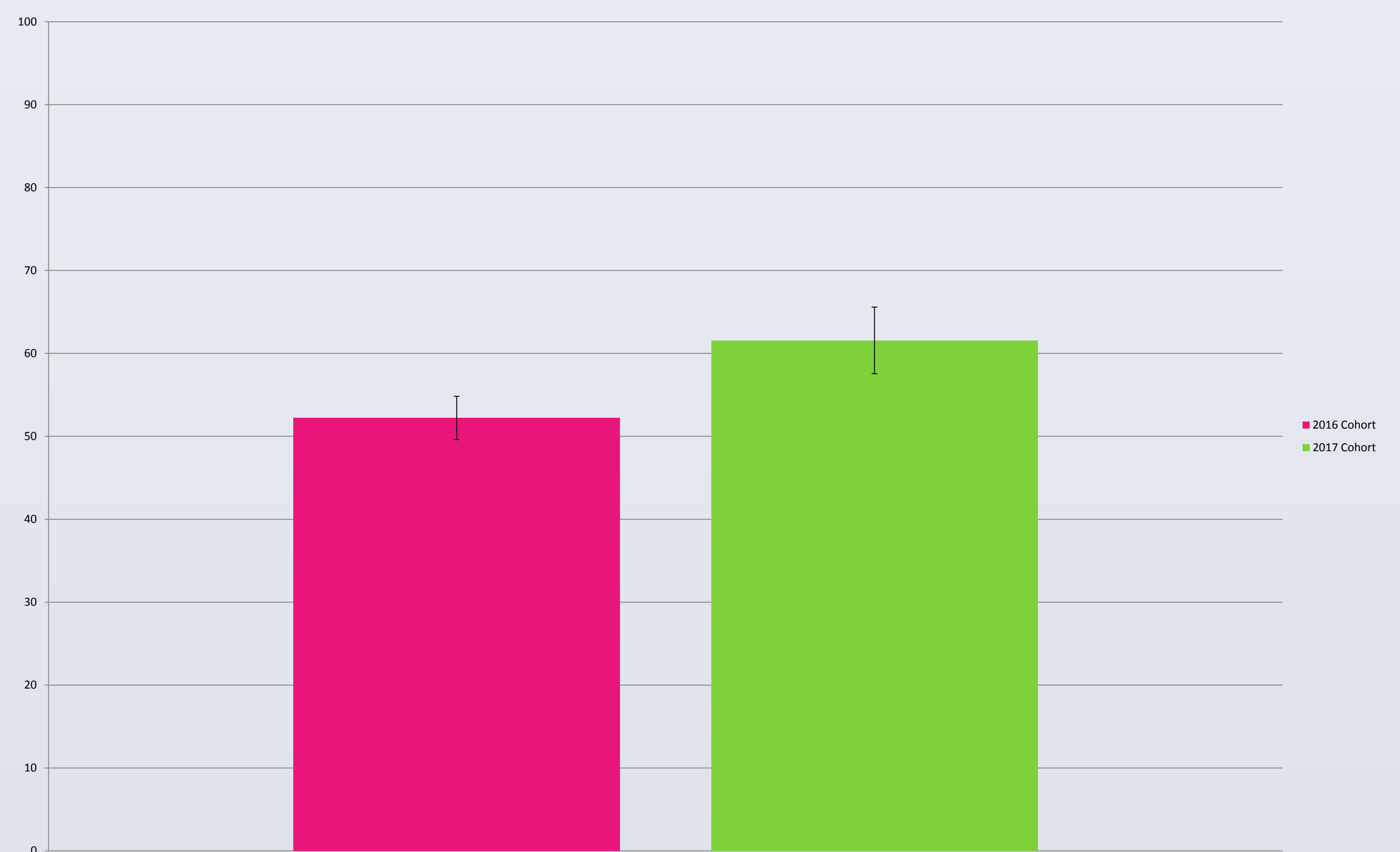
The VR experience received almost universal positive feedback with the few negative comments relating to the steep learning curve required to get to grips with the VR hand controllers and the comfort of the Oculus Rift headsets. A representative set of comments from the questionnaires are presented below:

- Incredible experience, I love the fact that as you manipulate the objects more information is displayed
- I could not believe how realistic the experience felt
- Very informative, I just wish we could have more access to the equipment particularly in the run up to our exams
- It furthered my knowledge for the exam
- Felt a little uncomfortable but perfect for short periods of revision
- Although it took a while to learn to use the hand controllers, the whole experience was amazing
- Perfect for revision I just wish I had one in my house
- Steep learning curve but amazingly realistic
- Kept steaming up after a few minutes but the room was very hot, the experience is fantastic
- Because I play computer games I found it easy to use and informative
- Clever, took a while to learn the controls but very informative
- I have tried something similar on my mobile phone and a cardboard headset but this is so much better
- We should have access to this all of the time

Summary of Student Responses as a Word-Cloud



Biomedical Science Module Performance (total module %) Pre and Post VR Introduction



Discussion

The 2017 cohort of students exposed to VR teaching performed significantly ($p < 0.05$) better in their biomedical module assessments compared to their counterparts in the 2016 cohort who received no VR teaching sessions. From previous experience with Health and Social Care students there has always been much variability between cohorts and their performance in biomedical assessments, therefore it is far too early to conclude definitively that the VR sessions have had a positive effect. However based on written feedback it is clear that the students greatly valued the VR sessions in enriching their educational experience, reporting that they found VR beneficial in consolidating the lecture and practical content and useful as a revision tool to prepare for exams and assessments. It is well recognised that complex subjects such as anatomy and physiology benefit from “hands on” tactile and visual teaching approaches. Traditionally this would come from a combination of laboratory sessions and cadaver dissections. Since both cadaveric dissection and certain laboratory sessions are expensive, time consuming and emotionally distressing for some students the use of anatomically correct models and simulations have become more widespread (Collins 2013) Since VR teaching is in its infancy there are few studies published examining its effectiveness in teaching anatomy and physiology. A recent study in 2017 by Fairén et al examined the use of VR by 254 undergraduate nursing students. In this study students could visually explore a variety of human organ systems in both virtual and augmented reality, the study concluded that the technology provided a powerful learning tool that helps students understand anatomical structures. As educators our own experiences of using VR to supplement the teaching of anatomy and physiology on both the Osteopathy and Health and Social Care programmes have been overwhelmingly positive. The only major current issue is the time taken to set up the equipment before use but with a dedicated VR room currently being equipped within the CHHS we aim to introduce VR teaching onto a wider range of programmes to provide our students with a cutting edge blended learning experience.

References

Collins J (2013) Modern approaches to teaching and learning anatomy BMJ 337:a1310
Fairén M (2017) Virtual Reality to teach anatomy Eurographics Proceedings c 2017 The eurographics association. <https://diglib.org/443/handle/10.2312/eged20171026>

Acknowledgements

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