The Future of Education? Using 3D animation and virtual reality in teaching physiology

Case study from a David Jordan Teaching Award recipient

Craig J Daly, University of Glasgow

After 30 years in cardiovascular research, my job abruptly became more teaching-focussed. This was quite an upheaval and it presented me with the challenge of engaging with the scholarship of teaching and learning. After a period of mild confusion, I was alerted to the David Jordan Teaching Award. Aimed at Society members who were trying to get started in educational research, this scheme seemed ideal for me. With no real expectation, I applied for the award and was successful. Four years on from completion, do I think it made a difference? The short answer is: YES, a huge difference. The longer answer follows below.

My project was titled 'Creation of anatomically accurate 3D animations for teaching physiology'. The idea seemed simple, but the technical aspects would be challenging. Put simply, could 3D volumetric image data, collected using confocal laser scanning microscopy, be used within sophisticated animation software to create 3D animations for teaching physiology? Once we overcame the technical challenge of converting the scientific data into the animation software, we set about building an animation of vascular structure (Daly et al., 2014) and neurotransmission within the vascular wall (Daly et al., 2016; bit.ly/2I8PWiY).

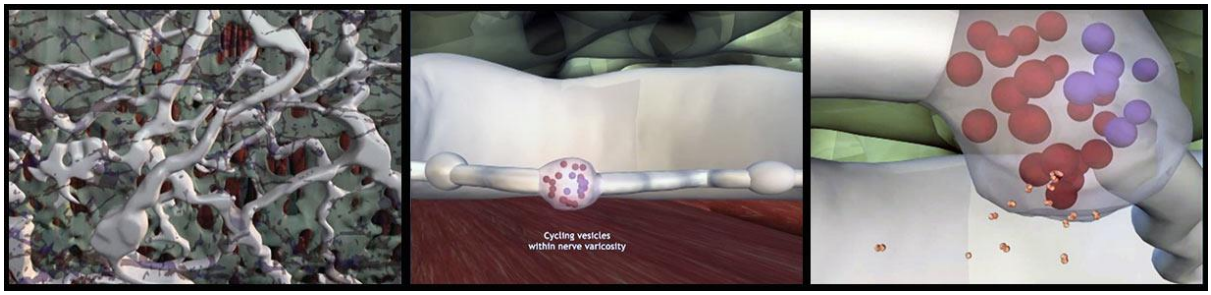

Figure 1. Screen shots from the 3D animation of vascular neurotransmission.

The neurotransmission animation was then used in an educational-multimedia study to examine the effect of animation versus stills in teaching and learning. Overall, we observed very strong student satisfaction with the 3D approach. However, we did not detect any improvement in learning when using animation (Daly et al., 2016). One of our conclusions was that extraneous cognitive loading was too high in the animated version of the presentation. This opened another avenue of research into the relevance of various multimedia learning theories (Mayer 2014) as applied to 3D animations and multimedia.

The success of the workflow we established through the David Jordan Teaching Award enabled us to create more animations which can be found on my YouTube channel (bit.ly/2KO2Apj). One of the animations (Development of Atherosclerosis) had 40,000 views in the last year.

More recently the animation work has evolved to incorporate virtual reality (VR). Fully immersive VR headsets are reasonably accessible and affordable. Over the course of a few months, I worked on the data flow to take my 3D structures from animation software to computer game design and then to VR (Learn more about the process in this video: bit.ly/2I5lO8b).

I presented the results of our recent educational research on cognitive loading of animations and VR at a recent education symposium (Pharmacology 2017) and won the prize for best oral communication. Briefly, our study found that student preference, for the design of educational 3D animations, was to have both narration and on-screen text. This contravenes one of the educational theories (the redundancy principle) which suggests that both text & narration in a multimedia presentation would reduce learning. However, this theory, and many like it, need to be re-examined for their relevance to VR, augmented reality (AR) and mixed-reality (combined VR & AR) educational designs.

Since being awarded the David Jordan Teaching Award, I have presented posters and oral communications at six education symposia. As a lifelong researcher in cardiovascular science, I would never have envisaged how much my career could be shaped by a single grant award. I now have the perfect way to combine my interest in laser scanning confocal microscopy, image analysis, 3D animations and virtual reality. I also have an avenue of educational research to investigate (i.e. the optimal design of VR learning environments and cognitive loading of 3D animations).

If you are interested in breaking into the educational research world then the David Jordan Teaching Award is ideal, and I would thoroughly recommend applying. I am extremely grateful to The Physiological Society for the award as it has provided me with a completely new avenue of research to pursue.

References

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