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VR in Higher Education

SUBMITTED BY

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Breaking the bubble

using VR to connect to the world inclusively and in an environmental conscious way

This design study is based on my personal vision for HE.

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- Firstly, to **democratize access to HE** for a wider audience of students. This applies to those already currently enrolled but in some way disadvantaged and to improve the learning experience for those who can't afford a traditional degree. I consider MOOCs as a viable alternative, which might not reach everyone, but at least a wider audience.
- Secondly, to enable greater **cross-university teaching** to allow students from different continents to collaborate and learn through social and cultural exchange without need to travel. Thus, respecting our planetary boundaries.

This design study seeks to showcase how VR can contribute to achieve those two visions in an environmental conscious way.

Educational Perspective

The notion of libertarian paternalism plays a role in the implementation of VR into HE since its adoption would clearly affect students' choice architectures. Will VR become a mandatory or voluntarily component of HE? In any way, it will be crucial for universities to implement VR not for the sake of it, but with the intent to enhance student's learning. Liz Kolb (2011) developed the **Triple E Framework**, which measures how technology used in the classroom supports students to meet their learning goals.

Design in mind, as implemented, as experienced
VR implementation into the classroom requires careful consideration in order to avoid creating a gap between design in mind and design experienced. Thus, creating an educational VR experience requires software designers, educators, and architects to collaborate so that the physical environment and software complement learning goals.
The Triple-E framework by Liz Kolb (2011) helps to integrate software design and the design of the physical environment with educational needs.

Engagement:
Kolb (2011) argues that students learn best when they are actively involved, their minds are on, they are undistracted by peripheral elements, with breaks from technology, through social interaction and clear and well-defined learning goals.

- Thus, **software design** should consider co-engagement as a key pillar. Learning in isolation often leads to misconceptions and misunderstandings. Thompson et al. (2018) highlight that recent technological advances have too much focused on individual experiences, and stress that designers of VR software "must balance the users' attention to their own experience and explore how to create a sense of shared presence, or co-presence, in the virtual world" (p. 4). This can be achieved through creating positive interdependence in a virtual setting. For example. virtual teams need to solve a problem by synthesizing complementary information. Thus, each team member and their access to bits of information is needed to solve a specific problem.

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Educational Perspective

- The **physical space** around the VR experience should be inviting to allow students to recharge their brains and take breaks from technology by offering enough space for yoga or stretching, and at the same time comfortable seating arrangements for in person-group discussions, and relaxation.

  In the Highly Sprung workshop our group envisioned the space to be similar to the "Create Space" in WBS. However, with movable and comfortable couches and bean bags that can be flexibly moved around to form small spaces for 3-4 students to discuss their VR experiences, with free space in the middle for stretching.

  A lush green floor (see Innocent Office) could invite students to enter bar feet and create a more home-like and thus safe environment to enter the world of VR, which is needed to grant full immersion without distractions.

Figure 1 Create Space at WBS

Figure 2 Innocent Office

Educational Perspective

Enhancement & Extension:
Moreover, educators need to ensure conceptualizing VR software that adds value to learning, and not simply digitalizes pen and paper exercises but instead brings new dimensions to teaching. For example, as a reaction to the effects of Covid-19 the University of Glasgow collaborates with Sublime to create VR labs that can be remotely accessed without need of specialized hardware apart from a laptop to improve the remote teaching experience of history, physics and anatomy students.

Figure 3 Remotely accessible VR physics experiment at University of Glasgow

Thus, in this case no physical space is required except of ensuring that all students have access to the digital infrastructure needed (i.e., Laptop Zoom, Teams etc.).

In the next instance, this type of learning could be offered to those not fortunate enough to earn a traditional degree but relying on distant learning or MOOCs to enhance their knowledge. Stanford School of Business, for example, delivers a program with eight courses entirely through VR (GSB Stanford, 2016). Students found this experience despite being entirely remote so bonding that they met at Stanford University physically after completion of the course.

Another example is University of British Columbia Law School that offers an immersive distant learning experience through VR allowing students to better talk to each other compared to standard distant learning (James, 2014).

Figure 4 VR lecture at University of British Colombia

Educational Perspective

Moreover, Harvard has partnered with Zhejiang University in Chiba to allow students from both Universities to study ancient Egyptian characters through the so-called Giza Project (Doghead 2019). VR helps students to use body language displayed through their avatars and helped to discuss, synthesize, and learn from each other throughout the project.

Figure 5 10:30am Boston, 11:30pm Hangzhou Ugrad students connected through VR

These VR examples could be adapted to extend the existing **Monash-Warwick alliance** to promote cross-institutional and cross-continental learning and research in the following ways:

- offering elective courses available to both Monash and Warwick students
- offering short-term exchange programs for students reluctant or unable to participate in long-term exchange programs
- facilitating cross-continental research

Student Perspective

Fit

In our group we explored the disruptive effect of VR for students from different departments and how this could revolutionize teaching styles in specific disciplines, which could either make or break VR adoption. For example, law students who traditionally learned through memorizing could feel uncomfortable being taught in a more interactive setting (see Persona Map in Figure 6).
On the flipside, new teaching methods could attract students to the discipline who because of its traditional teaching style otherwise would have never imagined studying law. Thus, the adoption of VR needs to be justified with end learning goals and their respective fit with the discipline and its students, and the profession as a whole.

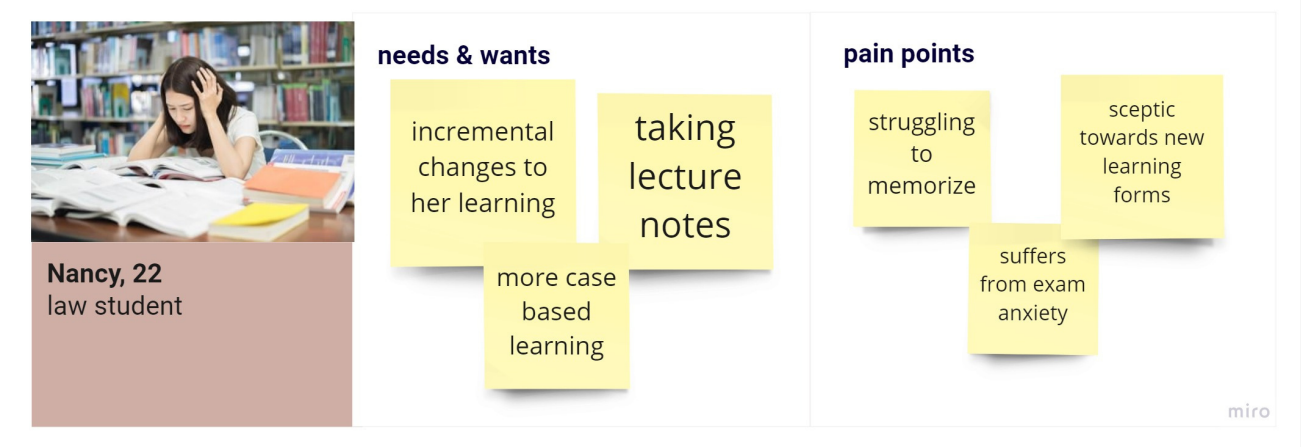

Figure 6 Persona Map Law Student

Stick – Emotional Durability and Sustainability

This design study has mostly praised the positive impacts of VR in an educational setting. Following Chapman (2005), good design is emotional durable. While VR can bring about many positive environmental effects, such as positive impacts on cities (i.e., reduced traffic, reduced energy consumption of buildings), reducing material waste through rendering virtual prototypes in real time, or educating people about sustainability (Nelson et al., 2020), sustainability should start at its core, namely with a VR headset.

Student Perspective

While today's limited number of VR headsets does not raise many concerns about harmful sourcing of materials needed to produce them, nor about their disposal and potential harmful effects on the environment, this question will need to be reconsidered before VR headsets become mainstream (Green Journal, 2019). Planned product obsolescence need to be prevented, which is particularly difficult for electronic products that constantly are equipped with new features and product attributes. VR headsets needs to be designed in line with the principles of the circular economy, i.e., modular components that are replaceable, and repairable, and can be safely disposed of or reused.

Figure 7 deconstructed VR headset (Medium, 2017)

Spread

VR becomes increasingly attractive in many sectors and after crossing the CHASM (Moore, 1991) economies of scale and scope will make its adoption more cost-efficient for Universities to adopt. However, individual consumer's overall reluctance to adopt VR due to its perceived newness and uncertainty about its benefits, might also slow down the adoption among Universities as resources need to be freed to educate students about the benefits. VR becoming mainstream will ultimately depend on whether it can leverage the concept of network effects (Shapiro & Varian, 1999).

Grow and Inclusive Design

VR should enhance all students' learning. Studies have shown potential benefits of incorporating VR into curricula for students with special educational needs. For example, Lin et al. (2016) argue that VR can promote independent learning especially for students with attention deficit and memory disorders.

Student Perspective

Da Silva Teófilo et al. (2018) show that captioning systems powered by AI [which can be incorporated into VR experiences] can empower deaf or hard of hearing people through turning spoken words into subtitles (see Figure 8). However, on the flipside many studies flagged psychological and physical discomforts during VR experiences. Penmudi et al. (2020) investigated the side effects of VR headset usage with the intent to not repeat the mistakes of the past when computers and smartphones were emerging, but little attention has been paid to risks of overuse on posture and physical health more broadly. The study highlights discomfort in the neck and shoulder and muscle strains as most reported physical limitations of using VR. These insights need to be incorporated into product design of VR headsets and proper ergonomic usage should be ensured by institutions offering VR as part of their educational delivery.

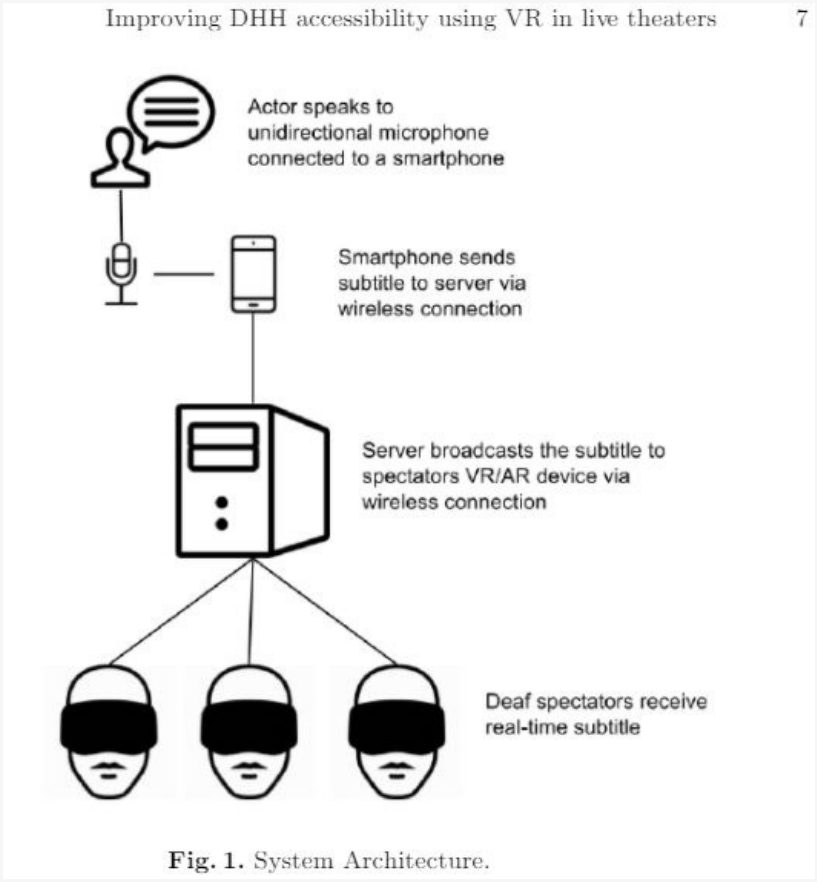

Figure 8 improving DHH accessibility (da Silva Teófilo et al.)2018)

Conclusion

This design study shows that offering VR experiences as part of the teaching and learning environment of Warwick does not have to be restricted to a fixed physical space on campus. Instead, VR can cascade and revolutionize the whole learning experience at Warwick by improving remote learning, making learning more memorable and social, and by increasing institutional collaboration. Thus, making teaching and learning more inclusive for existing students, and those unable to obtain a traditional degree, while contributing to environmental sustainability through reduced mobility.

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