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Searching for application areas for using AI and VR in the Higher Education classroom in Ireland

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Abstract:

The changing landscape of education for all, internationally, has led to education policy and operationalisation mis-matches, we advocate for active learning and critical pedagogy in our modern society but our society and resources are not sufficiently welcoming to adopting emerging hardware and software in the classroom. Resource constraints restrict the move from experiential learning to implementation where resistance is in-built within our culture to hold on to traditional teaching and learning methods and delivery mechanisms. We are familiar and open to science requiring apparatus, but using tools such as virtual reality and artificial intelligence in our everyday teaching and learning is uncommon and warrants further evidence to support its implementation to becoming the norm.

Education is the keystone for progress, we promote education as a sustainable, complementary activity to economic social and caring aspects of our society. As an integral part of the UN Sustainable developmental goals how we meet the objectives are contextual and in Ireland we currently adopt a traditional in-person educational experience with many online programmes affiliated with options for lifelong learning rather than mainstream education. Thus the experience of the authors through SEERLab (South East Education Research Lab) to design and develop teaching and learning artefacts is presented in this paper. SEERLab focuses on strategies to build a sense of community in HE (virtually) of educationalists who through their own learning experiences gain empowerment to dramatically change the classroom composition, using both physical hardware (VR headsets) and software (AI) to accentuate critical thinking and immersive learning in the classroom. There is evidence to support the use of VR in the classroom toward enhanced engagement of students (Kavanagh et al., 2017 and Campos et al., 2022).

However, the emergence of new education policies based on data, learning analytics, tertiary market demand and access is not easily understood in our communities. We purport that educationalists need to embrace change at HE to administer and deliver curriculum using non-standard applications. This research initiated by lecturers in the design of pilots to meet learning outcomes through using VR is gathering evidence to further develop HE policy using VR in the classroom. There are tensions in global societal research discourses in relation to emerging technologies such as AI and scant social scientific research on societal attitudes towards AI; its value and limitations in education, fears and emotions about AI technology which requires redress.

Without guidance lecturers advocating for the use of VR and AI in the classroom are challenged to demonstrate understanding the socio-cultural legitimacy of AI in Irish society. We present the cases of SEERLab that has been established to scaffold educationalists toward enhancing their attitudes towards VR and AI.

These challenges can be overcome using an innovative pedagogical approach to link the needs of teachers and lecturers and students to untangle the complexity of emerging technology and deliver educational solutions globally and nationally. The pilot cases presented include modules from Nursing, Business and PhD postgraduate programmes. The piloting of this technology is moving to implementation stage and along with evidence from

open educational communities we present the potential benefits and limitations of VR and AI in HE classrooms, which can lead to engaged students, innovative pedagogies, misperceptions, heightened sense of risk, inertia and resistance to its adoption. Universities, governments and organizations can work together to raise awareness about VR and AI through education and outreach initiatives aimed at different student cohorts but this necessitates greater knowledge in relation to accessibility, usability and educational 'buy in' and exposure to VR and AI technologies that combine scientific expertise with pedagogical know-how.

Keywords: Education, Sustainability, innovative pedagogies, virtual reality, artificial intelligence transformative learning, experiential learning

Introduction

This paper uses a novel approach to innovative pedagogy, introducing skill acquisition to actively engage students to achieve learning outcomes through use and assessment of emerging technology. Design and planning are critical elements of education provision, the literature is rich with models and frameworks to aid educationalists, however there is little evidence of disruptive transformative learning in the HE classroom. Following on from the global pandemic, most formal education ecosystems had to temporarily pivot to digital education. This paper presents a pedagogical approach that tightly couples classroom activities with the application of existing technology for teaching and learning outside of our comfort zone in a multi-faceted learning ecosystem. Furthermore, the case studies described here address complexity in the classroom, acknowledging the 'valley of death' approach used in transitioning research into practice, and furthering our understanding how innovative technologies only make a difference when deployed and used in line with user needs and requirements (Maughan et al., 2018).

Lecturers describe how they overcome fear from one's own comfort zone toward recognising the power of teachers as change agents using an array of community communication platforms to equip and enhance their toolkit with engagement tools tailored for their subject expert domain needs. Technology is a critical enabler to access knowledge, resources and people and has empowered those unable to engage with traditional educational settings to gain formal and informal knowledge whilst making learning more fun and engaging alongside other life responsibilities. Education as a career has expanded, teachers, tutors, lecturers, instructional designers, social and community enterprises, data analysts, database architects, facilitators all contribute to a complex education ecosystems that aspire to equality, inclusion and diversity. In order to guide lecturers into newer areas of module design we used templates to detail the pilots and their objectives across 4 programmes.

The pilots illustrate a sense of urgency to advocate for change, overcome complacency in classroom and introduce experimentation as a lever to learning in a failsafe ecosystem. Fear is identified as a concept that prevents the use of some technology due to its unpredictability and teacher legacy for being the person at the top of the class with all the knowledge. Times have changed, creativity is key and teachers are realising that they must prepare their students for failure in addition to success and that they need to model experimentation and failure to demonstrate that recovery and problem based learning prevails in a knowledge economy. As educator's compliance is a critical factor to meet the quality standards of our trade, meeting learning outcomes is just one part of the learning journey, gaining trust, delivery of engaging content and the realisation that students need an education ecosystem that promotes a nurture environment, self-actualisation and phronesis. Through this research 5 lecturers revised their delivery of content for their programmes to include the use of VR in the classroom. A number of internal workshops enabled the growth of confidence in using new VR apps and through peer learning opportunities lecturers were able to share knowledge and experiences in teaching and learning within a small community of practice. This research adopted a collaborative approach to finding out more whilst designing the new delivery and engagement methods. The sharing of context and experience in the classroom was promoted and regarded as essential to the ethos of this learning environment.

We adopted an agile curriculum development approach akin to software development that included a mechanism for feedback, co-creation of curriculum and discussion of alignment across disciplines (Wang, 2014). We believe this disruptive approach aligns to the principles of universal design for learning (UDL) which form a critical

ingredient promoted within our university (Cast, 2022). The design adopts elements of digital marketing to create a hook, Gravells (2014) and call to action language. Additionally, we leverage the concept of the zone of proximal development, peer learning techniques and scaffolding to enact our pilot to collaborate and use our creativity to experiment (Vygotsky, 1980 and Boud and Lee, 2005).

The course design has the usual boundaries of compliance to quality and module and programme learning outcomes. For this module though, the emphasis is on engagement, collaboration, transformative and innovative learning as promoted by Freire (in Darder, 2014) and UNESCO (Darder, 2014, Groff, 2013, Kitchenham, 2008, Perales and McCowan, 2021). This is further enhanced where learning is socially constructed within the socal constructivism paradigm and group work (Kim, 200, Biggs and Tang, 2015). We initially undertook a scoping exercise within our own university and nationally to explore current practices, this included on-site visits and feasibility studies to figure out the best approach. We decided on a short design time toward an implementation of the new design within a 9 month period.

During the semester discussions surround the use of technology enhanced learning and volunteer lecturers are empowered to be advocates of education that have adequate knowledge to inform policy-makers and leaders in education on priorities and challenges toward the national and global education agenda. This is further accentuated with the ongoing priority of the sustainable developmental goals (SDGs) and in particular SDG4. Whilst much of the practical lab tutorial work (still ongoing) within the pilots focusses on off the shelf software and non-integrated applications we generally observed that customisation of applications for education was unnecessary and added complexity to the pedagogical design. The potential for VR and AR in education has long been vaunted but limitations imposed by access to the technology, ease of use and software requirements have presented barriers to this potential been realised. A rapid decline in hardware cost, increased availability and ease of use, coupled with availability of low cost or open source software has mitigated many of the limitations highlighted in earlier studies. This paper shows that the time is ripe for more physical experimentation using education research labs. There are many elements within VR teaching and learning that cross disciplines such as student onboarding or orientation. We were able to share resources in this regard. We identify as a group of early adopters and want to reduce the lag time to general adoption, implementation and policy specification. A significant benefit of adopting advanced technologies is to facilitate a greater eco-system of learning tools to facilitate truly personalised learning (Humble and Mozelius, 2019). It is clear that there is a lack of understanding of how these VR technologies can be effectively deployed in a HE environment, their net contribution to learning, the risks associated with their uptake, and their potential to enhance the learning environment and student experience.

Whilst still in the implementation stage the pilots include the adoption of Virtualorator for entrepreneurship ideation, VirtualSpeech for pitch development, leadership and decision making, ShapesXR for prototyping and Oxford Medical Simulator for nursing triage. To date the lecturers have mapped the capability of the VR applications to the module descriptors and learning outcomes and trialled in a workshop environment, the next stage will be tested with students during semester and shared within faculty teaching and learning dissemination events.

There are a number of studies that examine the use of previous iterations of extended reality (XR) in education, and it is postulated that this technology could benefit in areas, such as complex data visualisation, design visualisation, digital twins, increased immersion and enhanced cognitive states. Using future literacy techniques students looked at emerging technology in addition to current technology to further move and voluntarily jump into zones of instability, questioning the ethics of artificial intelligence use in the classroom and in government (Miller, 2007 and Nemorin et al, 2023).

We feel that the toolkit currently available to lecturers in HE is restrictive and adversely impacting students that need more immersive learning and engagement mechanisms, our research advocates for open educational resources (OER) to include the sharing of hardware and software across the industry and educational landscape toward collaborative teaching and learning. Ireland's National policy[1] advocates for significant changes toward an optimised learning ecosystems 'Policy Platform: Progressing A Unified Tertiary System for Learning, Skills and Knowledge' but the processes and tangible pathways and avenues to realise this are not yet evident. This research

[1] https://www.gov.ie/pdf/?file=https://assets.gov.ie/225165/fff8a843-0df6-436a-ade1-ae060deadd45.pdf#page=null

goes further to collaboratively introduce cross-university sharing of knowledge and disruptive teaching and learning delivery through VR and AI.

Further research

It is planned to deliver modules using VR and AI by September 2024 following the pilot phase using physical hardware meta quest 2's and 3's for students to evaluate experiences and learning adventures using virtual reality and augmented reality. This testbed environment can facilitate a greater eco-system of learning tools that can enable truly personalised learning (Humble and Mozelius, 2019).

Known to help with student learning (Flink et al., 2019), immersive learning environments (ILEs) are learning situations that are constructed using a variety of techniques and software tools, including game-based learning, simulation-based learning and virtual 3D worlds. ILEs are distinguished from other learning methods by their ability to simulate realistic scenarios and environments that give learners the opportunity to practice skills and interact with other learners on their own terms by engaging their optimum learning style. Applying adaptive learning techniques can further accentuate the teacher or lecturers toolkit and increate the potential to be inclusive, flexible, personalised and engaging for students (Holmes et al., 2019).

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