

Learning in Cyberspace





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Virtual reality (VR) technology has made huge advances in the world of video games, embracing a whole new level of immersion and engagement. But what if we could use that technology to make our classrooms more immersive? Researchers at UM are designing the classrooms of the future through VR!

As you step into the room, you hear the familiar hum of conversation. Your classmates are spread around the classroom, chatting animatedly. As your professor stands at the front, waiting patiently, you notice the clock striking on the hour. Suddenly, a giant heart materialises in the centre of the classroom, accompanied by your professor's otherworldly voice, 'Today we're going to explore the biology of the human heart.'

As the lecture unfolds, the heart begins to expand, each vein and muscle tissue intricately labelled. What seemed like an ordinary classroom has transformed into a captivating space where the boundaries of reality and imagination intertwine. Welcome to education, where classrooms exist in the extraordinary realm of virtual reality! ▶

THE VR CLASSROOM

Developing a VR world requires a fair bit of tech, first and foremost: the actual VR headsets. These are large goggles that are worn on the user's head. Once you put on the headset, you're effectively 'in' the virtual world. Controllers, one strapped to each hand, allow you to interact with the world around you. Stepping into the virtual world is incredibly immersive, so it comes as no surprise that some video games are also making use of VR. But how does this work for educational purposes?

Paul Psaila is a master's student working with Prof. Matthew Montebello, head of the Department of Artificial Intelligence at the Faculty of ICT at UM. Using the popular game engine, Unity, Paul decided to create his own VR classroom. 'We're testing an AI being used in a VR classroom to dynamically change the classroom to tailor it to each individual student,' Montebello elaborates that, 'the goal here is immersion. It's in a first-person perspective, so the body experiences it first hand.'

'Essentially, you can have an actual classroom from anywhere. A student can log in and join a classroom, as opposed to a Zoom meeting. This gives variety to the learning environment. Plus, because you're already in a VR environment, you can have unique experiences where you put virtual objects in the environment to show and teach,' explains Paul. For example, you can show actual objects in motion when teaching physics or an actual 3D model of a heart for biology. This takes something like conventional diagrams in textbooks and completely modernises them.

The beauty behind this kind of technology is the customisation aspect. The virtual environment can be anything. 'If you're doing maritime education, you can have an underwater environment;

aspiring lawyers can be put directly into a courtroom simulation. You're essentially training them through a simulation,' explains Montebello. This is the same kind of technology that Ford uses to train their big rig drivers or which pilots use before training on an actual plane.

When it comes to Paul's world, the idea is to create a different virtual world for each student while still allowing them to interact with each other. 'When you customise a product or service, it gains value. We want to add that to education,' adds Montebello.

CUSTOMISED EDUCATION

Every student is unique; they have their own learning styles, particular interests, and specific needs. However, having teachers create specific material catered to each student in their class is an extremely daunting prospect. With AI, this is something that could easily be facilitated. 'The idea here is to start with the environment first,' explains Montebello. A student with an interest in sports would have their profile. Their virtual classroom environment could be sports-themed, while another student in the same class, interested in fishing, for example, would have a different profile, and their classroom would change accordingly. Yet, they'd still be in the same class and interacting with the same students.

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'For now, the learner profile is developed based on their actions in the virtual world to create a profile. But in the future, it could be possible to import a pre-existing profile,' explains Paul.

Besides Paul, there are also four other undergraduate students: Pedro Guidobono, Luke Cassar, Janice Xerri, and Gianluca Sciberras, who are working on a similar project. 'By having a group of students working on similar ideas, we can encourage a system where they can use each other's research. For example, one of the other students is working on creating a learning profile that collects information about a specific user, such as what websites they like, their strengths, interests, and needs. This profile could also be integrated into Paul's world,' explains Montebello.

Learning within virtual reality goes beyond a simple Zoom call or online conference, where students are passively receiving information. By having avatars, or virtual personas, students can interact directly with each other and the class. By using generative AI to scan their faces, the avatars could have a physical likeness. Alternatively, avatars could also be something completely different, more akin to character creation screens in video games.



Left to right: Pedro Guidobono, Janice Xerri, Gianluca Sciberras, Prof. Matthew Montebello, Luke Cassar, and Paul Psaila. Photo by James Moffett

However, this customisation isn't limited to just the students and their digital representations. The technology goes much further than that! For example, a lecturer would be able to simultaneously deliver the same lecture in a variety of languages. 'Through the use of AI, you can have a generative AI develop and prepare a lecture in advance, in any language. This allows for further customisation, so a student would be able to hear a lecture in their native language,' adds Montebello.


'We're converting one of our labs to an audio-visual studio. The lecturer would record a 3-minute video clip of themselves speaking, and this would give the AI the information it needs to generate more videos using the lecturer's likeness. The AI would then be able to translate the lecture into a variety of languages, and the avatar itself would even be able to deliver the lecture in those languages,' Montebello says.

While VR could revolutionise the way lectures are given, it could also help to modernise the way students are assessed. Instead of simply having students write their assignments or exams, VR could be directly incorporated. You could have exams that use videos or 3D models. For example, in the case of architecture, you could have students inspect a building through VR and try to identify potential issues or faults.

BACK TO REALITY

Despite its exciting prospects, there are still challenges that need to be overcome. One of the biggest challenges is the barrier of entry in terms of price. Each commercial headset can cost anywhere from €500 to €3,500. Ensuring that each student has a headset could very quickly add up. Furthermore, some people can experience a degree of motion sickness through VR. 'When it comes to motion sickness, the technology has improved a lot, for example by increasing the refresh rate,' explains Paul. 'The technology has come a long way, but some people might still be unable to use the technology. In this case, they would be able to log on virtually through their desktop, for example, instead of using a VR headset.'

However, the technology could have a huge impact on individuals with disabilities. Controllers are being developed for people with specific disabilities, and those who are physically challenged can experience a whole new level. In fact, within the AI department at the Faculty of ICT, VR has been used to show how individuals with autism experience the classroom. This has helped to inform lecturers and students and allows them to create a more appropriate environment.

The potential for VR technology is immense. Given the unparalleled levels of immersion and engagement that VR provides in video games, it only makes sense to harness and apply this capability to education. Montebello concludes, 'When it comes to VR learning, it is only our imagination and creativity that are the limit!' 

Further Reading

Montebello, M., Saini, A. (2022) Integrating Game Theory into a Virtual Learning Environment. In *Proceedings of the 16th International Technology, Education and Development Conference (INTED2022)*. (pp. 4637-4641). Online. DOI: 10.21125/inted.2022.1227

Montebello, M., Camilleri, V. (2021). VLE meets VW. In *Handbook of Research on Teaching with Virtual Environments and AI* (pp. 616-633). G. Panconesi & M. Guida (Eds.). IGI Global.

Montebello, M., Camilleri, V. (2018) Virtual Reality for Academics' Career Professional Development. In *Proceedings of the 2018 7th International Conference on Educational and Information Technology 2017 (ICEIT 2018)*, Oxford, UK.