



# Digital Excellence Impact Case Studies

2021/2022

TUOLE: Reimagining the Student  
Experience using Immersive  
Learning Experiences

*by James Bingham*

Planning  
Your  
Module



Introducing  
Your Module  
to Students



Structuring  
Your  
Content



Design,  
Collaboration  
and  
Construction  
of Knowledge



Formative:  
Putting Your  
Learning into  
Application



Designing Your  
Summative  
Assessment



Concluding  
Your  
Module





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With the growing sophistication of advanced digital technologies such as artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and mixed reality (MR), immersive learning is coming to life. These technological advances have the potential to provide rich contextual customised learning experiences for every individual. By layering virtual content on top of printed materials, objects or geographical locations, the opportunities for meaningful learning experiences in pedagogy are endless.

### Background:

TUOLE, the leading international designer and developer of engineering and technology open learning programmes, has one of the largest portfolios of accredited open learning programmes serving the engineering and process industries worldwide. TUOLE has been operational for 25 years and since 2002 has been part of Teesside University School of Science and Engineering. Our HNC/D programmes are accredited under licence from Edexcel.

As part of the Module Content Refresh project, there was a need to refresh the content of 11 core modules and 31 optional modules in order to improve student learning, assessment and progression. This meant taking predominantly paper-based learning materials and turning them into digital, interactive content to be deployed in the Blackboard virtual learning environment. Whilst the project has been highly successful, we are now looking to the future and how further improvements can be made, taking advantage to new technology and modes of learning.

### The future of online learning and education 4.0:

Distance learning environments have faced criticism for causing disengagement between students and their courses for reasons like technical issues or improper amounts of visual stimulation related to the lesson. Other factors that negatively impact student engagement in traditional online learning environments are related to having too much or too little stimuli during the lessons.

### How can we use these technologies to improve distance learning and teaching in the context of TUOLE?

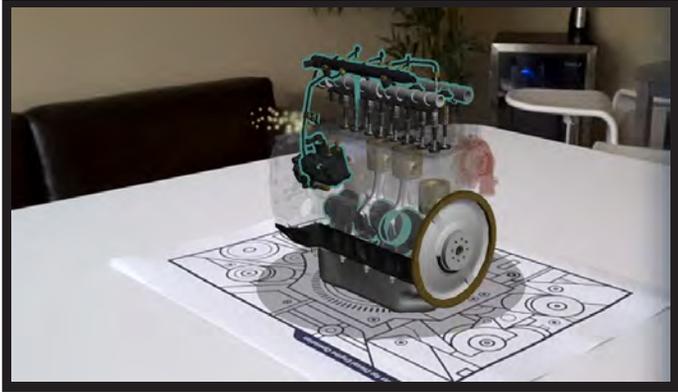
The possibilities of experiential learning through virtual, mixed and augmented reality are vast. Experiential learning is an engaged learning process whereby students “learn by doing” and by reflecting on the experience.

According to American educator David Kolb, effective learning is seen when a person progresses through a cycle of four stages: of (1) having a concrete experience followed by (2) observation of and reflection on that experience which leads to (3) the formation of abstract concepts (analysis) which are then (4) used to test hypotheses in future situations, resulting in new experiences.

We can imagine a scenario where students experience an immersive TUOLE module on Heat Engines. With the help of immersive hardware and software, the student can go ‘inside’ the engine and get a deep, immersive sense of oil systems, understand how the cooling system works or any complex system from a first-person perspective. Such ‘look-see-do’ modes of learning encourage students to explore, identify, and experiment with the content at their own pace. In addition, by incorporating properly created VR and AR libraries, we can move beyond traditional learning to provide an environment where students are engaged and inspired to explore further. Such interactions also enable students to deeply absorb abstract concepts where simple text might struggle convey effectively.

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By incorporating AR, VR and mixed reality effectively into an online study programme, students have agency over what they want to explore, for example, choosing to move around a particular engineering component or piece of machinery and seeing it work in real time.



At first glance, and especially in terms of individual features, AR and VR educational solutions appear to be ideal choices to help combat the challenges with student motivation, engagement, and information retention. Due to the fact they closely mimic learning in-person through a 3-dimensional environment, the use of AR and VR technologies as educational tools has been demonstrated to improve knowledge acquisition among a variety of educational subjects

When it comes to implementing augmented reality technology into the online learning environment, there are a few design principles that should keep in mind. The first question should be why? Why are we implementing the technology and how do we intend to use it to support learning goals? Haphazardly introducing a technology just for the sake of using it will not necessarily lead to improved outcomes. The second question is how? There are a plethora of AR and virtual systems and software available, so choosing the right technology is key. Currently, Teesside University is introducing a suite of software applications via Adobe Creative Cloud. Adobe Aero is an intuitive, effective augmented reality tool that allows users to build, view, and share immersive AR experiences. Currently, all staff and students can access Adobe Aero via the Future Facing Learning toolkit on their iPad which means that content can be created, uploaded, and viewed from a single source. We are currently exploring opportunities with Adobe Aero as a simple, effective transition into using immersive technology for online learning.

**“Augmented, virtual and mixed reality is a tool that can be best put to practice with a little planning.”**

## **How can we use these technologies to improve distance learning and teaching in the context of TUOLE?**

The state of augmented, virtual and mixed reality in online learning today is still quite fragmented. Researchers have made significant strides in understanding some of the best approaches to integrating augmented reality, but it remains one of the newest fields in education. Because of that, educators are still finding new ways of effectively using the technology in the classroom.

The best role for augmented, virtual and mixed reality is as a supplementary tool, rather than as a primary method of delivering content. So, while we can use it to bring lessons to life, we also need to maintain a focus on more traditional ways of delivering content. Augmented, virtual and mixed reality is best suited to enhancing those traditional lessons rather than acting as stand-alone methods of delivery. It is also worth noting that if students do not possess a certain level of technological knowhow, they won't be able to work with the technology effectively.

Augmented, virtual and mixed reality is a tool that can be best put to practice with a little planning. Creating online lessons that use the technology to enhance, rather than replace, more traditional instructional approaches seems to be the best approach. This can be done by using the many apps that make augmented reality such a flexible and powerful tool for use in the classroom.