Reinventing education through generative AI and XR

- Extended reality (XR) technology and generative artificial intelligence (AI) have reached a critical moment.
- Dr James Hutson of Lindenwood University in the USA is pioneering their role in education.
- The gamification of education – or adding gaming elements to learning – has multiple benefits for teachers and students.
- Excitingly, Hutson has developed 'The Museum of the Lost', an educational virtual reality game that teaches the ethics of cultural repatriation.
- Generative AI technology can realise personalised education, a field which Hutson is leading.

There comes a juncture moment in the development of any significant consumer-focused technology where its functionality improves and its price decreases. That moment triggers a rapid uptake in the technology, and the result can be transformational. Extended reality (XR) technology – the umbrella phrase for technologies presenting augmented, mixed, and virtual realities – and artificial intelligence (AI) are at that point, and one US-based senior research specialist in visual culture is taking them into some extraordinary spaces.

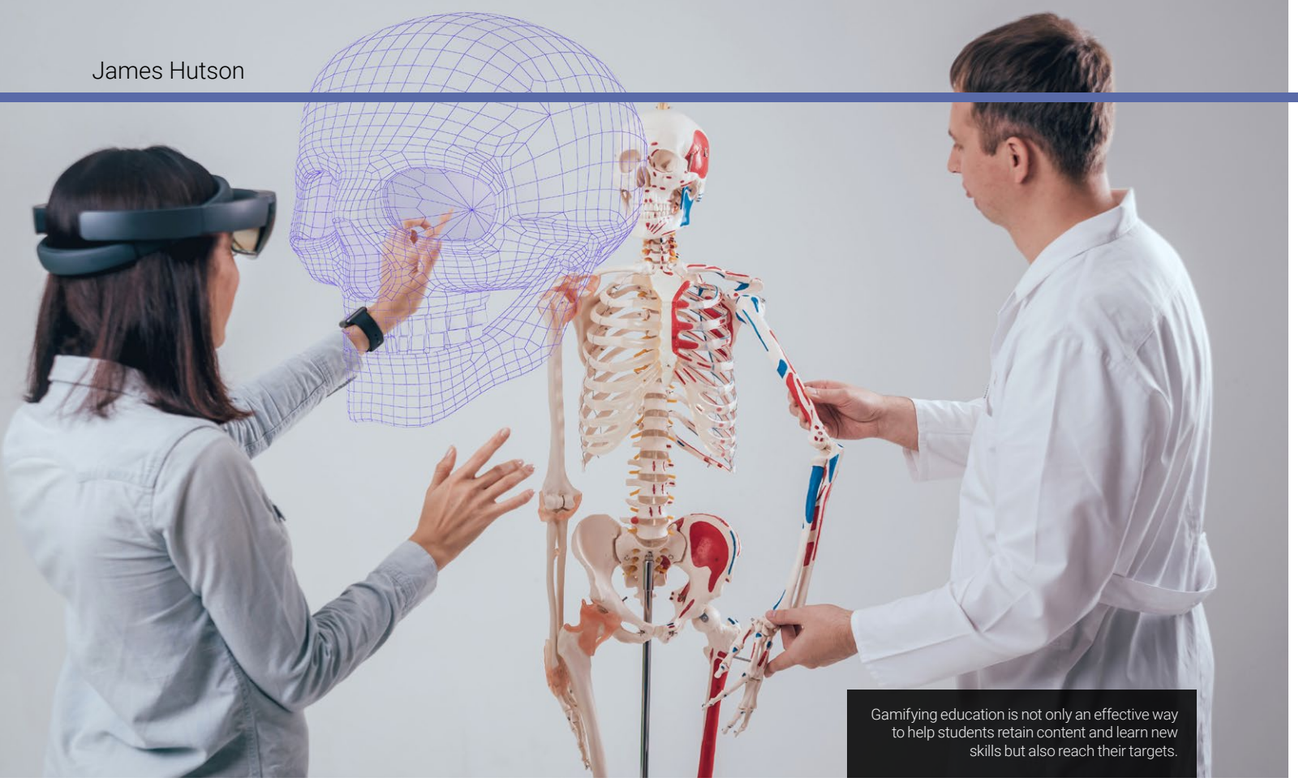
Dr James Hutson at Lindenwood University in St Charles, Missouri, USA, is exploring imaginative and disruptive ways that technology can transform our lives. He has a particular interest in areas we don't usually consider when thinking about the realms of extended reality. The technology has its champion sectors, notably entertainment and gaming, the military, and hi-tech industries such as aerospace and engineering. Hutson is looking beyond those to focus on using extended reality in history, art, culture, and education, and his timing is spot on.

Expectations of XR technology

Education has reached a crisis point where its standard sage-on-a-stage model of a teacher imparting wisdom to a pliant class that absorbs and then regurgitates that wisdom through examination is essentially defunct. Young people now have unfettered access to information through mobile technology – they don't need it fed to them – and actively immerse themselves in creative realities through gaming at every opportunity. As a result, the higher education learners of today are easily distracted, and they expect XR technology to be part of the classroom; they're probably wondering what's taking it so long.

> **Imagine learning about ancient Rome standing next to Julius Caesar, surrounded by angry senators, moments before the knives come out.**

Knowing this, and that learning is more engaging when entertaining, Hutson has embarked on a series of initiatives to integrate XR technology into higher education and online education, and most recently in collaboration with assistant professor, Dr Trent Olsen. Hutson was instrumental in establishing the Immersive Arts and Culture Hub and XR and Gaming Lab at Lindenwood University, which is finding places for immersive experiences across all programmes. This 'gamification' of education has multiple benefits for teachers and learners. Research has shown it can improve motivation and 'time on task', increase the enjoyment of learning, and encourage deeper learning and long-term retention. It can immerse learners in environments to better understand course content, providing rich, visual context – imagine learning about the history of ancient Rome, not from a textbook but standing in the Curia of Pompey next to Julius Caesar surrounded by angry senators, moments before the knives come out.

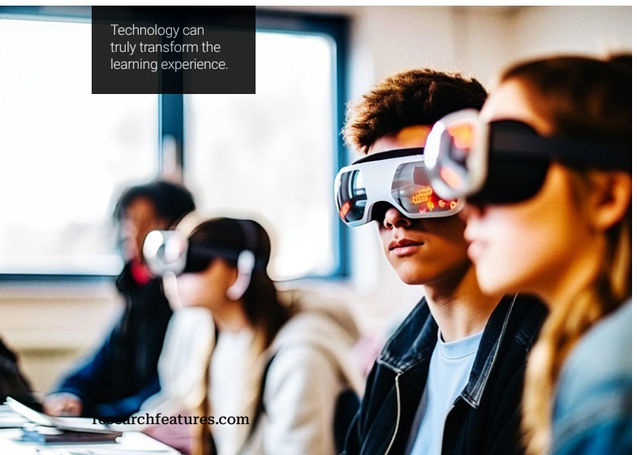


Gamifying education is not only an effective way to help students retain content and learn new skills but also reach their targets.

Such XR experiences also offer students opportunities to interact with each other inside virtual spaces – moving students from passively consuming content to actively creating a learning experience. For educators, gamifying education is not only an effective way to help students retain content and learn new skills but also reach targets — critical components of any compelling game. Also, because such experiences are structured, they provide all students who engage with them with an equitable education.

The Museum of the Lost

As an example of this gamification of education, working with a team of game designers, coders, and art historians, Hutson helped design 'The Museum of the Lost', a virtual reality game that teaches the ethics of cultural repatriation through the lens of art history. Working their way through the various levels, students playing the game come across artworks looted during wars of the last two centuries. They encounter the complex issues facing those collecting artefacts from other nations and peoples and the ethics behind cultural ownership. Even though the game focuses on art history, the ethics are applicable today; witness the cultural appropriation of Ukrainian heritage by Russian forces during the current war and the ethical debates about whether the British Museum should 'return' some of its most famous artworks deemed 'stolen' by the countries of their origin.



Technology can truly transform the learning experience.

This meeting of the museum and the Metaverse (the emerging 3D-enabled digital space that uses virtual reality and other advanced internet technology to allow lifelike online experiences) is just one area of research that attracts Hutson. He is also interested in how XR can help neurologically diverse students. He has investigated how virtual reality in art therapy can mitigate the symptoms of autism spectrum disorder and how the Metaverse can help neurodiverse learners develop the necessary people skills in preparation for the future world of work.

Hutson's passion for education runs deep. He has taught over a hundred online courses and designed dozens of award-winning online degrees – four of which are ranked in the top five best online programmes worldwide. He also serves as editor-in-chief for the *International Journal of Emerging and Disruptive Innovation in Education*, an interdisciplinary forum for publishing original peer-reviewed scholarship, data, and research addressing intersections of education and technology.

Vision and passion

Hutson believes that education is poised to enter an inspiring space. Teachers have at their fingertips technology that can truly transform the learning experience. He points to generative AI as an example. This technology embraces artificial intelligence to generate content. For educators, it heralds opportunities in a long-considered holy grail in teaching: personalised education. Not only can this technology help educators create exciting, interactive activities such as simulations and games, it can also generate questions for a student based on their grasp of a subject and bespoke study plans for each student in a class.

Generative AI in education and gamification using XR are just two examples of technology encouraging the reinvention of education. These are exciting times for learners, which is why we need more people with the vision and passion for education shared by Dr James Hutson.

Hutson has investigated how virtual reality in art therapy can mitigate the symptoms of autism spectrum disorder.

Personal response

What attitudinal bulwarks do you encounter for the gamification of education, and how do you address these?

In my experience, most educators are quite open to the use of gamification and game-based learning but either don't know how to get started, don't believe they have the skillset, or don't see how their field can be appropriately gamified. Of the two, gamification is much easier to achieve as game-like elements, such as scoring, mechanics, leaderboards, and such, can be easily integrated into regular classroom activities, regardless of the modality. The challenge in the past has been in game-based learning, which often required technical skills associated with hardware and software, such as game engines. Faculty who did not have a game design programme at their institution often worked alone or were never able to get their projects off the ground. Luckily, our research addresses all of these concerns in various case studies and steps to operationalise educational gaming no matter the institutional assets, capabilities, or size.

What motivations do learners share for using XR technology in the classroom?

The motivation initially to use XR technology, such as augmented reality (AR), mixed reality (MR), or virtual reality (VR) – where most of my research has been focused – has changed over the past few years and definitely since the pandemic. When we started case studies on pedagogic research on the potential benefits of integrating XR in the classroom in 2020, we found that few students in any demographic had even used the technology. However, after Meta popularised the hardware, making it more affordable with an all-in-one solution, we saw an increase of roughly 15 to 20% semester on semester. Most students who had experience were gamers and did not use games for educational purposes. Therefore, the initial motivation was the class requirement to have an experience, but as time has gone on, the benefit of these immersive learning experiences has grown, especially among the 18-to-25-year-old demographic and now having meaningful, deeply engaging learning experiences is a major motivator, while social VR and addressing social anxiety and depression among college-age students has also shown to be critical for overcoming fears of public speaking, working in teams, and more.

What drives your interest in the use of XR technology in helping neurodiverse learners?

Research into helping neurodiverse learners is quite personal and close to home as my son was diagnosed with autism spectrum disorder (ASD) and after having that diagnosis there was an immediate improvement in his general mood, performance in school, and mental health and wellbeing. The reason is that we were able to change the environment and not the person. Previous research on ASD has focused on 'treating' the symptoms in order to force those on the spectrum to be more neurotypical and to function within 'normal' social conventions and expectations. But with the advent and widespread use of new immersive technologies, we would be preparing students for a world that no longer exists. These technologies can afford millions to unlock their potential without the sensory processing issues that would otherwise impede their performance. We are entering a new era of work and life that is increasingly hyperreal and virtual, and we as researchers and educators have a duty to leverage emerging technologies for the betterment of the population as a whole.

What do you say to teachers who are anxious about learning this new technology?

What has amazed me most in working with educators globally is that they honestly have the best intentions for their students' learning outcomes and future personal and professional success. Therefore, when there is anxiety about new technologies (that are increasingly proliferating) entering the world of education, most educators want to adopt them, but may not know how. I would say to those individuals that they absolutely can use all of the emerging technologies and gamification strategies from my research without being a 'techy person'. The barrier to entry has been lowered in both user-friendliness and affordability so that we can now integrate immersive and engaging experiences at all levels from birth throughout lifelong learning that will be demanded with the emergence of the digital age.

Details

e: jhutson@lindenwood.edu
www.linkedin.com/in/jameshutsonphd
w: www.james-hutson.com/index.html
w: www.digitalcommons.lindenwood.edu/ijedie

Funding

Lindenwood University PRIDE Fund Grant

Collaborators

Special thanks to collaborators Prof Ben Fulcher, Assistant Professor of Game Design, who worked with Hutson on The Museum of the Lost, and Prof Joe Weber, Department Head of Art, Production and Media, who created the digital twins for the Florentine Church article.

Hutson would also like to thank all his collaborators involved in the research, including Stephanie Afful, Kathryn Arnone, Sara Bagley, Gaurango Banerjee, Colleen Biri, Geremy Carnes, Jason Cellabos, Kyle Coble, Peter Cotroneo, Ryan Curtis, Sue Edele, Ben Fulcher, Lawson Hardrick, Katherine Herrell, Barbara Hosto-Marti, Paul Huffman, Piper Hutson, Theresa Jeevanjee, Naresh Kshretri, Michael Leary, Jason Lively, Elizabeth Macdonald, Erin Martin, Mike Marzano, Caitlyn McGinley, Travis McMaken, Elizabeth Melick, Nancy Messina, Carla Mueller, Rodger Nasser, Morgan Nichols, Kurt Odenwald, Trent Olsen, Gillian Parrish, Margaret Pavone, Daniel Plate, TJ Rains, Jeremiah Ratican, Scott Richmond, Bryan Robertson, Christie Rodgers, Gabriele Romero-Ghiretti, Angela Russo, Ana Schnellmann, Ben Scholle, Chris Smentkowski, Marcus Smith, Robert Steffes, Mark Valenzuela,Tara Vansell, Vanessa VanderGraaf, Vanessa Vosevich, Joseph Weber, Laura Wehmer-Callahan, Peter Weitzel, Graham Weir, Andrew Wright, Shannon Wright, and Lisa Young.

Bio

Dr James Hutson is a senior research and innovation specialist at Lindenwood University in the USA, serving as XR Disruptor and department head of Art History and Visual Culture. He specialises in immersive realities, digital humanities, and the gamification of education. Hutson also serves as editor-in-chief for the *International Journal of Emerging and Disruptive Innovation in Education:* VISIONARIUM.

References

- Hutson, J, Hutson, P, (2023) Museums and the metaverse: emerging technologies to promote inclusivity and engagement. Application of modern trends in museums [Working Title], *IntechOpen.*
- Hutson, J, (2022) Social virtual reality: neurodivergence and inclusivity in the metaverse. *Societies*, 12 (4), 102.
- Hutson, J, Fulcher, B, (2022) A virtual reality educational game for the ethics of cultural heritage repatriation. *Games and Culture.*

LINDENWOOD UNIVERSITY