Emerging technologies driving the future of online learning

With many university courses and students forced online during the COVID-19 pandemic, can digital tools replace face-to-face teaching, particularly for medical and nursing students who traditionally rely on physical access to labs?

As universities around the world transitioned to online learning with mixed results over the past 12-18 months, there has been increased focus on the most effective ways to integrate immersive technologies for best practice remote learning.

According to Professor Jill Downie, Curtin University Deputy Vice-Chancellor Academic and Australia's National Education Commissioner to UNESC0, this online shift had a positive effect on the global higher education sector by making it more interactive.

While the physical campus will continue to be an option for students, Prof Downie believes innovative and immersive technologies will be integrated into university teaching and learning by 2050.

Already, some universities in Asia have embraced these digital opportunities, offering a combination of virtual experiences for their students:

• The National University of Singapore is creating projects with virtual reality (VR) and augmented reality (AR) capabilities to create more immersive remote learning. These include an AI-powered virtual counselling application showing a 3D simulation of a patient, including a pregnant woman; and Patient Safety as Inter-Professional Training providing virtual experiences for medical students to understand how to treat patients safely.
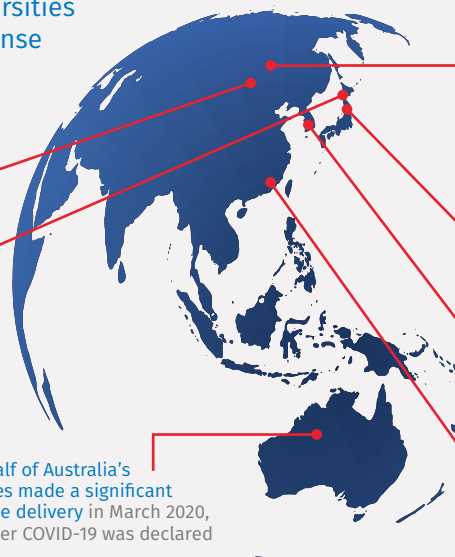
• Singapore Management University is developing an integrated digital learning strategy for undergraduate and postgraduate students, as well as professional and executive education.

• City University of Hong Kong is using VR technology to conduct virtual experiments on different courses, with online teaching and the hybrid mode both effective ways of teaching, according to a campus-wide survey.

• A Hong Kong University simulation ward activity included scenarios related to the Accident and Emergency Department, medical and surgical ward and intensive care unit for the high-fidelity simulators and standardized patient.

189 of the world's top 200 universities moved teaching online in response to the pandemic

Zhejiang University moved more than 5,000 courses online just two weeks into the transition using the Learning at ZJU course hub and DingTalk ZJU live streaming app.

Japan's education ministry set aside 2.7 billion yen (about $25.3 million) in the fiscal 2020 revised supplementary budget to assist universities and other institutions build online learning systems to keep classes rolling during thae coronavirus pandemic.

More than half of Australia's 41 universities made a significant shift to online delivery in March 2020, one week after COVID-19 was declared a pandemic.

Peking University launched live online programs for 2,613 undergraduate courses and 1,824 graduate courses to ensure normal teaching operations.

65.8% of state-run universities and 35.9% of private universities and junior colleges in Japan introduced remote teaching.

Despite a smooth transition to online education, South Korea's experiences demonstrate a need for long-term, systemic change and policy.

City University of Hong Kong (CityU) introduced the CityU-Learning system in early February 2020, the first local university to conduct online learning on a campus-wide scale. By March 2021, more than 220,000 classes were conducted, with around 5.8 million visits from around the world.

VR PROVIDES COST-EFFECT CLINICAL TRAINING SIMULATION

The increased pressure on budgets and standardization makes virtual reality (VR) more cost-effective for delivering clinical training simulation for both students and educators. VR also provides shared simulated clinical experiences that facilitates quality interprofessional education at scale, transforming educational delivery.

Dr Donovan Jones, Senior Lecturer at Charles Sturt University's Faculty of Science and Health, says digital tools allow medical and nursing students to experience situations that would otherwise be dangerous or confronting.

"For example, a real-life immersive experience such as a cardiac arrest provides a true insight to the pressure and stress that medical and nursing students need to prepare for in the future clinical environment," he said.

"Transformative digital technologies such as VR are rapidly becoming established as a valuable method of teaching clinical-based emergency skills and continuing professional development in a safe environment to improve confidence and competence."

Dr Jones says VR (which addresses all four learning types for students - visual, auditory, read-write, and kinaesthetic) is an innovative and largely unexplored area in health education, accreditation and training in Australia.

"Learning environments are most effective using a combination of teaching styles to educate health professionals about important content and emergency clinical skills, regardless of their learning style preference.

"While traditional emergency simulation and training requires costly hi fidelity equipment and qualified personnel to run them, VR affords substantially lower costs, and can be used anywhere the student or health professional has access to a smart phone and VR glasses."

VIRTUAL ENVIRONMENTS CAN IMPROVE STUDENT PERFORMANCE

iN2iTY LAB CEO Greg Higgins says flipped learning is common in many areas of undergraduate study, with traditional lectures (typically delivering theory) pushed to students online in more engaging and digestible chunks.

"Auto-grading tools are used to monitor understanding and provide feedback if students are having difficulties with troublesome knowledge areas. This helps better prepare students for more practical work often conducted in smaller tutorial groups."

Mr Higgins believes VR is best used as an additional learning tool to face-to-face delivery, providing students with an opportunity to practice specific tasks or scenarios that might be difficult, or dangerous, to practice in real life.

"Use cases and case studies have demonstrated that when used this way, a simulated, learning-by-doing scenario in a fully-immersive virtual environment can improve student performance significantly," he said.

In 2020, an Immersive Learning Prototype project by TAFE NSW Digital Lab demonstrated that student performance in assessment dramatically improved when some of the learning occurred in VR compared to using only traditional learning methods.

The project results showed that students who completed training using virtual reality were more successful (90%) at assessment tasks compared to the traditional learning cohort (55%).

> " *Collaboration platforms will need to support interaction with individuals who have more diverse learning needs and preferences than ever before. Integrating and building in artificial intelligence and machine learning to help people along that path means that collaborative technology will start to become more and more embedded into the strategies to improve the future of learning outcomes.*"
>
> *How digital collaboration is shaping the future of healthcare and education*

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DIGITAL LEARNING MUST FOCUS ON THE STUDENT EXPERIENCE

Even as universities are re-focusing their efforts on providing more flexible and immersive online learning in the wake of the COVID-19 disruption, a 2021 KPMG report suggests that the student experience is core to this recovery.

The report says those universities that will survive and thrive can deliver the following at a competitive cost:

• Serve diversity at scale

• Deliver rich digital learning and engagement

• Design service platforms in line with student expectations

• Partner with the individual student to co-create an education and engagement experience

• Understand and serve students' preferences.

Similarly, an earlier report on Peking University's online delivery during COVID-19 identified five high-impact practice principles for online higher education:

• High relevance between online instructional design and student learning

• Effective delivery on online instructional information

• Adequate support provided by faculty and teaching assistants to students

• High-quality participation to improve the breadth and depth of students' learning

• Contingency plan to deal with unexpected incidents of online education platforms.

Although the global e-learning market is growing at a compound annual growth rate of 13% and will be worth USD $388 billion by 2026, the KPMG report says, "Many traditional universities are organisationally unable, or culturally unwilling, to participate in this and some competitors are becoming stronger and stronger".

The role of education institutions is shifting from being repositories of knowledge to teaching learners to curate, challenge and extend knowledge, redefining research and teaching methodologies via technology.

Can the universities of today lead learning for tomorrow? The University of the Future

BENEFITS AND CHALLENGES OF ONLINE LEARNING

Flexibility, online support and self-management were some of the key themes of student experiences during the transition to online learning by higher education, according to a report by the Australian Tertiary Education Quality and Standards Agency.

Students reported their positive experiences as:

• Flexible access to materials, assessment, and academic help and advice online

• The technology used made it easier for students to learn.

• Better learning outcomes (some reported improved retention in semester 1).

The report also identified the following themes raised by students as they adapted to online learning environments:

• Reduced interaction with academic staff and peers

• Difficulties with it and variation in staff expertise in its use

• Assessment changes

• Isolation, lack of engagement and reduced motivation

• Difficulty with the translation of some subject areas from an internal to an online mode of delivery.

These challenges were echoed in a survey by Lingnan University in May 2020:

• Only 27% of university students in Hong Kong were satisfied with their online learning during the COVID-19 outbreak.

• 60% found online learning less beneficial than classroom teaching.

• Students cited internet connection, no in-class interaction and lack of after-class communication and engagement with instructors.

• The main challenges of online learning were lack of self-discipline (59.98%), a poor learning atmosphere (56%), and eye fatigue due to long screen time (54.77%).

DIGITAL TOOLS FOR MEDICAL AND NURSING EDUCATION

These changing online education environments highlight the importance of effectively engaging with students beyond the classroom and lab.

Lippincott's Virtual Anatomy Center provides a range of interactive digital human anatomy resources that can augment student learning, increase their engagement, support self-directed learning, and can be easily integrated into courses and curriculum:

- Acland's Video Atlas of Human Anatomy contains nearly 330 videos of real human anatomic specimens in their natural colors, including ground-breaking videos of the inner ear. Dr. Robert Acland presents moving structures—muscles, tendons, and joints—making the same movements that they make in life.

- Grant's Anatomy Lab enables instructors to customize dissection instructions and related text and image content to help students prepare for the gross anatomy lab, follow step-by-step instructions during cadaver dissection via in-lab computers or iPads, and review for exams.

- Visible Body® is a suite of interactive online programs that bring human anatomy to life through 3D anatomical models, video animations and simulations, and cutting-edge, augmented reality technology.

- Lippincott digital tools provide integrated learning solutions for nursing students.