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What is working and what is not in higher education technology enhanced learning

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COMMENDATIONS & RECOMMENDATIONS FOR TECHNOLOGY-ENABLED HIGHER EDUCATION
This week, one of my media staff invited me in to demonstrate his work on virtual reality in higher education. He fitted me with the latest Oculus Rift headset and controllers. I went for a tour of the human body, travelling through the skin to the muscles, organs and bones. Then I visited an office, where I brought objects to virtual life by using a simulated 3D printer. It was all very cool and exciting. It reminded me of my stats professor taking me to the computer lab and showing email to me and my peers. He said that email was going to revolutionise education. I could not see how, but I believed him. Once again, I cannot envision just how far virtual reality, in combination with artificial intelligence, is going to take higher education. What I do know is that we are on the cusp of something exciting and I am optimistic about a whole new type of learning for my future grandchildren.

Across nearly 30 years, two countries and three universities, some of the roles I have held include postgraduate student, researcher, practicum coordinator, tutor, director and professor. In addition, national research grants have allowed me to visit most Australian universities. These experiences, over this timeframe, have led me to three groups of seven: seven conditions for a university to qualify as excellent, seven exemplar applications of education technology and seven technology-related problems or challenges.

University Excellence

1. Graduate success
These universities acknowledge that the primary reason most students go to university is not for university itself, but for what comes after, and thereby set students up for graduate success, including in careers.

2. Knowledge, skills and attributes
Learning is clearly defined and supported as positive change and development in a balance of knowledge (both discipline-specific and overall), skills (both technical and super-skills such as problem solving) and attributes (meaning that a graduate has become someone more advanced and mature than if they had not gone to university).

3. Assessment and feedback
Much of assessment at these universities is designed as learning opportunities whereby students are given rich and compelling assignments and specific, personalised feedback, as well as iterative chances to adopt, adapt and improve.

4. Student experience, learning and graduate outcomes
The university embraces each student as a whole person and makes university life about heightened opportunities for the overall student experience (including social), learning and graduate outcomes.
5. Passionate staff
Staff (including but not limited to academics) are happy and passionate about supporting students, teaching, research, leadership and/or contributing to communities. Furthermore, these staff persons pass that enthusiasm on to students, thereby creating healthy learning cultures.

6. Student diversity
All students are respected, believed in, trusted and treated as diverse individuals with multiple life roles and responsibilities within and beyond the university.

7. Learning to think
Students are invited, compelled and taught how to think, inquire, learn and to develop and portray their distinct identities and value propositions.

Exemplar Technology Applications
Just as there are these seven descriptors that characterise university excellence, there are also seven applications of technology that I have experienced as exemplar. This full set of technologies is not present at all (or most) universities, but large numbers of these technologies are applied at those universities who are striving to achieve some or most of the characteristics of excellence described above.

1. Micro-credentialing and badging
Some universities have realised that pre-packaged degrees do not work for some students in some contexts and as development for emerging careers. These universities use supporting technologies to manage, document and certify the offering of short modules. Students can complete these modules in a personalised sequence and timeframe that works for them. Students receive badges for each completed module. Completion of a specified number of badges qualifies students with a degree. Technology, in the form of online learning management systems, digital portfolios and databases, has enabled this personalisation and flexibility.

2. Program mapping
While some disciplines and corresponding industries lend themselves to micro-credentialing (e.g. ever-shifting digital industries), others are better suited to a fixed, sequential offering. This is the case for many degrees that lead to membership in professional associations, such as engineering and nursing. Technology has enabled careful mapping, benchmarking and refining of programs versus haphazard collections of courses (individual units of instruction which some universities call subjects). This allows careful learning plans that sequentially progress students through being introduced to knowledge, skills and attributes, which are further developed and then assured (certified) closer to graduation. Furthermore, assessment is carefully planned and managed in regard to type, sequence and content.

3. Data analysis
Netflix makes choosing movies easy, because algorithms sort and classify choices onto the viewer’s personal picks based on characteristics of their watch history. Likewise, education uses data such as how long students spend on which online resources to create a profile and make predictions about future behaviours. Specifically, some universities now have clear predictors indicating which students are likely to succeed with the standard offerings and which are likely to need extra supports so that they do not fail or drop-out. Armed with this data, sometimes all a student needs for a nudge back onto a success path is a personal phone call. Hearing the voice of a caring university staff person can be metaphorical chicken soup for a student who previously felt like ‘only a number’.

4. Innovation and invention
Some universities are knowledge hubs. Not only are they effectively preparing students for industries with existing technologies, but they are encouraging and fostering innovation, including supporting students to come up with new solutions, thus creating digital futures. Such universities do not (over) lecture at students or use rote, standardised assessment that does not change year after year. These universities have makerspaces, equipment, tools and a spirit of creativity, as well as high tolerance for trial, error and success. Academics and students partner to ‘give it a go’ researching, inquiring and experimenting.

5. Visualisation
Textbooks, photographs and illustrations do not compare with 3D printing, virtual reality and simulations. Emerging architects can
now construct miniature models and make modifications. Medical students can take a virtual trip through the circulatory system. Space programs are advanced by students simulating flight with no real safety risks.

6. Authoring, profiling and contribution
Digital technology enables a myriad of ways for students to contribute to the knowledge marketplace. They can build and launch websites, blog, post, comment and curate. Forward-thinking universities create contexts where the term of the degree is equivalent to time in industry. Throughout their studies, learners make real contributions, shape professional reputations and build networks. Their CVs are robust and abundant upon graduation. They have LinkedIn profiles and searchable personal videos showcasing their unique value propositions.

7. Expert connections
Some universities have maximised what it means to students to have access to the World Wide Web. This means that students have access to additional experts besides the ones that their own university has hired as academics. Students have access to new discoveries from innovators shortly after they are launched. Students become global citizens as they are connected with students from across the globe for online discussions and debates. Students can go for virtual tours and engage in international work experience without leaving home.

I believe that a university that meets all seven of these visionary characteristics and all seven of these technology enablers might currently exist, but I am yet to have seen or heard of it. While there are lots of universities, including across Australia, who live up to some of these descriptors, they tend to be inhibited by some or another set of seven – this time technology-related problems and challenges that they have not yet overcome.

**SOME UNIVERSITIES ARE KNOWLEDGE HUBS. NOT ONLY ARE THEY EFFECTIVELY PREPARING STUDENTS FOR INDUSTRIES WITH EXISTING TECHNOLOGIES, BUT THEY ARE ENCOURAGING AND FOSTERING INNOVATION, INCLUDING SUPPORTING STUDENTS TO COME UP WITH NEW SOLUTIONS, THUS CREATING DIGITAL FUTURES.**

**Technology-related Problems and Challenges**

1. Stagnant assessment
For many years, academics have been talking about adaptive assessment. This assessment would identify and accommodate students’ current achievement, aptitude and competency levels and adapt accordingly. This would truly personalise learning in that students would be given challenges that they are uniquely ready for. Their learning would be personalised and incremental. This has not successfully transpired in a robust enough manner to take this beyond trial and small, specialised application. Instead, whole classes are given the same assessment and some students are bored while others are overwhelmed.

2. Academic controlled LMS
Learning management systems (LMSs) have been incrementally improved over the last decade so that they now include media-rich content and compelling communication and interaction tools. They serve as a one-stop-shop for students to find out what they need to do as assessment, and then submit and track their grades. However, the unanswered plea from students is that they also have access to authoring, beyond the minimal opportunities doled out by some academics. Students would like to use the LMS as a true one-stop-shop, where they can enter their notes right onto the lecture slides, adding bookmarks to videos and discussing answers (where appropriate) with other students.

3. Graduation cut-off
The next problem is directly related to the previous in relation to the LMS. Students from most universities are cut-off from electronic university resources upon graduation and many students only have access to the LMS course site in the semester of enrolment. If universities are truly committed to university-industry connection and lifelong learning, then students and graduates should have indefinite access to course sites to use as resources for work-integrated application. Furthermore, they should have compelling opportunities to continue to interact with university academics and student/graduate peers.

4. Course-based LMS
Another problem with the current administration of the LMS is that it is administered on a course-by-course basis. Studies then become a collection of courses as opposed to an entire sequenced program (where appropriate). Students have difficulty relating and connecting the developed knowledge, skills, and attributes, as well as the relevance of the assessment tasks between courses.

5. Clunky systems
Booking a flight and selecting hotel deals is now easy through websites and mobile apps. Student systems have not reached this level of ease and efficiency. As a result, student time and attention have to be paid to administrative matters that should not be unnecessarily drawing time away from studies and overall student life.

6. Fixed university systems and bureaucracy
Visions of innovation are usually cut short by questions such as: what about timetabling, room allocation and work allocation models? Innovations seldom fit within established semesters and grading systems. Academics and professionals working within universities have fixed roles and sometimes applied territorialism. In this context and culture, enabling applications of education technology cannot be used to maximal advantage.

7. Patchiness
The final frequent problem is that innovation, using education technology, is usually patchy across universities. Some faculties and schools are innovating within specific degrees. Others are not. This makes it particularly challenging, and disappointing, for students who have chosen double majors or double degrees. The positive news is that progressive application of education technology raises students’ expectations, who then make demands in areas perceived as under-performing.

This article started with a description of education technology innovation, using the Oculus Rift for application of virtual reality. Coming full circle, the key recommendation is that universities apply these seven learning and teaching propositions, successes and problems to modelling progressive virtual universities. Such experimentation in the virtual field can provide concrete guidance for application in real-life universities of the future.

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