A new era; Personal Technology Challenges Educational Technology

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As we race towards a new era, rapid change of conventional models has become the norm. Just as technology has etched itself to the core of society, the sheer quantity of student devices connecting to university networks presents a sector wide challenge coinciding almost perfectly with many universities creating technology rich learning spaces. New fears include future proofing. It is not just a matter of technology becoming outdated. In seeking to accommodate the teaching styles and experience of staff across diverse faculties, is this technology simply too vanilla to meet their needs as they become increasingly skilled and inspired by technology's potential? Through the early findings of a study into staff use of technology within Queensland University of Technology's next generation collaborative learning spaces, this paper explores whether the answers lie in a model presented by students equipping themselves with the tools they need to learn in the 21st century.

Keywords: Technology, learning, higher education, future proofing, collaborative learning, learning spaces.

The Digital Future

Visions of a digital future more often than not play out in science fiction before becoming our reality. Advances in technology are seemingly limited only by our imagination. The pace of acceleration in technological development approaches light speed. When computer systems once required whole rooms, the need for personal computers would have been incomprehensible. Yet by the 1990s mobile computing became fact. The computing landscape subsequent exploded with smart phones and tablets now be found in the pockets and backpacks of students across the globe. In just a few short years mobile technology has become ubiquitous and presents itself as the silent revolution in higher education. Smart devices now outnumber global population (ITU, 2013, 1). As the intelligence of these devices matures, predicting our processes as we interact, so too will their entanglement in our everyday lives. Where does the future lie for higher education?

Sector wide, concerns are shifting from access and availability of technology to the sheer quantity of student devices connecting to university networks. University investment in new learning spaces is considerable, yet these spaces are routinely equipped with vanilla technology. Pace of technological advancement presents a constant pressure upon ensuring technology is not outdated before its installation. The economics of servicing large fleets of computers within learning spaces is influential in making cost effective, uninspiring technological solutions. Pressures upon choice include the capacity of the technology to meet the needs of teaching staff across a range of faculties with various teaching styles and skill sets in teaching with technology. Designers and architects of these spaces are confronted by how to cope with the changing needs of teaching staff as they become increasingly proficient and inspired by technology's potential in their teaching.

Early adopters of technology among teaching staff appear to be following the lead of students and bringing their own devices while waiting for institutional catch-up. This presents a potential institutional solution. Employee BYOD is not a new phenomenon in other sectors. Like the preferred knives of a chef, or the scissors of a hair stylist, should higher education adopt the model used in industries where employees are supported in equipping themselves with the tools of their trade? The answer to sustainability may be that institutions take the lead in providing learning spaces that are inviting, conducive to a range of learning experiences and facilitate the use of a multitude of technologies, which may be brought into the space by academic teaching staff and students. In such a vision of the future it would be imperative that institutions assume responsibility for supporting and encouraging, financially and otherwise, academic staff who wish to equip themselves with tools to teach in 21st century learning spaces. Institutional equity initiatives, particularly in relation to access and affordability, must address the needs of both staff and students. The economics of such a model include the likelihood of staff and students renewing their technological choices more often than would be financially feasible were the mobile devices owned by the university.

In Space

The pace of student adoption of technology is eclipsed only by the forms in which they have seen fit to mould personally owned devices into their learning experience (Conole, G., de Laat, M., Dillon, T., & Darby, J., 2008). Students are actively demonstrating the affordance of using one's own technology. This testifies to their perception of the benefits of equipping themselves with the tools to learn in the 21st century. Just a few years ago, we were concerned that not all our students might have a mobile device on hand in our classrooms (Evans and Matthew, 2012). The potential for a paradigm shift in staff and institutional use of technology remains largely untapped and yet is a pressing concern in creating sustainable, technologically rich, learning spaces.
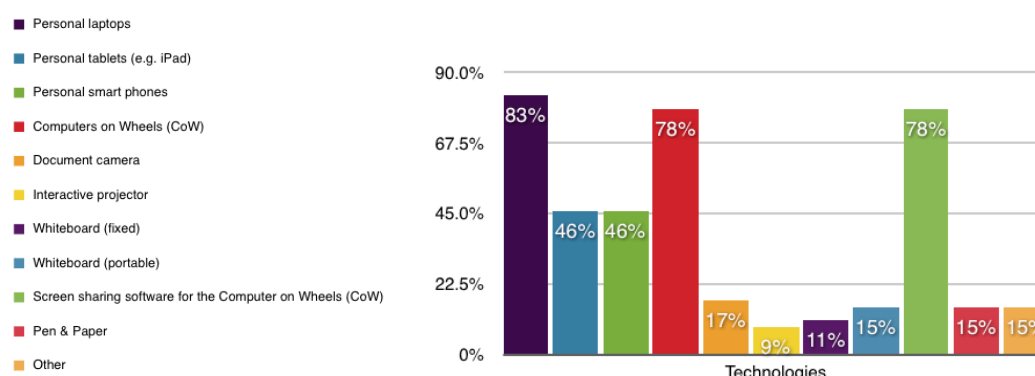
As we identify challenges between personal technologies and educational technologies, trends are emerging from the work undertaken by Queensland University of Technology in the use of the new collaborative learning spaces and the design of a new $230 million Science and Engineering Centre opened in 2013. The design of these new learning spaces draws on research and practice in both problem based learning (PBL) (Hmelo-Silver, C. E, 2004) and collaborative learning (Lee, C. D., & Smagorinsky, P, 2000). Experimental collaborative space design and the study of the experience of early adopters within those spaces were underpinned by a university-funded project called, Learning and Teaching in Collaborative Environment (LATICE) with four key objectives:

- Developing a strategy to integrate a range of scalable, transformative and sustainable models for learning and teaching in new physical and virtual spaces, strategically aligning with university initiatives.

- Assisting academics to design, develop, and implement new pedagogies that utilise more flexible interactive and collaborative learning space.

- Ensuring provision of support for appropriate collaborative technologies to facilitate collaborative learning and teaching models for in class physical and virtual collaboration/communication.

- University sector and inter-faculty collaboration, advancing research and evaluation of new learning environments focused on pedagogy, space and technology.

Building the aspirations of teaching staff was central to the adoption of these new learning spaces and as part of the LATICE project. Specialist staff development programs were created that focused on student centered approaches for active and connected learning (Penuel, B., Rhodes, J., Salen, K., Schor, J., & Sefton-Green, J. 2013).) The key aim of these programs was to inspire teaching staff with new ideas and approaches to engaging students in rich, real world learning experiences that harness the physical space and their technology while encouraging best practice implementation of emerging pedagogical practices. Evaluation of these spaces has included detailed surveys of both staff and student experiences of learning and teaching, interviews, observational data and business analytics examining the impact on attrition of classes taught in the new spaces.

The purpose of the evaluation was for the evaluation and improvement of learning and teaching. It was undertaken in accordance with university ethics procedures. The data examined in this paper is part of a broader evaluation process and should be considered within this context. Academics teaching in collaborative spaces were invited to undertake an online survey. The survey was designed to provide a meaningful insight into both the academic experience and academic perception of the student experience in collaborative spaces. 46 responses were received. The use of technology within these new learning spaces was of particular interest. Figure 1 displays staff responses to the survey question 'what technology do you typically use in class'.

Respondents were able to select more than one technology in response. Results for each possible result are displayed out of 100%, allowing scrutiny of each technology and its use by the survey respondents.

Which technologies do you typically use in class? (you may tick more than one)
Figure 1: Survey Results

Preliminary analysis of these survey results show over 82% of staff indicated that they were using the university provided computer in the new collaborative learning spaces in contrast with 19% using tablets and 26% using a laptop. A significant number of respondents rely upon and use the university provided technology but a number are bringing their own technology. When correlated to the growth of staff mobile devices seeking to connect to QUT wireless networks, these results appear consistent with social trends generally in staff BYOD: it appears that we are witnessing an increase in the phenomenon of staff bringing their personally owned devices into their teaching and learning environments. While institutions continue to grapple with data security implicit in staff BYOD, there may be a serendipitous efficient benefit that may go some way to addressing institutional concerns regarding sustainability of technology rich learning spaces.

The collaborative learning spaces are designed for multiple groups of 6-8 students, each group equipped with a Computers on Wheels (COWs), whiteboards, keyboards, web access, large tables, comfortable chairs, the latter two all on wheels. QUT's collaborative learning spaces employ herds of COWs, a trolley-mounted computer with a large plasma screen, designed specifically for student collaboration.

Considering the traditional use of technologies in learning spaces, we may have expected to see both a resistance to engagement with new technologies and persistent continuance with familiar technologies. Reluctance to engage with new technologies is likely to be at its highest where pedagogically sound use of new technology involves a deeper understanding of learning. While this was expected, it did not prove to be the case with this data set:

- Survey responses indicated that COWs were used by 41% of staff. Interestingly, COWs are designed for student use. COWs are not specifically designed for staff use.
- Real time collaboration tools played a central role in the staff development programs. More than 15% of respondents indicated that they used real time collaboration tools like google documents within their teaching, thus establishing a connection between academic staff development programs and adoption of technology.
- 43% of survey responses reported using a whiteboard but interestingly 34% made use of the document camera, which many regard as the future whiteboard.
- 15% of respondents indicated that they were using interactive projector technology compared to 82% using the built in computer. This trend in results suggests that the need for using projector technology was, to some extent displaced by screen sharing software used by 26% of respondents.

In Time

Academic adoption of technology in teaching is consistent with pedagogy targeting increased student engagement. Though it is not proposed here that the technological cart be put before the horse, more and more often technology provides new pathways for achievement of learning and teaching objectives (Palfrey & Gasser, 2008; Oblinger, 2005). Oliver and Goerke framed the 'enterprising university teacher' as one who harnesses students' social use of mobile devices and social software applications and challenges students by encouraging them to become participative constructors of knowledge in engaging learning experiences (Oliver and Georke, 182-183). Such a construct enables a richer, 'real world', learning experience where students are 'encouraged

and enabled to engage repeatedly in the goal - action - feedback - reflection - adaption - revision cycle' (Laurillard, 2009, 14). The teacher is able to 'motivate the iterative exchange of ideas' and students 'have an increased sense of ownership of the whole' learning experience since 'their own contributions clearly playing a role in the synthesis of ideas' (Laurillard, 2009, 14). Active learning research suggests outcomes improve when students are actively involved in thinking about what they (Braxton, Milem & Sullivan, 2000; Popkess and McDaniel, 89). Numerous projects harnessing in-class use of students' own mobile devices demonstrate that the power of mobile technology at the fingertips of students can be exploited in effective learning design alleviating institutional burden of investment in technology such as commercial clicker systems (Stav, Nielson, Hansen-Nygard & Thorseth, 2010, 179; Evans & Matthew, 2011).

What is evident in the trends emerging from the data is that traditional approaches to space, technology and pedagogy are shifting. Questions for further research include whether early adoption of technology by students is influencing pedagogy. It may be that staff adoption of technology in teaching is more likely to be explained as a cultural response to changes in society rather than an effort to seek new ways to engage students in learning. Trends emerging from this research suggest staff are following in the footsteps of our students as intrepid explorers of new learning spaces, and present an interesting insight into what the future might hold.

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