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Digital technology and the culture of teaching and learning in higher education

Kwok-Wing Lai
University of Otago

This paper discusses how the use of digital technologies may support a shift of cultural practices in teaching and learning, to better meet the needs of 21st century higher education learners. A brief discussion of the changing needs of the learners is provided, followed by a review of the overall impact of digital technologies on teaching and learning. In the final section we suggest how digital technologies may provide a more active and flexible learning experience by adopting a participatory pedagogical approach and by blending formal learning with informal learning.

Introduction

In the last three decades there have been great changes in the higher education landscape in the economically advanced countries. For example, increasing access to higher education has resulted in a diversification of student populations that comes with a wide range of learning styles and learning needs which are rather different from the traditional, elitist student populations. At the same time, higher education institutions are asked to respond to the demands of globalisation and the knowledge economy, to prepare students with 21st century skills and competencies for the labour markets, which require changes in the curriculum and teaching practices. There are demands for increased efficiency, more transparent accountability and better performance in both research and teaching. Some policy makers see digital technology as a tool to help manage some of these changes, and in particular, to use it as a transformative tool in teaching and learning (Crook & Light, 1999).

The changing needs of higher education learners

The changing learners

We have witnessed a global massification of higher education since the late 20th century. For example, in 2000, the total enrolment of higher education institutions worldwide was about 100 million, 200 times more than the global enrolment as recorded at the beginning of the 20th century (Guri-Rosenblit, Sebkova & Teichler, 2007). As estimated by the Observatory on Borderless Higher Education (OBHE), the global enrolment of higher education will increase to 125 million by 2020 (Laurilland, 2008). This huge increase in enrolments has resulted in a diversification of student populations, with the vast majority of the students now coming from lower socio-economic backgrounds, and many of them are mature and part time students. For example, in England, 60% of higher education students in 2002-2003 were over 21, and in 1972-73, it was only 21%. This increase was largely due to the growth of part time

student numbers (Ashwin, 2006). There has also been a huge increase in the enrolment of international students in the economically advanced countries, particularly in the USA, UK, Canada, Australia, and New Zealand. For example, in Australia, international students constituted 21% of its total higher education enrolments in 2002 (Harman, 2004). The OBHE estimates that there will be 5.8 million international students globally in 2020. These mature, part time, and international learners have different expectations from the traditional elitist school leavers about what facilities and services are needed to support their learning. They also demand more flexibility in the teaching and learning process, as many of them would only be able to take courses in distance education mode.

Traditional school leavers also now expect more flexibility in their formal education. Many of these students have been characterised as 'digital natives' (Prensky, 2001), who have grown up with digital technologies, and are surrounded by and immersed in technologies in their daily activities. Some commentators maintain that there is a fundamental difference between the current and previous generations of young people, in terms of learning styles and how they access information (Prensky, 2001), as recent advances in neuroscience research suggest that technology may affect developments of the brain during adolescent years (Ali & Kor, 2007; Carr, 2010). These students expect that technologies should be widely used in teaching and learning. It is thus argued that teaching in higher education institutions should respond to these learning differences to accommodate the "more technology-driven, spontaneous, and multi-sensory" learning styles (Prensky, 2001).

How do students learn?

In the last few decades we have seen a gradual shift of understanding about how learning should be facilitated in higher education, towards an emphasis on student-centred learning, rather than teacher-centred teaching (Ashwin, 2006; Schneckenberg, 2009). Conventionally learning has been conceptualised as a passive activity, with knowledge being transmitted from someone who knows it, to someone who does not. In this view learning is understood primarily as reproducing knowledge, and as a 'thing' that can be delivered to the learner and put into his or her head. The knowledge acquisition metaphor is used to describe the learning process in which learning is seen as individuals acquiring knowledge that is a concrete, transferable entity and the mind as a storage vessel (Sfard, 1998). In the last few decades, learning has been increasingly understood as a constructive process, where the learner actively participates in the construction of knowledge through situated and authentic tasks, either as an individual or collaboratively to support deep, rather than surface, learning (Lai, 2008). The knowledge building or knowledge creation metaphor has also been used to describe the inquiry process supported by the use of technologies in advancing personal and communal knowledge (Scardamailia & Bereiter, 2006).

What is to be learned?

With the emergence of globalisation and the knowledge economy, it has become a priority for the economically advanced countries to increase and democratise their innovative capacity in order to gain competitiveness in the global market. There is a high demand for "ingenuity", for good and powerful ideas that can help address the many social, economic, and environmental challenges that we face in the 21st century (Homer-Dixon, 2006; Feinstein, Vorhaus & Sabates, 2008). As economically advanced nations are shifting from an industrial to a knowledge society, there is an urgent need

to develop young people's competency to work creatively and innovatively with knowledge. There are metacognitive, problem solving, collaborative, and learning how to learn skills that citizens are required to work with and create knowledge in the knowledge society. This presents higher education institutions with a great challenge in how to prepare their students to meet the demands of the knowledge society (Lai, Khaddage & Knezek, 2011).

In a knowledge society, as changes occur rapidly at the societal and economic levels, citizens have to be able to adapt and be re-trained in order to keep up with these changes. With the growth of the so called symbolic-analytic jobs, the "mind workers", or "professional, managerial and technical" occupations (Levy & Murnane, 2007), and the disappearing of many "blue collar" occupations, there is a need to raise the literacy level, and information management and problem-solving skills of graduates in order to improve employability. Indeed, in rapidly changing job markets, what students have learned in higher education may not equip them well in the labour markets, as they may have to change jobs frequently, and many of the skills learned in schools and universities now have a much shorter shelf life. According to a U.S. report (U.S. Department of Labour, 2003), a worker on average will change jobs nine times or more before he/she reaches the age of 32. Higher education institutions thus have the responsibility to develop the lifelong learning competencies of their students required by the knowledge society. Since people have to upgrade their knowledge and skills throughout their working life, the demand for postgraduate studies will be increased and higher education institutions will see a new student clientele with different needs from traditional postgraduate students.

There has been a lot of discussion in the lifelong learning literature as to what constitutes the knowledge, skills, and attitudes that an effective lifelong learner should have. For example, the European Commission has published a series of documents on lifelong learning since the turn of the century and one of them is the *Key Competences for Lifelong Learning: A European Framework* (European Communities, 2007) which includes eight competencies (defined as knowledge, skills, and attitudes) that lifelong learners should be proficient. They are:

- Communication in the mother tongue
- Communication in foreign languages
- Mathematical competence and basic competences in science and technology
- Digital competency
- Learning to learn
- Social and civic competencies
- Sense of initiative and entrepreneurship
- Cultural awareness and expression (European Communities, 2007)

In this and other similar documents (e.g., UK Department for Education and Skills, 2006), lifelong learning is seen primarily as an informed response to the rapidly changing economy and technology that people are encountering at present, and more so in the future.

Digital technology is seen as a driver of growth of the knowledge economy. As pointed out by Castells (1998), "information technology, and the ability to use it and adapt it, is the critical factor in generating and accessing wealth, power, and knowledge in our time" (cited in Warschauer & Matuchniak, 2010, p.179). It also

supports lifelong learning as it can be used to overcome the barriers of time and place to learn, and to provide new opportunities to learn, and is effective in enhancing metacognitive, problem solving, and collaborative learning skills (Lai, 2008).

Online learning, in particular, has long been touted as a way to support lifelong learning (Flores, 2010) and some commentators such as Clarke (2002) consider it as "a core skill in the twenty-first century" (p. 12).

Traditionally, teaching and learning in higher education institutions take place within the four classroom walls. To support the life-wide (i.e., different modes of learning) and life-deep (i.e., values, attitudes and commitment) dimensions of lifelong learning means that some of the learning should happen outside the higher education institutions, i.e., in informal learning settings. Thus, to provide students with the skills to pursue lifelong learning, the class community should be extended beyond its four walls with the support of communication and Web 2.0 technologies, to encourage students to engage in collaborative learning (Lai, 2010a). Students can be supported by mobile technologies and digital content, and learning environments would include both physical space and virtual spaces. This also requires a re-thinking of how the higher education curriculum should be structured to allow students the opportunity to undertake cross-curriculum or inter-disciplinary projects, in flexible ways.

The use of digital technologies in higher education

While it is difficult to gauge the exact level of investment in higher education in ICT and e-learning in the last three decades, there is no doubt that it has been very large. For example, an OECD document published in 2001 reported an investment of $16 billion by OECD countries in e-learning (Balasubramanian et al., 2009). With this level of investment, one would expect that digital technologies should have a major impact on teaching and learning. Indeed, ICT has been used effectively in supporting traditional forms of teaching and administration in higher education institutions (Laurillard, 2006). We see lecture theatres and seminar rooms fitted with data projectors and computers linked to the Internet. It is almost a norm that lectures are now supported by some kind of presentational technology, and lecture notes and reading materials are archived electronically for flexible access. But these are surface uses of digital technologies, with pedagogical practices seldom affected deeply, and there is little shift of the locus of control of learning from the teacher to the learner (e.g., Rossiter, 2007).

From the research that has been undertaken to evaluate the overall impact of ICT on teaching and learning in higher education in the last two decades, one can conclude that higher education institutions have been slow in taking the fullest advantage of the potential benefits that can be afforded by the use of ICT. It seems that ICT was used primarily to support existing teaching practices, "being add on to the traditional classroom experience" (Bates, 2010, p.23), but has not fundamentally transformed it. One large scale study confirmed this observation. Collis and van der Wende (2002) surveyed 174 higher education institutions in five European countries, the USA and Australia and reported that while "institution-wide use of ICT is being encouraged" and "the establishment of institution-wide ICT is now in place", the "strategic use of ICT with a view to the different target groups of higher education, has in most cases not been considered explicitly yet" (p.8). This report was published almost 10 years ago, but it seems that little has been changed in the last decade, even with the

exponential growth of the use of Web 2.0 technologies by young people. For example, a recent report published by the Commonwealth of Learning for the UNESCO World Conference on Higher Education (Balasubramanian, et al., 2009) maintains that while "there is a trend to introduce eLearning or online learning both in courses taught on campus and in distance learning… it is too early to say whether the role of ICTs in the teaching function of higher education is truly transformative, or whether it is simply a repackaging of previous pedagogy" (pp. 19-20).

As pointed out by Yelland, Tsembas and Hall (2008), "much of the education sector often seems to be in denial about the relevance of ICT and its implementation in educational contexts is tokenistic and introduced to appease stakeholders who demand access and innovation as their educational right" (p.95). Similarly, Ehlers and Schneckenberg (2010) comment that the integration of e-learning in higher education has been disappointing, as the use of technology has not come with any significant pedagogical changes. According to them:

> …the promises of ICT and e-learning have not effectively innovated universities. Little progress has been made, and resources invested into ICT adoption are frequently spent without a clear definition of objectives and change strategies. The future of learning is taking place now – and yet courses in universities are stalled in a pedagogical model of transmitting knowledge rather than constructing solutions, following educational approaches that have been put into place centuries ago and still largely dominate teaching and learning in academia (pp. 6-7).

Indeed, as pointed out by Schaffert (2010):

> Despite considerable investment in technology-enhanced teaching and learning, there is little evidence of profound changes in educational practice. In particular, the idea that the use of ICT would promote student-centred and collaborative approaches to teaching and learning has not been fulfilled (p.130).

It seems that there is a wide gap between what is said and what is done in the use of digital technologies in higher education (Guri-Rosenblit, 2005).

It is rather difficult to have a good understanding of how digital technologies are actually used in teaching and learning and what are their effects on higher education, as there are simply too many new developments in digital tools and researchers cannot catch up with all of these. It seems that the use of ICT in higher education has fallen into what Cuban (1986) has described as the expectations, rhetoric, policies and limited use cycle. This cycle begins with great expectations of positive cognitive or attitudinal outcomes. The promotion of the use of new technology is supported by some preliminary research to establish its scientific credibility, which becomes policy. But very soon, when the initial enthusiasm subsided and limited use is observed, teachers are blamed for failing to use the technology to improve teaching and learning (Lai, 1996). There is a need to undertake systematic and longitudinal studies to provide a better understanding of the impact of individual technologies on higher education teaching and learning.

Many reasons, the so called 'barriers', have been suggested as to why there is so little impact on the use of teaching and learning in higher education institutions. The lack of understanding of why and how technology should be embedded in pedagogy by university teachers has been suggested as a primary reason, and the lack of professional development opportunities is usually cited as the reason for this lack of

understanding. It has been pointed out that many tertiary teachers still subscribe to the top-down knowledge transmission model and they believe that technology should be used to increase teaching efficiency, without any need for fundamental changes in pedagogy. This is also seen as an institutional cultural clash between conventional pedagogies and the participatory pedagogies facilitated by new digital technologies (Lim, So & Tan, 2010). This view leads to technology being domesticated, thus losing it transformative power (Salomon, 2002). Selwyn (2007) call these "barriers" operational deficits, with the lack of use of technology "attributed to deficits of skills, motivation, and know-how on the part of students, faculty, and the educational institutions themselves" (p. 84).

There are deeper structural factors that affect the use of technologies in higher education. According to Schneckenberg (2009), there are two major reasons for the lack of use of ICT by the majority of higher education teachers. The central administration of higher education institutions often has only limited control over the academic life of their staff, as there is a high level of autonomy of academic staff in both research and teaching. Higher education policies are sometimes difficult to disseminate and implement at the grass root level. The second reason is that higher education institutions are seen primarily as knowledge creation, rather than knowledge reproduction, organisations. Career advancement is dependent primarily on research outputs, which provides little incentive for academic staff to invest their time and energy on new pedagogic practices, and little attention will be put on research on teaching pedagogies, and in particular, pedagogies of using technologies in teaching and learning, as learning how to use new technologies embedded them in course design is time consuming.

The increasing emphasis on performance-based outputs in research by policy makers in recent years has exacerbated this lack of attention to teaching. Many higher education teachers see it as a waste of time to invest in technology-enhanced teaching, as there is little benefit for career advancement. What and how technology is being used in higher education institutions is also influenced by the commercial interests of hardware and software developers, as they try to shape technology use for their best interests, which may not align with pedagogical principles. These social, political, and economic contexts have to be explored if we try to understand why and how technology is used and not used for teaching and learning in higher education, as pointed out by Selwyn (2007).

Changing the culture of teaching and learning

Digital technologies have the potential to support and shape a pedagogy which is more active, participatory, personalised, flexible, and inclusive (Laurilland, 2008). While it is acknowledged that the socio-political factors discussed in the previous section may discourage institution-wide use of technologies in teaching and learning, and it is likely that these macro factors would not disappear in the short term, it is believed that at the micro or grass root level technology use can have an impact on student learning if there is a better understanding of the pedagogic potentials and a wider dissemination of exemplary and creative use of these technologies to show how they can be embedded in teaching to improve quality. In this section we would like to explore briefly how digital technologies may encourage more active and flexible learning that can better meet the needs of the 21st century learners.

Online learning

With the advent of the Internet and other communication technologies, we have seen a phenomenal growth of e-learning or online courses in the last ten years, partly as a result of increasing demand for access to education, and partly as a means for cost cutting. For example, in the U.S., according to a recent Pew Internet survey (2011), more than three-quarters (77%) of the colleges and universities offered online classes in 2011, and close to half (46%) of the students graduated in the last ten years had taken a course online. This growth is significant, as compared to the overall higher education enrolment, as a survey conducted by the Sloan Foundation (Allen & Seaman, 2010) shows that there was an increase of 21% in online course enrolments between 2008 and 2009 in U.S. higher education institutions, but the increase in the overall enrolment in the same period in higher education was only 1.2%. Online education has now become an important component of higher education, with online courses designed for both distance and on campus students. Indeed, close to three quarters of the chief academic officers of the public higher education institutions in the U.S. surveyed in 2009 considered that online education was a critical part of their long-term strategy (Allen & Seaman, 2010). It is reported by the Sloan Foundation that in 2008, more than one in four higher education students took at least one online course and just a few years earlier, in 2002, it was only about 10%. The vast majority (82%) of these online students were undergraduate students.

It should be noted that depending on how technologies are embedded in the design of online courses, they may not support an active or participatory teaching and learning process. In many online courses, for example, technology is used to enhance the delivery of online lectures, as a representational medium (Hamilton & Feenberg, 2005). The potential of digital technology lies in its capability for supporting a more interactive and communicative process, and facilitates a participatory pedagogy by supporting one-to-many and many-to-many communications, and also the development of online learning communities. In these technology-supported learning communities, students can share ideas and co-construct knowledge with their peers. The following example illustrates how digital technologies can increase access to education and improve students' learning experience.

An online distance program was designed by the author (for a detailed description, refer Lai, 2009, 2010b; Lai et al., 2011) to provide access to doctoral studies for New Zealand students who are not able to attend classes and meet their supervisors regularly on campus. New Zealand is a sparsely populated country and universities are located in the main cities. Many rural students would not be able to access part time postgraduate studies if they were not offered online. However, distance doctoral students often face the problem of intellectual isolation and this has been cited as one of the major factors or even the prime contributing factor for high attrition rates (Hortsmanshof & Conrad, 2003; Lovitts & Nelson, 2000; Manathunga, 2005). It is well known that the attrition rates of traditional doctoral programs in the economically advanced countries are very high. For example, in Canada, the completion rate of PhD programmes is around 50%, and it takes 7-9 years for the successful students to complete their studies (Elgar, 2003). Lovitts and Nelson (2000) point out that a key to successfully completing a doctorate is to develop learning communities for doctoral students. This doctoral program is based on a collaborative peer-support and supervision model, supported by communication technologies in order to provide quality learning experiences. In this community-based model, students work as a

cohort within a learning community and collaborate intensely during the course work and thesis proposal preparation stages. They meet regularly in online conferences as a group during the course work stage and during the development of their thesis proposals. During the thesis proposal development stage, students meet with their supervisors as a group in online conferences to support each other. Structured online meetings are regularly held for students to share ideas, discuss issues, and critique each other's work. Students have to present several drafts of their proposals at online conferences, to be critiqued by their peers and supervisors. Students thus are exposed to a wider range of expertise and the online community also provides them the opportunity to learn how to critique scholarly work.

In this model, students are encouraged to co-construct knowledge and are enculturated to become a member of the academic research community. *Moodle* is used as a customised discussion platform to adapt to the needs of the students. Other communication tools such as *Skype* are also used to facilitate interaction. This doctoral program has been evaluated and findings show that there was a very high level of cognitive presence in the discussions and the online course was effective in supporting construction of new knowledge (Lai, 2009). It also shows that online discussion can facilitate research supervision, with students gaining valuable feedback from peers (Lai et al., 2011). As a learning community, students participated actively to support each other (Lai, 2010b). It should be emphasised that in this example digital technologies were used primarily to support participation and communication, not as a representational medium simply to increase the efficiency of delivery (Hamilton & Feenberg, 2005). When technology is used as a representational medium to present or archive lecture materials, it cannot transform the culture of teaching and learning, as there is no change in the pedagogy and technology is not used to support an active learning process. Thus whether online learning represents a pedagogical advance depends on how technologies are being used, and how they are embedded in pedagogy.

Linking formal and informal learning

Digital technology blurs the boundary between formal and informal learning experiences. Learning has long been compartmentalised into formal, non-formal, and informal slots. In higher education, learning is supposed to occur formally through attending lectures, completing prescribed readings and texts, undertaking lab work or field work, and subsequently assessed through internal assignments or examinations. Until recently, there is little recognition that learning can also occur outside public spaces. As mentioned previously, up till now digital technologies have not been widely used in teaching and learning. However, outside higher education institutions, young people are surrounded by and immersed in technologies in informal settings. A Kaiser Family Foundation report (Rideout, Foehr & Roberts, 2010) shows that in the U.S., 8-18 year olds in 2009 spent four and a half hours per day using their mobile phones and computers to do text messaging, talk to peers, listen to music, play games, and watch other media, and the three most popular activities being visiting social networking sites (e.g. *MySpace* and *Facebook*), playing computer games, and watching videos on websites (e.g., *YouTube*). These technology experiences may affect how they socialise, communicate, and learn. If students are to develop the competencies of being a self-regulated, independent, lifelong learner, and be able to respond to the demands of the knowledge economy, they will need to learn how to learn in informal settings, as there is a semiotic relationship between formal and informal learning.

This learning ecology perspective (Barron, 2006) suggests that while students learn differently in formal and informal settings, learning can take place across boundaries. What has been learned informally, for example, by participating in knowledge sharing in social networking Web sites and interest-focused learning communities using Web 2.0 technology, it can help shape what is learned in higher education. Conversely, what is learned in higher education institutions can motivate students to learn in informal settings (Greenhow & Robelia, 2009). In informal learning situations, while learners will use the forms of learning that they have already learned from formal settings, they also use strategies which are not normally used in formal settings, as shown in Sefton-Green's (2003) study. Adopting the learning ecology approach requires a cultural shift, as suggested by Sefton-Green (2004):

> …that in their leisure, at play and in the home with their friends, young people can find in ICTs powerful, challenging and different ways of learning. The emphasis is on sharing, working together, and using a wide range of cultural references and knowledge… unless education policy makers can find ways to synthesise learning across formal and informal domains, our education system will become the loser in the long run" (p.33).

Higher education institutions have the responsibility of preparing their students as lifelong learners who are able to engage in self-directed learning in informal settings. They also need to recognise that their students' formal and informal technology experiences are drastically different, and that there is a semiotic link between formal and informal learning. This requires a shift of teaching and learning culture. The challenge is how to use their technology experiences acquired in informal settings to enhance formal learning. At present young people are not aware that there is a link between formal and informal learning and they do not use Web 2.0 for formal learning. For example, according to a survey conducted in the UK by the Joint Information Systems Committee (JISC) in 2007, the majority of the sixth formers who were users of social networking sites considered these sites primarily social and did not know how they could or should be used in formal university learning (Minocha, 2009). In using Web 2.0 tools and applications in informal settings, such as blogging and twitting, students are facilitated in sharing their ideas and working collaboratively with other users. Learning is occurring in learning networks and learning communities, which is very different from formal learning in higher education that is primarily individualistic. By using these Web 2.0 tools in formal courses, formal and informal learning technology experiences can be blended, and the culture of teaching and learning can be shifted towards a more collaborative and engaging environment. However, it should be noted that in using Web 2.0 technologies to blend formal and informal learning, we should not intrude too much on students' personal life as Web 2.0 tools are seen primarily as social, but not academic, tools by young people (Sharples, 2007).

Web 2.0 tools such as wikis also facilitate an informal knowledge construction process. If they are to be used in formal learning, there is a need for a shift of the epistemology of knowledge to acknowledge a more democratic notion of knowledge creation (Eijkman, 2010). The distributed nature of knowledge creation, for example, by *Wikipedia*, relies primarily on "the wisdom of crowds" (Surowiecki, 2004, cited in Peters & Slotta, 2010, p.207). It should be noted that the use of *Wikipedia* as a primary source of knowledge has now become very popular among students, although it is less likely that they are contributors of *Wikipedia* articles (Selwyn, 2007). Instead of denying the use of knowledge generated informally, higher education institutions should be

proactive in preparing their students with skills in assessing the values of user-generated knowledge in informal learning, and how this knowledge can be used creatively and productively in their formal learning.

Conclusion

This paper began by highlighting the changing needs of the 21st century learners as a result of the massification of higher education and the demands of the knowledge economy. The use of digital technologies has been suggested as a means to respond to these changes. In terms of improving the learning experiences of the students, the impact of digital technologies has so far been rather limited. It is suggested that the use of digital technologies can improve the quality of the learning experiences if they are used as a participatory communicative tool to support collaboration and co-construction of knowledge. It is important that learners are aware of their own learning characteristics in informal settings and adapt them in formal settings (Lai et al. 2011). It is also important to recognise the blending of formal and informal learning strategies in higher education to prepare students as lifelong learning learners and innovative knowledge creators in the knowledge society.

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Author: Dr Kwok-Wing Lai, Professor and Director
Centre for Distance Education and Learning Technologies, College of Education, University of Otago, New Zealand. Email: wing.lai@otago.ac.nz
Web: http://www.otago.ac.nz/education/staff/profiles/wing_lai.php

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