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Changing knowledge systems in higher education

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To a greater extent than is often acknowledged, the modern university is a creature of the society of the printing press. Until the turn of the twenty-first century, print was the medium of scholarly communication. It was the source of book learning. Now, quite suddenly, digital text is beginning to displace print as the primary means of access to the knowledge of academicians and as the dominant medium for the delivery of instructional content. This chapter explores some of the consequences of this change. To what extent do digital technologies of representation and communication reproduce the knowledge and pedagogical systems of the half-millennium long history of the modern university or how far do they disrupt and transform them?

To answer this question, this chapter will first explore key aspects of contemporary transformations, not just in the textual forms of digital representation, but the emerging social forms that digitisation reflects, affords and supports. This we call the 'social web', a term we use to describe the kinds of relationships to knowledge and culture that are emerging in the era of pervasively interconnected computing. What, then, are the impacts and potentials of these changes on two of the fundamental missions of the university: knowledge formation and teaching?

Today, universities face significant challenges to their traditional position in society – contemporary knowledge systems are becoming more distributed and learning ubiquitous. Where does this leave the university – as a historically specialised and privileged place for certain kinds of knowledge and learning, as an institutionally bounded space? What do these changes mean for the mission and structures of a renewed university in the era of digital communications? These are large questions, which we can only begin to answer in a schematic way in the space of this chapter.

The social web

The first printed book, Gutenberg's 1452 Bible, had no title page, no contents page, no page numbering. Extant copies show the signs of ecclesiastical, manuscript culture – the beautifully illuminated marginalia which, until the era of print, gave the written word an aura of authority that raised it above the spoken word of everyday experience. It took another fifty years for the

textual architecture of the printed word to take its modern form, and with it, new forms of textual authority.

By 1500, the end of the period of 'incunabula', eight million books had been printed. It was not until then that printed text came to be marked by the structures of graduated type and spatial page design, and the information hierarchies of chapter headings, section breaks and subheadings. Navigational devices were added in the form of tables of contents and running heads. Alphabetically ordered indexes were added. And the text was divided into uniform and easily discoverable units by means of the most under-rated and revolutionary of all modern information technologies – the page number (Febvre and Martin 1976; Eisenstein 1979).

These textual forms became the ground for representations of knowledge and patterns of teaching in its characteristically modern form. Petrus Ramus, a professor at the University of Paris in the mid-sixteenth century, could be regarded as the inventor of the modern textbook, laboriously laying out in print the content of what students were to learn by way of a sectionalised knowledge taxonomy. Eleven hundred editions of Petrus Ramus's texts were published between 1550 and 1650. Walter Ong credits Ramus with no intellectual originality in the content of the texts, but with an ingenious sense for the emerging epistemic order in which knowledge was analytically laid out and spatially ordered, replacing the authority and pedagogy of rhetoric and dialogue with the atomistically compartmentalised and formally schematised knowledge of modern academe and pedagogy (Ong 1958).

Also characteristic of the textual forms of the emerging print culture was the premium it placed on accuracy, from the standardisation of spelling in vernacular languages, to the processes of editing, proofing and correction. Even after printing, errata were used to correct the text, and text was further corrected from edition to edition – a logic intrinsic to the fastidiousness for detail and empirical verity which marked the emerging lifeworlds of the thinkers and teachers of the early modern academy.

Not merely textual, printed texts came to be located in an intertextual universe of cross-referencing. The announcement of author and title did not just mark the beginning of a work. It situated that work and its author in a universe of other texts and authors, and marked this with the emerging conventions of librarianship, citation and bibliography. Moving away from the rhetorical tradition, authors used footnotes and referencing, not only as a sign of the erudition upon which authoritative text was necessarily grounded, but also to distinguish the author's distinctive and ostensibly original voice from those of the textual authorities or research data upon which they were relying (Grafton 1997).

No longer simply a matter of identification of authorial voice, the new social conventions of authorship became the boundary markers of private intellectual property, the copyright of authors as originators of ideas being embodied in specific forms of words. Knowledge as intellectual property expressed in written text, owned by the individual author and alienable as

commodity, was to be found in incipient forms as early as in fifteenth-century Venice (Rose 1993).

This regime of textual knowledge became a key foundation of the modern university, a point of clear break from its monastic origins. It was both a symptom and an enabler in the development of characteristically modern ways of attributing human origins to ideas, of ascribing authority to these ideas, and of developing modern pedagogy that melded the voice of the teacher with the voice of the writer of the authoritative text.

The purpose of this quick sketch is to consider what is new and not new about the emerging regime of digitised text. Widespread digitsation of parts of the text production process began in the 1970s with phototypesetters that were driven by rudimentary word processing programs (Cope and Kalantzis 2001a). During the 1980s and 1990s, word processing and desktop publishing became near-universal tools of authorship. Academics who had previously handwritten their articles, books and teaching notes, and passed them on to typists, started to spend a good part of their working days keyboarding digital text. The logic of their work, however, remained to a large degree within the Gutenberg orbit, marking up the information architectures of their text in the typographic mode, designed to be printed or pseudo-printing in the form of PDF (portable document format) digital replicas of the printed page.

Three decades into the digitisation process, we may well still be in an era of what Jean-Claude Guédon calls 'digital incunabula', in which the full potentialities of digital text have barely been explored, let alone exploited (Guédon 2001). Information is locked up in PDFs which are designed for printing out rather than the functionalities of search, access and copying offered by more advanced digitisation technologies. Such texts-for-print are not marked up by structure and semantics, so even the best search mechanisms offer little more than what can be achieved through word collocation algorithms, far less adequate in some crucial respects than the traditions of indexing and cataloguing from the era of print.

Moreover, some things that are purported to be new about digital text, are not so new at all. For all its apparent novelty, 'hypertext' is nothing other than a version of the process of referencing to be found in the tradition of page numbering and catalogue listing established over the past five centuries. What is the link other than a way of making the same old distinction of individual authorship, delineating the boundaries between one piece of intellectual property and the next, and a sign of deference to the authorities on which a text is based?

As for the much-vaunted novelty of the 'virtual', what more is the digital than a reincarnation of the modes of representation of distant people, places and objects that made books so alluring from the moment they became cheaply and widely accessible? Also, books and their distribution systems, no less than today's networked communities, allowed the creation of dispersed communities of expertise, mediated by local interlocutors in the form of pedagogues who gave specialised classes (Cope and Kalantzis 2004).

Some things about the world of digital communications, however, may turn out to be very different from the world of printed text. Just how different remains to be seen, and the full impact upon universities may take decades to become clearer. Or it may happen sooner.

Several features of the new communications environment stand out. One is a change to the economies of cultural and epistemic scale. Whilst something like a thousand copies need to be sold to make a print run viable, there is no difference in the cost of one person or a thousand reading a web page, or a print-on-demand book. The immediate consequence is that the amount of published and accessible content is rapidly growing and the average number of copies accessed of each academic work is declining (Waters 2004). These are ideal conditions for the development of ever more finely grained areas of knowledge, cultural perspectives and localised applications of knowledge. So significant is this change that knowledge itself may change. What is the enduring validity of universal and universalising perspectives? How do they accommodate the particular? How does the local connect with the global? Furthermore, with the development of Unicode and machine translation, scholarly communication beyond the local may not for much longer have to be expressed in the language of global English, and if it is, it is in the specialised discourses of academic technicality less dependent for their aura of reliability on the 'good style' of native English speakers.

Another key feature is the intrinsic multimodality of the new media. The elementary modular unit of text manufacture in the Gutenberg (and then ASCII) era was the character. Digital texts make written words and images of the same stuff, pixels, and sound of the same stuff as pixels – the zeros and ones of semiconductor circuitry. In everyday life, we have experienced this radical conflation of modes throughout the media, from illustrated books and journals (previously, in lithographic processes as a simple matter of technical convenience images were mostly placed on pages of their own), to video, to the Internet. Academe, however, has stayed steadfastly wedded to text, with the increasing incursion, however, of diagrams and images into the text (Kress 2003). Will the new media destabilise the traditional textual forms of book, article or essay, paper and thesis? In what other ways might knowledge be represented today, and particularly in the areas of the sciences, the arts (Martin and Booth 2007) and design?

Perhaps most significant, however, is what we call a shift in the balance of textual agency between the author and the reader (Kalantzis 2006a; Kalantzis and Cope 2006). Here are some examples and symptoms of this change. Whereas print encyclopedias provided us with definitive knowledge constructed by experts, Wikipedia is constructed, reviewed and editable by readers and includes parallel argumentation by reader–editors about the 'objectivity' of each entry. Whereas a book was resistant to annotation (the size of the margins and a respect for its next reader), new reading devices and formats encourage annotation in which the reading text is also a (re)writing text. Whereas the diary was a space for time-sequenced private reflection, the blog is a place for personal voice that invites public dialogue on personal

feelings. Whereas a handwritten or typed page of text could only practically be the work of a single creator, 'changes tracking', version control and web document creation such as Google Docs make multi-author writing easy and collaborative authorship roles clear. Whereas novels and TV soaps had us engaging vicariously with characters in the narratives they presented to us, video games make us central characters in the story where we can influence its outcomes. Whereas broadcast TV had us all watching a handful of television channels, digital TV has us choosing one channel from amongst thousands, or interactive TV in which we select our own angles on a sports broadcast, or making our own video and posting it to YouTube or the web. Whereas broadcast radio gave listeners a programmed playlist, every iPod user creates their own playlist (Kalantzis 2006b). We call this rebalancing of agency, this blurring of the boundaries between authors (and their authority) and readers (and their reverence), 'the social web'. If print limited the scope for dialogue, the electronic communications web opens up that scope.

Each of these new media is reminiscent of the old. In fact, we have eased ourselves into the digital world by using old media metaphors – creating documents or files and putting them away in folders on our desktops. We want to feel as though the new media are like the old. In some respects they are, but in other respects they are proving to be quite different.

The earlier modern regime of communications used metaphors of transmission – for television and radio literally, but also in a figurative sense for books, curricula, public information, workplace memos and all manner of information and culture. This was an era when bosses bossed, political leaders heroically led (to the extent even of creating fascisms, communisms and welfare states for the good of the people), and personal and family life (and 'deviance') could be judged against the canons of normality. Not only have things changed in today's everyday life – the most advanced of contemporary workplaces devolve responsibility to teams and ask workers to buy into the corporate culture. Neoliberal politics tells people to give up their reliance on the state and to take responsibility into their own hands. Diversity rules in everyday life, and with it the injunction to feel free to be true to your own identity.

Things have also changed in a homologous fashion in the social relations of representation. Audiences have become users. Readers, listeners and viewers are invited to talk back to the extent that they have become media co-designers themselves. The division of labour between the creators of culture or knowledge and their consumers has been blurred. The direction of knowledge flows is changing. In fact, the flows are now multifarious and in many directions. Consumers are also creators, and creators are consumers. Knowledge and authority are more contingent, provisional, and conditional – based relationships of 'could' rather than 'should'. They are more open to contestation and to critical reading on the basis of personal experience and voice. Knowledge and culture, as a consequence, become more fluid.

This is what we mean by a shift in the balance of agency, from a society of command and compliance to a society of reflexive co-construction. It might

be that the workers creating bigger profits for the bosses, that neoliberalism 'naturally' exacerbates disparities in social power, and that proclamations of diversity are a way of putting a positive gloss on inequality. The social outcomes, indeed, may at times be disappointingly unchanged or the relativities even deteriorating. What has changed is the way these outcomes are achieved. Control by others has become self-control; compliance has become self-imposed. New media are one part of this broader equation. The move may be primarily a social one, but the technology has provided new affordances and social aspiration has helped us image uses for available technologies even beyond the imaginings of their inventors.

Where does this leave the university as a source of epistemic authority? What is the status of Wikipedia, written by tens of thousands of unnamed persons who may or may not have passed the credentialing hurdles of higher education, the authority of individual expert voice or institutional credentials? What is the status of an academic's blog? How do we reference mini-lectures on YouTube, and measure the validity of one YouTube video against the next or a refereed article? How do we assess practice-based and multimodal theses, publications and exhibitions?

The means of production of meaning in the social web are also deceptively the same, and different, to what has preceded. Eschewing the Gutenberg look-alikes of word processing, desktop publishing and postscript files is a new tradition of semantic and structural markup (as opposed to visual markup, for one rendering). This tradition originated in the IBM labs of the 1960s as Standard Generalised Markup Language, but rose to widespread prominence with Berners-Lee's HTML in the early 1990s, and subsequent refinement as XML and more recently the Resource Definition Framework of the 'Semantic Web' (Cope and Kalantzis 2004). This second generation Internet was dubbed Web 2.0 in 2003, and is manifest in widespread application web-based social networking technologies including wikis, weblogs, podcasts and syndication feeds. In the words of the un-named author or authors of the Wikipedia Web 2.0 entry, it is also a 'social phenomenon embracing an approach to generating and distributing Web content itself, characterized by open communication, decentralization of authority, [and] freedom to share and re-use'.

Distributed knowledge systems

Universities today face significant challenges to their historical role as producers of socially privileged knowledge. More knowledge is being produced by corporations than was the case in the past. More knowledge is being produced in the traditional broadcast media. More knowledge is being produced in the networked interstices of the social web, where knowing amateurs mix with academic professionals, in many places without distinction of rank. In these places, the logics and logistics of knowledge production are disruptive of the traditional values of the university – the for-profit, protected knowledge of the corporation; the multimodal knowledge of audiovisual

media; and the 'wisdom of the crowd' which ranks knowledge and makes it discoverable through the Internet according to its popularity.

The new, digital media raise fundamental questions for the university. How can it connect with the shifting sites and modes of knowledge production? How can it stay relevant? Are its traditional knowledge-making systems in need of renovation? What makes academic knowledge valid and reliable, and how can its epistemic virtues be strengthened to meet the challenges of our times? How can the university meet the challenges of the new media in order to renovate the disclosure and dissemination systems of scholarly publishing? How can the university connect with the emerging and dynamic sources of new knowledge formation outside its traditional boundaries?

To a greater extent than is frequently acknowledged, the rituals and forms of print publishing were integral to the modern republic of human and scientific knowledge. Publication was contingent upon peer review, it represented a point of disclosure in which other scientists could replicate findings or other humanists could verify sources. Until publication, academic knowledge remains without status, unassimilable into the body of knowledge that is the discipline and without teachable value. Publication is an integral part of the academic knowledge system.

Pre-publication, peer review as a method of scientific knowledge validation began to evolve from the seventeenth century, with Oldberg's editorship of the Philosophical Transactions of the Royal Society (Guédon 2001; Biagioli 2002; Willinsky 2006; Peters 2007). Post-publication, bibliometrics or citation analysis emerged as measure of ranking of the value of a published piece. The more people who cited an author and their text, the more influential that person and their work must have been on the discipline. This thinking was refined in the work of Eugene Garfield and his Institute for Scientific Information.

The system of academic publishing, however, reached a now well-documented crisis point at the beginning of the twenty-first century. The bulk of academic journal and book publishing was still dominated by commercial publishers producing to the economies and production logics of print – even their electronic versions were by and large in print-reproduction PDF form. The commercial publishers came under increasing fire for the slowness of their publication processes contrasted with the immediacy of the web, the relative closure of their networks of editorial control contrasted with the more democratic open-ness of the web, but most importantly for the rapidly increasing cost of journal subscriptions and books in contrast to the free content on the web (Bergman 2006; Willinsky 2006; Peters 2007; Stanley 2007). The background to this growing critique was one of the most remarkable phenomena of the evolving world of the Internet, that is freely accessible intellectual property in the form of software code (Raymond 2001; Stallman 2002; Williams 2002), content tagged with Creative Commons licenses (Lessig 1999, 2001, 2004; Benkler 2006) and, more specific to the case of academic knowledge, the rise of open access journals (Bergman 2006; Willinsky 2006; Peters 2007).

These developments in an economic domain that Benkler calls 'social production', are not, however, without their own difficulties. John Willinsky speaks lyrically of a return to the days when authors worked beside printers to produce their books (Willinsky 2006). However, academics do not have all the skills or resources of publishers. Nor is playing amateur publisher necessarily the best use of their time. The new economy of social production, moreover, is removing the economic basis for publishing as a form of employment and as a way of helping fund professional associations and research centres which have historically gained revenue from the sale of periodicals and books. Tens of thousands of people used to work for encyclopedia publishers, even if some of the jobs, such as that of the proverbial door-to-door salesperson, were less than ideal. Those who write for Wikipedia have to have another source of income to sustain themselves. What would happen to the significantly sized global scholarly publishing industry if academics assumed collective and universal responsibility for self-publishing?

Open-access, moreover, does not necessarily reduce the points of closure in academic publishing: its English language and developed world bias; the self-replicating logic which gives visibility to established journals and the insider networks that support them; its bias to the natural sciences at the expense of the social sciences and humanities; its valuing of journal articles over books; the intrinsic lack of rigour of most refereeing, without reference to explicit criteria for valid knowledge; and its logic of ranking in which academic popularity ranks ahead of academic quality, and self- and negative citation carries the same weight as positive external citation (Peters 2007).

The Internet in its initial forms, in fact, perpetuates many of precisely these deficiencies. Google is the brainchild of the son of a professor who translated Garfield's citation logic into the page rank algorithm which weights a page according to its 'backward links', or the people who have 'cited' that page by linking to it. When is such a process unhelpful populism, mob rule even, in the newly democratised republic of knowledge? And what do we make of a knowledge system in which even the wisdom of the crowd can be trumped by the wisdom of the sponsored link?

In 1965, J. C. R. Linklider wrote of the deficiencies of the book as a source of knowledge, and imagined a future of 'procognitive systems' in the year 2000 (Linklider 1965). He was anticipating a completely new knowledge system. That system is not with us yet. We are still in the era of digital incunabula.

In semantic publishing technologies, however, we see possibilities not yet realised, in which all the world's knowledge is marked up within developing disciplinary discourses and meaningfully accessible. In the social web, we can gain an inkling of dialogical processes in which academics, professionals and amateurs may advance knowledge more rapidly, take greater intellectual risks, and create more creatively divergent and globally distributed bodies of knowledge and theoretical paradigms than was possible in the slower and more centralised knowledge production systems of print publishing.

If it is the role of the university to produce deeper, broader and more reliable knowledge than is possible in everyday, casual experience, what do we need to do to deepen this tradition rather than to surrender to populism? What needs to be done about the knowledge validation systems of peer review and the dissemination systems of academic publishing? These are fundamental questions at this transitionary moment. Their answers will not just involve new publishing processes. They will entail the creation of new systems of knowledge production, validation and distribution.

Ubiquitous learning

At the height of the dot.com boom, online education was forecast to be one of the key industries of the new 'knowledge economy' (Drucker 2000). Universities began to forge relationships with media conglomerates and operators of Internet portals with names like NextEd, UNext, Pensare and the Global Universities Alliance. They were attracted by opportunities to extend their reach beyond the geographically delimited market of their past (determined by who lives nearby or is prepared to live nearby, a kind of location-based monopoly) to the possibility of competing with universities everywhere. Their business models were built upon what appeared to be the low costs of online teaching – with overheads apparently reduced to computer servers on the Internet and tutors in chat-rooms instead of the expensive real estate and labour-intensive processes of traditional teaching and learning. They were also attracted by the proposition that the value in their 'product' could be transferred from location and fixed infrastructure to an internationally bankable 'brand'.

Since the dot.com crash of 2000, many of the most-hyped endeavours have disappeared into obscurity or bankruptcy (Carr 2001; Mangan 2001). What survived into the second half of the decade of the 2000s was surprisingly modest – a few private, for-profit online universities offering graduate professional programmes in business, teaching and nursing, of which the University of Phoenix and Jones International University are perhaps most notable. As for online learning platforms, the two largest, Blackboard and WebCT, merged in 2005. Much to the chagrin of the champions of Open Source, Blackboard was granted a patent on its e-learning technology in 2006, then proceeded to take action against its near commercial competitors (see www.boycottblackboard.org). Even in 2007, and despite its aspirant monopoly position, Blackboard only had a $180 million turnover, was spending a third of that on marketing and in one reading of its accounts, was trading at a loss (see Blackboard's 2007 Annual Report).

Apart from the questionable extent of the impact of online teaching in higher education, the impact on teaching and learning has been questionable, too. Online learning in higher education often involves little more than the reproduction through digital media of traditional higher education pedagogies – a week-by-week sequence of lecture presentations (written scripts or recorded video), virtual classroom discussions, assignments to upload and

tests to take. The didactic relation of teacher to student remains essentially unchanged. The sources of epistemic authority remain unchanged, too, as textbook and readings are copied into digital formats to be downloaded by students. Indeed, the translation into a digital environment often makes the curriculum seem more didactic than one more nuanced by person-to-person contact.

The full potentials of the digital may take some time to be realised. One such potential is pedagogical. Here, the key question emerging from a world increasingly influenced by the epistemic norms of the social web may be, how do we teach in a world where people are more inclined and able to build their own knowledge and understandings from a mix of sources than to receive the pre-packaged wisdoms of authorities? James Paul Gee speaks of the increasingly anachronistic lack of engagement in traditional, transmission pedagogies as contrasted with the identity-engaging pedagogies of video gaming (Gee 2004, 2007). What pedagogical or assessable status might a teacher afford to YouTube video? How might equally generative learning spaces be created for students inured to the communicative practices of MySpace or FaceBook? How might server-based collaborations be managed so that students get involved in more joint work? How might lateral peer-to-peer learning relationships be nurtured, along with peer assessment on social networking principles? How might we develop non-linear pedagogies which allow alternative navigation paths according to the prior knowledge and preferred ways of knowing of diverse learners (Cope and Kalantzis 2001b)? These key pedagogical questions arise not only from the changing dispositions of new generations of students, but from a reading of the kinds of knowledge and epistemic sensibilities that may be more relevant to the 'knowledge economy' (Peters 2007), adaptive communities and cosmopolitan citizenship.

Another potential is to shift the sites of higher education or to blur the boundaries between higher education institutions and the sites of application of learning. More of today's learning happens close to the specifics of everyday life – on the job, for instance, or at the software interface. More of the minutiae of what we need to know to be fully functioning workers, citizens and persons we learn in the pedagogic spaces of training programmes, help menus and by immersion in communities of practice which provide support scaffolds for new entrants (Wenger 1998). How do universities, sites of formal education par excellence, respond? What does it mean for the level of generality of their curricula – should they be geared up or down? To what extent should universities join the markets for learning anywhere and anytime, just in time and just enough? How can universities work with the disruptive potentials of e-learning, or should they resist in order to maintain their brand credibility?

One thing seems clear: that universities will find themselves enmeshed in new geographies, in which the local meets the global, and the public-institutional meets the private-domestic and the pragmatics of workplaces. To be anywhere and everywhere, they will have to adjust their pedagogies so the general and theoretical is able to engage with the local and the practical,

and in extremely divergent sites. The distinction between on-campus and off-campus may also be blurred and programme delivery mechanisms blended. Students may move between one mode and another, or join a class based on multiple and readily available alternative modes. Increasingly, regular face-to-face courses are using online content management systems, such as the open source Moodle, for delivery. From this point, it is a small step to offer the course online. The future of online higher education, in other words, may not be as a separate alternative to on-campus delivery. These alternative modes may in fact be integrated in a seamless relation to each other.

Yet another potential of online and blended delivery is to shift the demographics of the student body. Universities are under increasing pressure to push the frontiers of equity as they respond to the demands of the knowledge society. How could twice the percentage (or more) of the population go to university? What would happen to the knowledge and learning of elite institutions, if they stooped to the logic of mass delivery? What if they had to develop a new economics of online provision in order to open opportunities for entry to historically excluded groups located around the corner and around the world? There are many demographically identifiable groups for whom residential or full time higher education is not an option, usually because of overriding commitments to work, family, military service, or other factors. Many people cannot afford the fees, and if they have to live nearby, the board and lodging.

The challenges raised by this demographic shift are, as much as anything, pedagogical. Online higher education will increasingly be situated within lifeworld settings which were formerly 'outside' of the university – in workplaces, in homes, in other countries, in communities which have not traditionally enjoyed access to higher education. This raises enormous issues about diversity in its every sense – how university teaching engages effectively with widely different people located in widely varied learning settings; how, in other words, the teaching/learning relationship is redefined.

The idea of a less expensive, more accessible university education could certainly open the horizons of access for historically under-represented groups. However, this can only be achieved by identifying efficiencies that are peculiar to online learning ecologies.

Efficiencies were created in traditional teaching contexts by having professors lecture large numbers of students in lecture halls and graduate assistants hold tutorials. Online learning is rarely efficient in these ways. It takes the professor far longer to translate the oral discourse of the classroom into a publishable written discourse; and without their direct participation in online discussions and other forums, the learner has no more engagement with the professor than they would by reading a textbook. By and large, the alternatives are either an unsatisfactory learning experience for the student or a huge amount of work for the professor.

Efficiencies and effective learning can, however, be achieved by creating energetic horizontal communities of knowledge construction and peer review amongst learners. Graduate students, emeritus professors and programme

alumni can act as tutors who are close to the intellectual agenda of the programme. And professors could be accessible through online conferences and conversations. The key challenge is to create efficiencies through mass customisation, not massification. This means finding fundamentally new ways of creating efficiency. The online analogue to the large lecture hall is the hundreds of students consuming the professor's generic content which has now been published online. This is the massification model of efficiency.

The key question for online learning needs to be, how can a multitude of programmes be customised so that each has a feel of its own as a learning community? For instance, the energies and distinctiveness of each learning community needs to be constructed as much by the learners as the content transmitted by the professors. If the learning is engaged, practical and rooted in learner needs and experiences, each class in each course will develop a distinctive feel of its own which fits the sensibilities of the group of learners, and reflects the learning dynamic that emerges within the group. This requires new and more open pedagogical approaches, a new place for content, and new facilitation roles on the part of instructors. The efficiencies here are created by a layered approach – peer-to-peer learning, teaching assistant led teaching, instructional and technology specialist support, with faculty contributing in a 'light touch' overall content development and pedagogical design role.

Emerging technologies and social relationships of the 'new media' have the potential to change the contexts and forms of teaching and learning in higher education. The word 'ubiquitous' captures key aspects of this potential. The implications for our heritage institutions of higher learning are enormous. Whilst technology does not in and of itself change the social world (many so-called 'learning management systems' achieve little but to replicate traditional classroom relations), its affordances may open possibilities that could not previously have been realised.

One potential is to blur the traditional institutional, spatial and temporal boundaries of 'education'. Another is to transform pedagogical relationships, changing the balance of agency between teacher/text and learner, in which learners become collaborative co-designers of knowledge and even learning itself. Still another is to change the modalities of learning, in which forms of representation are increasingly multimodal and written text sits alongside and sometimes within multimedia communications.

The changes we are witnessing today could be deeply disruptive of the discursive, epistemological and interpersonal forms of heritage higher education systems. The challenge for technologists and educators is to work together to explore relationships of learning that are more apt to today's social conditions, more dynamic, and which engage learners more effectively.

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