

Editorial: Educating minds for the knowledge economy

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Welcome to the second part of this double issue exploring ICT-driven change in higher education (HE). The prevailing theme of our papers, which were summarized in the editorial to volume 3.3, is accounts of transformational projects that leverage ICT to help HE offer affordable, high-quality mass education via e-learning. Now, one might think that affordable, high-quality mass education *should* align well with the envisioned role of HE within industrialised nations that competitively chase growth via knowledge-based economies (Evaline 2004). Unfortunately, we argue, while e-learning can support mass education, it can also replicate existing HE systems that are over reliant upon teaching which aims to transmit knowledge (c.f. Adler 1996). This approach risks failing to equip graduates with the requisite skills to solve novel problems set by fast moving knowledge-based economies. Although approaches to redress this balance by incorporating research have long been available, for example action research (Lewin 1948; Dickens and Watkins 1999) and mode two (Gibbons et al 1995), so far their impact in mainstream undergraduate teaching has been rather marginal. Recently, however the family of 'enquiry- and research-based' approaches is starting to unify under the banner of enquiry-based learning (EBL), which is starting to gain traction in HE (Jenkins 2007). Here, we acknowledge that the e-learning community have already played a substantial role in the seeding of EBL. However, we suggest that, as part of a sector-wide transformation, e-learning now needs to generate radical innovations in process and technology (see Rossiter this special issue) and thereby develop capacities for affordable, high-quality mass EBL.

The World Bank acknowledges that knowledge-based economies require knowledge workers: "in industrial countries, where knowledge-based industries are expanding rapidly, labour market demands are changing accordingly" (The World Bank Group, 2005). Drucker's concept of a knowledge worker (1959) is quite familiar (although we suggest it is something of a misnomer). Kelley summarizes the term succinctly: knowledge "workers are hired for their problem solving abilities, creativity, talent and intelligence" (Kelley, 1990, p. 109). While knowledge is requisite to knowledge work, the creative application of that knowledge to research and solve new problems is the hallmark of the successful knowledge worker. In the sciences, we are already reasonably certain that human environmental impact will be an economic imperative throughout the 21st century (Stern, 2006). Addressing such issues will require researchers with the vision to transcend traditional manufacturing paradigms (McDonough and Braungart 2003). Unfortunately, we will argue, many e-learning programmes fail to develop the research based skills that graduates, employers and wider society now require.

Traditional 'chalk and talk' approaches to undergraduate teaching, as critiqued by Laurillard (2001) and Perkins (1992), are often replicated within e-learning programmes based upon behaviourism and instructional design (MacLean and Scott 2007). Such approaches are particularly seductive in e-learning for a variety of economic reasons. They license development teams to reduce a subject area into free-standing units of knowledge. In principle, such units can be instantiated as reusable learning objects. Better still, they can subsequently be assessed via the computer to attest that pre-specified learning outcomes have been achieved. Institutions can offer such courses with minimal involvement by academic staff. Moreover, this whole approach is well matched to the logical positivist mindset that is often encountered in software engineering design (Winograd, 1996) and to the relatively linear nature of current virtual learning environments. In many cases this lean approach recreates instructor led pedagogy, albeit at one remove, rather than offering a more liberating student driven andragogy (see MacLean and Scott 2007; Scott this special issue for discussion of constructivist alternatives, such as conversation theory). The problem is that e-learning products based on the instructional design paradigm rarely equip graduates with the skills to create new knowledge. Such induction into knowledge creation has previously been reserved for research based postgraduate programmes. Offering online research experiences is resource intensive (Shurville et al 2001). Consequently, although one of us was a relatively early adopter of online EBL, he now prefers to facilitate

action research in face-to-face mode within blended courses (Shurville et al 2004). The problem, then, is not that theories and technologies to support EBL do not exist. They do. It is that within a hard pressed sector, academics need to be convinced that the extra effort will be justified and supported. .

In our experience, most, but regrettably not all of the e-learning community are grounded in learning and teaching theory as well as technology. A minority of this community has not always recognized that new technology of itself is not the answer to fundamental problems within the sector nor that overselling e-learning has already been counter-productive (see Luckin et al; Rossiter; Stiles and Yorke; this special issue). In 2002, the UK Joint Information Systems Council (JISC) embarked upon an E-learning and Pedagogy Programme (JISC 2003). The programme was in part a response to the criticism that there has been an over-concentration on developing e-learning practices separate from pedagogic development, merely welding ICT onto traditional transmission teaching. While promoting e-learning, the programme also served as a change agent within the e-learning community. It aimed to ensure that e-learning should be 'pedagogically sound, learner focused and accessible'. Our experience is that the programme helped to generate renewed interest in learning and teaching in both traditional and online environments. Along with many colleagues we leveraged the spotlight such initiatives threw on the new technologies to rekindle wider educational debates within our institution. In this context we grew to appreciate that a blended approach to learning and teaching is very effective in enabling EBL. We made this linkage explicit within the change programme reported in Luckin et al (this special issue) and matched the potential of the blended approach to specific objectives within our University's learning and teaching strategy. We believe that such initiatives have prepared the way for wider institutional reflection but the problem remains in translating such reflection into action.

At a national level the JISC E-learning and Pedagogy Programme, which comes to an end in 2007, was particularly successful because it influenced both the HEFCE and the Department for Education and Skills (DfES) e-learning strategies. One outcome was a recent Higher Education Funding Council for England (HEFCE) TQEF initiative which states as one of its priorities that institutions should ensure "that teaching is informed and enriched by research" (HEFCE 2006a). A sensible approach to informing teaching by research is to merge the two activities to create EBL programmes. The UK Centre for Excellence in Enquiry-Based Learning (CEEBL), which is funded by HEFCE and based at The University of Manchester, defines EBL as follows:

"EBL describes an environment in which learning is driven by a process of enquiry owned by the student. Starting with a 'scenario' and with the guidance of a facilitator, students identify their own issues and questions. They then examine the resources they need to research the topic, thereby acquiring the requisite knowledge. Knowledge so gained is more readily retained because it has been acquired by experience and in relation to a real problem. It is essential that our students are educated for knowledge creation, lifelong learning and leadership. They will take on leading roles in their future working environments: directing change, asking important questions, solving problems and developing new knowledge." (CEEBL, 2007).

The CEEBL web site claims that "enquiry-based learning is the most natural, creative and enduring method of learning" (CEEBL, 2007). The learning and teaching community is increasingly attempting to justify the above quote through action research within their own institutions and not just at the research-intensive universities for which it is becoming one of their standard tenants (Jenkins 2007). Although the EBL learner may primarily 'learn for themselves what is already known', there is potential for a direct feedback loop between the lecturer's research and that of the student, thereby contributing directly to new knowledge. This is a virtuous outcome, binding teaching and research much closer together and enabling the same skills to be used for both.

At the root of this new relationship between teaching and research is the desire to promote deeper learning. Within e-learning, the new term 'learning design' (Laurillard 2002a; Dalziel 2003), is increasingly being used in this context to delineate the development of activity-based learning with the learner at the centre of

the interaction within a virtual learning environment or virtual research environment (see Grimshaw and Wilson this special issue)ⁱ. In such an environment, the learning process can mirror the research process. An effective design for EBL should be collaborative and involve such processes as peer- review/feedback, presentations, posters and team working (see Shurville et al 2004). Laurillard recommends that “[learning] design has to be generated from the learning objectives and aspirations of the course, rather than from the capability of the technology” (Laurillard, 2002b). Appropriate software and standards to run learning designs in virtual learning environments are starting to appear (Koper and Tattersall 2005). For example, the Learning Activity Management System (LAMS) can be used to design and run these types of activities online using conditional branching to respond to individual and group progress (LAMS 2007). However, relationships between EBL, learning design and appropriate virtual learning and research environments have to be actively constructed. Institutions need to make both human and ICT resources available to academics.

So, as our suite of papers illustrates, the locus of such a challenge is now on *institutional* transformation. Institutions are increasingly articulating visions. Strategies are mostly in place. But do these strategies and other exhortations address practical support and staff development issues? And are they embedded and evaluated as part of quality assurance? Are they yet communicating effectively (see Hughes this special issue) and convincing staff and students to engage with these strategies? So far, the evidence of effectiveness of such strategies is all too scarce. To transform the sector, the kind of grass roots and top down initiatives documented in this double issue need to be implemented at a much larger scale. As ‘contextual mood music’, vision, strategies and other building blocks are all absolutely vital. But centralised missives are astutely sidestepped unless they are both convincing and properly resourced. So how do key players engage, convince and ‘make it happen’? Without strategic leadership, little comprehensive institutional progress will be made, as evidenced in Luckin et al (this special issue). Failure is structurally predetermined without the wholehearted support of the institution at the highest level. However, embedding and transformation cannot be achieved simply by removing the barriers. We must be far more proactive, putting life into our strategies.

Collaborative engagement is the key and the ideal locus of collegiality may in fact lie without the institution and within subject areas across institutions. HEFCE’s Centres for Excellence in Teaching and Learning represent opportunities of such collegiality which “reach across all the main subject areas and involve many aspects of student learning” (HEFCE 2005) (see Cook et al this special issue). HEFCE (2006b) and Jenkins et al (2007), both emphasise that families of like-minded disciplines may form communities of practice. Nevertheless, many institutions are engaging in the familiar panoply of running workshops, sponsoring ‘swap-shops’ and other means for contextual peer sharing of ideas. But is this always done in full knowledge of understanding where the institutions’ weaknesses lie? Even when academics are enthused by the potential of blended learning and EBL they remain fearful of the time commitments and their perceived lack of requisite skills, both in determining how to revamp their courses pedagogically and in any associated ICT skills. To ameliorate such blockages there is increasing recognition that what is needed is a multidisciplinary task force to work with academics. Note the example of the ‘Harvard compact’ (Harvard University, 2007). Explicit in such a model is the recognition that academic staff development programmes are fundamental and that staff need to engage with and contribute to the change plans (see Marek et al this special issue; Shurville and Owens in press).

Organisational transformation can often under-estimate the need for changes in professional practice. Rethinking the design of courses to enable them to be more enquiry-led may require a radical adjustment on the part of academics who will then often need much education, support and training. Such rethinking was anticipated in the Dearing Report (Dearing 1997) and one outcome has been that most UK universities now have a course accredited by the Higher Education Academy to train new staff in the new pedagogies allied to e-learning. More broadly, the most appropriate support models have much exercised the UCISA community and opinions have been canvassed in three surveys (Browne et al, 2006). These surveys reveal great diversity though the technical is still mostly separate from the pedagogic. There is also much variety regarding centrally or departmentally embedded expertise, with history and culture accounting for much of this variety. But organisational change of academic practise requires an equivalent transformation in the support services in order to leverage the synergies between what used to be regarded as discrete services, such as educational

development units, flexible learning support centres, information technology services, libraries and media units. In our experience, internal politics and differing cultures across such services can be considerable barriers. Negotiations which involve such stakeholders are vital to successful change programmes (see Benson and Whitworth this special issue).

So far we have considered the change issues from the perspective of academic and academic-related staff. There is, however, a second group of stakeholders who need to be engaged in sector wide transformation: the students (see Beastall and Walker; Coen et al this special issue). Various surveys sponsored by JISC (2007) have shown that students value those aspects of educational processes which are often least used by staff. These include collaboration, feedback from instructors and peers, and shared materials. Students also value face-to-face contact (and are fearful of its reduction) as well as timely on-line feedback. Moreover, although up to date on-line content is much valued students are very receptive to active, contributory learning designs. However, institutional on-line discussion technology is often little used compared with students' own pervasive social networking tools (c.f. Criag 2007), where, perhaps to the frustration of many academics, human connectivity is very high. They are often confused by the plethora of individualistic academic presentation styles and layout of content within virtual learning environments. They want more training in vocational skills such as giving presentations using PowerPoint, time management and discernment of resources. Also, assessment drives much of student behaviour. Students want timely feedback and value formative testing and can see the merit in competency-based summative assessment. But where do we explain to students what is meant by research-like teaching and what their responsibilities and required capabilities will be? Some institutions operate certificated programmes for acquiring a range of competencies to underpin students' formal studies (c.f. Fowlie and Smale 2003). But the extent to which they are credit-bearing is not widespread. On the basis of such surveys, we believe that HE needs to demonstrate that it can meet existing student requirements and reward the development of personal skills before students will put faith in new approaches such as mass EBL.

Finally, how should HE measure success in such initiatives? The recent HEA (with JISC) -sponsored e-learning benchmarking programme (HEA 2007) gave participating institutions "an opportunity to participate in an externally-driven process of reflection and analysis of their current e-learning provision, processes, and practice, using a recognized methodology". Given the increasingly substantial resources that are being invested in e-learning, institutions are now required to justify its impact using key performance indicators (KPIs). To date, however, whether input (e.g. number of modules in an institutional VLE) or output (e.g. percentage of higher degree classifications) when KPIs are used they are but crude proxies for hard data. Can we really nail down the contribution made by the pedagogic design employed and also disentangle the contribution made by blended learning? And when do we say we 'have arrived'? With the relentless changes in technology, new pockets of innovation are continuously developing at the periphery of our increasingly centralised infrastructure. These bring many new educational affordances but also additional support headaches! They may at some point challenge those infrastructures in which we have already made significant investment (see Craig 2007). Continual creative tension will be ever present and this will require much organisational maturity. The constantly acquisitive 'centre' must be perpetually tolerant of seemingly aberrant behaviour at new peripheries—where enthusiasts and early adopters of e-learning and EBL used to reside! We must anticipate that our destination will be a constantly moving target and that generational change will bring creative destruction and renewal.

Lest readers are left with the impression that we have jostled with a straw man, we would like to close with a historical quote from an established and suitably conservative figure. In 2000, Tony Blair, then UK Prime Minister, famously commented: "I strongly believe that the knowledge economy is our best route for success and prosperity. But we must be careful not to make a fundamental mistake. We mustn't think that because the knowledge economy is the future, it will happen only in the future. The new knowledge economy is here, and it is now." (Department of Trade and Industry, 2000). We therefore believe it is imperative for HE to undertake sustained transformations in organizational structure, processes, staff development and technology to support initiatives such as mass EBL that will equip graduates for the knowledge economy.

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ⁱ At the moment virtual learning environments have become mature products and there are projects underway to develop virtual research environments (JISC 2004). We envisage that future managed learning environments will provide integrated access to virtual learning environments and virtual research environments.