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Ideas from the United Kingdom on research and development to utilise the innovation potential of Information and Communication Technologies in order to enhance learning

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Research into Online Distance Education and E-learning: Making the difference

Contribution to Round Table on 'Not enough research
or not the right research to see the full innovation
potential of ICT implemented in learning systems? Or
is the problem somewhere else?'

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Ideas from the United Kingdom

Ideas from the United Kingdom on research and development to utilise the innovation potential of Information and Communication Technologies in order to enhance learning

This paper was originally written as a contribution to a Round Table at an EDEN workshop on 'Not enough research or not the right research to see the full innovation potential of ICT implemented in learning systems?' In the ensuing discussion I argued this is an interesting question but one which is slightly out of focus. The goal should not be research to utilise more fully the innovation potential of ICT in learning systems but how to enhance learning in order to produce learning outcomes that are valued. It would be possible to achieve the former in a way that did not achieve improvements in desired learning outcomes – learning is ultimately about values and technology should be used primarily to enhance learning, not to achieve technologically-framed goals.

So, what can ideas from the UK tell us about my question: how can research and development utilise the innovation potential of ICT in order to enhance learning. In the UK a number of national organisations have recently produced reviews and strategy documents that directly addressed this question (BECTA, 2005a, 2005b; HEFCE, 2005; Taylor *et al.,* 2005; ALT, 2005) and one outcome was the decision to fund a programme of multidisciplinary research on 'technology enhanced learning' (TEL) (TLRP, 2006), within the umbrella of the UK's Teaching and Learning Programme (TLRP). It may therefore be worth drawing on ideas from these reviews and strategy documents to see if they can inform a broader international dialogue on future research on learning systems innovation. The TLRP is a coordinated research initiative, operating since 2000 and managed by the Economic and Social Research Council (ESRC),

which has involved over 700 researchers in over 60 projects and associated thematic investments. The aim of TLRP is to support and develop research which leads to improvements in outcomes for learners of all ages and in all sectors of education, training and lifelong learning in the UK. It has strong links with many user organisations and has established a significant range of output vehicles for dissemination and impact. It had already supported a number of projects with a TEL component before managing a major new programme of TEL research, with eight major TEL projects being commissioned in 2007-08.

From the documents and programmes mentioned above I have drawn out five particular challenges that TEL research and development will have to meet if it is to enhance learning and support innovation in learning systems.

Challenge 1: Research on 'technology enhanced learning' needs to be genuinely interdisciplinary

TEL as a field spans the disciplines of learning, cognition, information and communication technologies (ICT) and education, as well as drawing on the broader social sciences. However, if TEL research is to be more widely used then there needs to be greater recognition of the need to develop the area as a genuinely interdisciplinary research field. Those working in this field need an awareness of research on teaching and learning and research and development on innovative digital technologies to support knowledge development and human interaction. A virtuous circle could be created if innovation in one research area challenges those working in the other area to rethink ways of making learning more effective and researchers then collaborated in constructive and iterative processes of engagement and mutual development in order to achieve that goal.

Research areas that require collaboration across the social/educational and technical/computing research communities could include, for example, the development of naturalistic and multimodal interfaces to support distributed and mobile communities of learners, an open

architecture for TEL systems, and dynamic user modelling to improve personalisation of learning. The overall challenges to the research community will be to develop innovative applications of digital technologies that will contribute to making education and lifelong learning more personalised, inclusive, flexible and productive (TLRP e-team, 2006):

> *Personalised:* Transforming the quality of teaching and the learning experience by exploiting the responsive and adaptive capabilities of advanced digital technologies to achieve a better match with learners' needs, dispositions and identities.

> *Inclusive:* Improving the reach of education and lifelong learning to groups and individuals who are not best served by mainstream methods.

> *Flexible:* Enabling the provision of education and skills to be deployed in more open, variable, and accessible ways, so that learning opportunities are available in a more seamless environment that can link classroom, home, workplace, and community.

> *Productive:* Achieving higher quality and more effective learning in affordable and acceptable ways.

It may be self-evident that in order to understand TEL and make it more effective it is necessary to promote a strong interdisciplinary research agenda. However, interdisciplinarity brings together not only different disciplines but also very disparate research traditions. One consequence of this is that while some researchers find a new 'home' and commit to the new area, others prefer to work in the area but, in terms of their outlook, orientation and identity, remain firmly attached to their original disciplinary base. One way to overcome this may be to establish TEL research centres, as has been the case in a number of countries, rather than relying on collaboration of individuals who are still in their original disciplinary homes. Such centres have the advantage that there can be a continuing dialogue about research

perspectives leading to mutual development. This type of approach may help researchers come to terms with the multiple voices and perspectives that influence the area and understand how the practice of the various disciplines differ in their approach to the adoption and use of learning technologies.

The following summary from the Research Councils funded review of TEL expresses the scale of the challenge: 'Research into e-leaning is inherently multidisciplinary, requiring partnerships between those who develop technology and a broad range of social science researchers who seek to understand the nature of learning and the interaction and organisational effects of technology. This combines perspectives, methods and theories from the technical domains (e.g. Computer Science, Technology, Artificial Intelligence); design disciplines (e.g. Design, Human-Computer Interaction (HCI); the learning sciences (e.g. Educational Technology, Psychology, Education) and the disciplines studying communication, communities and discourse (i.e. Social Sciences, Linguistics). Establishing and maintaining these multidisciplinary research teams is essential for successful e-learning research, particularly given the longitudinal nature of the research involved, and requires us to move forward in a coordinated manner in order to build effective e-learning environments in the future' (Taylor *et al*., 2005 p. 2).

Challenge 2: recognising the value of personalising learning but recognising its drawbacks too

Personalised learning appears to be a killer application for TEL, so some advocates of TEL promote personalised learning as if it is a 'universal good.' This ignores the fact that much learning has a strong social dimension, whereby quite often an individual might rather study the same topic area as others precisely because it brings access to a peer group and a tutor, even if the topic is of less interest to her or him than another topic that he or she would largely have to study on their own. To achieve the highest ambitions for education and lifelong learning we need to exploit fully what technology offers in support of

our goals, but not to set the goals simply to get the maximum use from technology. Overuse of technology might narrow the range of learning outcomes in ways that may be unhelpful for an individual – some large IT employers, for example, were recruiting arts graduates with good communication skills as network consultants in preference to computing graduates on the grounds that it was easier to teach the former IT skills than it was to teach the latter communication skills!

So providing there is recognition that personalising learning can be more useful in some contexts than others, then using TEL to personalise learning in order to improve learning outcomes (broadly defined) is an important challenge. [In this context it is worth bearing in mind that TLRP draws attention to the need to define learning outcomes quite broadly so as to include both the acquisition of skill, understanding, knowledge and qualifications and the development of attitudes, values and identities relevant to a learning society.]
One avenue worth exploring could be transforming aspects of the teaching and the learning experience by exploiting the responsive and adaptive capabilities of advanced digital technologies to achieve a better match with learners' needs, interests, dispositions and identities. That this issue is more complex than it might first appear arises partly because learners' needs, interests, dispositions and identities need not necessarily be congruent. However, even in order to attempt more effective personalisation, we need a more explicit understanding of the nature of learning itself, both formal and informal, and the way it is responding to changes in society and the opportunities created by new technologies (TLRP e-team, 2006).

The Association of Learning Technology (ALT) Research Strategy (2005) raises the issue, however, that it is less of a question of whether we can deliver personalised learning experiences per se and more 'How do we deliver a personalised experience within a mass system? Unless an educational system is capable of scaling up it will inevitably be too expensive and become moribund as soon as initial enthusiasm wanes. A lot of what currently passes for personalisation is only 'skin deep', and does not really help the learner beyond a psychological feel-good factor. There are two conflicting paradigms: mass education

and the user expectation of a personalised learning experience. Research into how technology can continue to help resolve this conflict is required' (ALT, 2005, para 18).

Research under the personalisation theme could explore: how digital technologies can help to match the needs, abilities, aspirations, and circumstances of learners and learning communities through personalised technology and services; how technologies can be developed and used to connect learners to networks of others and to derive social support in learning processes and to enable learners to make informed choices about their own learning and to learn where, when and with whom they want, in ways that suit their approaches to learning and learning identities; and how to provide learners with easy access to a personal learning environment that offers culturally, educationally and psychologically appropriate tools, resources, and support for their learning; the application of learning strategies and other approaches to learning, user profiling, recommender systems, learner modelling, and personal development planning, to support effective tools and services that are capable of matching individual needs, abilities, interests, dispositions and identities, and of yielding a higher level of personal performance; how to develop ways of networking individuals and groups of learners to achieve new, socially appropriate forms of challenge and support in learning; the use of an understanding of the implications of personalised learning to investigate innovative solutions for new areas of curriculum development, and for new and more challenging forms of assessment (TLRP e-team, 2006).

Challenge 3: build on achievements that have already been made

One problem is that insofar as Technology Enhanced Learning is maturing as a discipline so there is a widening of the gap between leading edge research and standard practice. While some state of the art developments can perform a showcase function, it is important to build on the achievements behind the leading edge that could have a significant impact. 'An e-learning Research Agenda' (2005) took care to highlight that much has been done and a number of developments

are starting to permeate approaches to education, training, learning and development. There have been significant developments in advanced ICT techniques, such as 'an advanced e-infrastructure that includes the virtualisation of computational and data resources through the techniques of Grid computing, the automated processing, integration and reuse of information through Semantic Web technologies, support for knowledge sharing and distributed team-working, and new mobile and ubiquitous computing systems' (TLRP e-team, 2006, p.3).

Additionally 'every member state of Europe now has an e-science programme, and the EC IST programme supports concertation activities in areas such as Semantic Grid and standards. The US cyber-infrastructure has also been influential. These meet internationally through community efforts such as the Global Grid Forum (GGF) and nationally through the network of e-Science centres and the e-Social Science community. Such new developments stand to benefit the entire learning technology lifecycle, starting with the conceptualisation, design and development of systems and content to support learning experiences and opportunities, through to deployment, maintenance, evaluation and reuse. Importantly, they can support practitioners and stakeholders at each stage including teachers, learners, administrators, researchers and service providers' (TLRP e-team, 2006, pp. 3-4).

More general developments in computer science are also applicable to TEL, so that in some areas it will be more a question of adapting tools rather than developing them afresh, as 'personalised tools, services and environments, context-aware computing, mobile computing, enhancement of collaboration and workflow tools and services, autonomic (self-managing) systems, human computer interaction and context-aware computing amongst others' become more widely available (TLRP e-team, 2006, p.3). Also some TEL, such as the use of virtual microscopes; simulations in science, medicine and engineering; virtual 'cases' in speech therapy and so on, are so widely used and appreciated that learning without them is now almost unthinkable.

However, there is another dimension to 'building on achievements that have already been made' and that relates to the use of evidence from research and development studies that have already taken place. In a developing field it is often more exciting to seek funding for new developments than to consolidate what has already been achieved.[1] The ALT Learning Technology Research Strategy (2005) also highlighted how there was 'a growing need for co-ordinated evaluations, which collect together smaller studies by practitioner researchers, in order to develop an understanding of the bigger picture……This needs core researchers who can cope with large distributed, possibly part time teams and trained part time researchers/evaluators in distributed, virtually connected communities' (ALT, 2005, para 42). Co-ordinated evaluations could be used to produce overview articles to be disseminated widely.

Challenge 4: implementation rather than development as the major challenge

'Recent educational research on classroom use of information and communication technologies (ICT) has found that teachers continue to be centrally important in designing and supporting learning with ICT across the curriculum. The potential of new technologies is still not being realised, with few teachers and lecturers making full use of computers and other technologies' (TLRP e-team, 2006, p. 4). Similarly, the ALT Research Strategy (2005) points to how much research in LT has been accused of 'failing to address the problems facing practitioners or resource controllers.' This was partly due to a 'frequent lack of understanding, especially by developers, of institutional contexts' (para. 4). ALT (2005) believes there to be an ongoing requirement to bring together researchers, practitioners, developers, and resource controllers in order to ensure effective deployment. Only in this way can 'embedding' of TEL be achieved. One problem is that researchers are often not bound by the same

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[1] Some educational institutions have development units where the express intention is to 'follow the funding', with a preference to move on to a new development rather than trying to embed the last initiative once that funding has ceased.

constraints that are considered the norm for mass education. Some researchers exploit technology without a thought-through pedagogic strategy, whereas other researchers use a clear pedagogic strategy but in a context of a single lesson or classroom that is treated as a 'one-off' intervention, almost totally divorced from what happens the rest of the time or in other lessons. Resource controllers do not seem to find either approach helpful. Also new approaches to learning usually have to be introduced within existing administrative, organisational, learning and assessment systems. The interaction between them is currently seriously under-researched.

If a researcher is serious about implementation then they need an evidence-informed approach to the management of change, and will need to consider how this will interact with the approach to TEL. Some questions they might ask include: How does change impact upon motivational issues? What are the drivers and rationales for change? What are appropriate strategies for managing and enabling change and mechanisms for implementation? How well do we understand issues of scalability?

Implementation not only takes place in particular social, economic, organisational and cultural contexts, but there is also often a strong political dimension too. Technology-enhanced learning has been massively over-hyped in the past (indeed from the 1960s onwards). However, if the 'selling' of the prospective rewards of technical innovation were scaled back, better managed expectations may result but would such generous funding be forthcoming?

The UK does have a variety of organisations that seek to promote the take up of TEL in different sectors.[2] Becta (2005) point out how

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[2] British Educational Communications and Technology Agency (Becta), for example, was set up to offer 'timely, evidence-informed, advice both on the implications of ICT for schools and the learning and skills sector and on the best way of realising the full potential of ICT in education; continue to play a leading role in developing the evidence base that is needed to underpin the educational use of ICT; and carry out in-depth studies to evaluate new technologies, applications and software in order to understand their benefit for the education system.'

'achieving evidence-informed policy and practice is challenging. Many ICT research studies can lack utility in supporting strategic decisions. Policy and technology developments are rapid and research studies can quickly date. Links between research and decisions making can be weak' (p. 2).[3] The Becta Review (2005) highlighted how the educational context is one of variable capability with ICT – both in terms of institutional provision and educational practice. Yet there are pockets of innovation from which others can learn. Becta is seeking to develop robust ways of identifying effective innovative practice with ICT, and also understanding how it is best developed in those who have not yet developed it. Therefore understanding how organisational and professional change with ICT can be achieved is important.

Challenge 5: Issues of fairness, equity and inclusion

The development and implementation of TEL gives rise to demanding educational, technological and organisational challenges. However, these are mirrored by an equally demanding set of political, economic, social and cultural challenges. E-learning may have been recognised as politically significant by the UK government but 'concerted and co-ordinated political action will be needed to achieve the combined agendas of lifelong learning, widening participation, e-Government and active citizenship in the 21st Century. Yet there continue to be major practical difficulties that are rooted within societal and economic concerns that must be overcome. For example, the UK 'digital divide' remains a problem - women, people aged 55+, those not in work, those from social classes C2DE, and people without formal educational qualification continue to feel disconnected from our increasingly connected vision of the future' (Taylor *et al.*, p. 8). Research is also needed in how TEL can support multiple cultures, particularly as 'Western methodologies often rely heavily on a

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[3] The aims of the Becta Research and Development Strategy (2005) are therefore to: 'deliver research and evidence which can support the strategic development of ICT in education, and to inform and influence the decisions of educational decision makers – either directly, or indirectly, via intermediaries, advice streams or national policies.' (pp. 2-3).

particular style and format of online tutorial support that is sometimes replicated without thinking through the cost and cultural implications. As blended learning becomes the new norm, we should be researching what blends work best across a range of sectors, disciplines and cultures' (ALT, 2005, para 42).

A key goal of TEL should therefore be to improve the reach of education and lifelong learning to groups and individuals who are not best served by mainstream methods. Research in this area might include exploring 'how digital technologies can be used to support learners who are exceptionally talented, who have become disaffected from learning or who are otherwise unable to study to achieve enhanced learning outcomes and progression. How can technology enhanced learning - excite and stretch high achievers; motivate excluded learners through more engaging learning experiences that scaffold progress into more challenging learning opportunities; provide greater accessibility to learning technologies for learners with physical disabilities; support learners with cognitive disabilities to enable them to achieve their learning ambitions; provide higher quality access to learning for learners at times and places of their choice, in association with appropriate others, at any stage of learning?' (TLRP e-team, 2006, p.8). This could include developing the design principles and prototypes that will help disaffected learners or those with cognitive disabilities to make faster progress and achieve greater accomplishment of basic skills and concepts, than may be possible otherwise. Research to address issues of social inclusion could include 'making affordable the forms of inclusive accessible learner-centred design that challenge current forms of HCI; technical solutions to support learners with limited literacy, language or cognitive skills in access meaningful learning resources and experiences; finding design solutions that support learners outside the mainstream in truly intuitive, empathetic means of interaction; understanding the psychological and social requirements, and developing appropriate technical solutions, for bringing reluctant users into the digital world' (TLRP e-team, 2006, p.17).

Conclusion: educational purposes – innovation – pedagogy – technology-enhanced learning

Education should be about the development of character as well as the intellect; helping individuals develop the emotional, social and intellectual capacities to participate fully in society. If this leads to a sense that we need to reform aspects of our learning systems then this reform should perhaps be driven by clearer purposes than to, for example, to raise achievement: it could include young people feeling connected with the world; engaged with learning; valuing and respecting difference; wanting to be active citizens. Once we are clearer for example on what an educated 19 year old might look like, then we can look to pedagogic means to achieve these goals – for example, a strategy might be to develop greater resilience (Dweck, 1999); improve informal reasoning (Perkins, 1985); or help individuals develop a wider range of approaches as these are all things we do not do very well in many current approaches to education. Technology enhanced learning can play a role in this, but let us be clear that this is a second or third order issue – being clearer about educational purposes and devising a pedagogy to achieve those goals should be the drivers of innovation in learning systems. TEL may have a role to play in this but that role should not be as the driver of the reform: values driven, pedagogically sound and technologically enhanced and underpinned by research and development looks like a balanced approach to learning to me.[4]

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[4] An example of appropriately modest aims for TEL comes from a consideration of the pedagogy strand of the HE eLearning programme that has as its core aims: to provide the post-16 and HE community with accurate, up-to-date, evidence- and research-based information about effective practice in the use of elearning tools; and to promote the application and development of elearning tools and standards to better support effective practice (JISC, 2005). See: www.jisc.ac.uk/elearning_pedagogy.html. This approach is informed by evidence from Beetham H (2004) Review: developing e-Learning Models for the JISC Practitioner Communities.

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Taylor, J. *et al.* (2005) An e-learning research agenda (2005). ESPRC. http://www.epsrc.ac.uk/CMSWeb/Downloads/Other/E-learningResearchAgenda.pdf

TLRP e-team (2006) Research on Technology Enhanced Learning: Understanding, creating, and exploiting digital technologies for

learning – Call for research proposals, TLRP.
http://www.tlrp.org/manage/documents/CALLTELfinal-1.pdf

The reviews and strategy documents include:
Becta, Review 2005: Evidence on the Progress of ICT in Education,
http://www.becta.org.uk/page_documents/research/becta_review_feb05.pdf
Becta's Research and Development Strategy 2005-8
Delivering research and evidence which can support the strategic development of
ICT in education
http://www.becta.org.uk/page_documents/research/research_strategy05-8.doc
HEFCE, Strategy for e-learning (2005),
http://www.hefce.ac.uk/pubs/hefce/2005/05_12/
JISC, The e-Framework for Education and Research – an Overview,
http://www.e-framework.org/resources/eframeworkrV1.pdf
JISC, Designing for Learning: an update on the Pedagogy strand of the JISC e-
Learning Programme, www.jisc.ac.uk/elearning_pedagogy.html
Josie Taylor *et al*, An e-learning research agenda (2005) (ESPRC/ESRC /core e-
science review group)
http://www.epsrc.ac.uk/CMSWeb/Downloads/Other/E-learningResearchAgenda.pdf
ALT Learning Technology Research Strategy – 2005
http://www.alt.ac.uk/ALT_2005_Research_Strategy_20050420.html
Technology Enhanced Learning has been identified as being of key importance for
the UK government and there are official strategies in relation to particular
educational sectors in Northern Ireland, Scotland, Wales and England.

[1] Research on Technology Enhanced Learning: Understanding, creating, and
exploiting digital technologies for learning – Call for research proposals (TLRP
2006)
http://www.tlrp.org/manage/documents/CALLTELfinal-1.pdf
The European Commission is currently using the phrase 'Technology Enhanced
Learning' for Framework VII, and will promote it as a 'new' research area.
'Technology enhanced learning' includes what has recently been termed 'e-
learning'.

The management of the commissioning of the TEL research is being conducted by
the TLRP e-team: comprising Dr Richard Cox (University of Sussex); Professor
Diana Laurillard (Institute of Education, University of London); Dr Lydia Plowman
(University of Stirling); Professor Josie Taylor (Open University) and the Director
of the TLRP: Professor Andrew Pollard (Institute of Education, University of
London). ESRC, EPSRC and the e-Science Core Programme have provided
approximately £6m funding for an initial four years to support a limited number of

teams or consortia (approximately 3-5, with awards up to £1.5m each). Additionally, a number of small six-month development networks (up to £60k) will be funded, in anticipation of a second round of the competition, for which additional support is being discussed with potential co-funders. The TLRP e-team drew together many of the ideas that are reflected both in this paper and in the call for research proposals mentioned above. http://www.tlrp.org/manage/documents/CALLTELfinal-1.pdf

In the US they have established dedicated e-learning research centres such as the Stanford Institute for Learning Sciences and Technologies (SILST). The UK has had inter-disciplinary research institutes at the Open University and elsewhere; and the London Knowledge Lab is an example of a centre that is multi-institutional as well as inter-disciplinary.