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Evidence for E-learning Policy

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ABSTRACT E-learning is becoming an increasingly mainstream feature of educational delivery. The launch of a national e-learning strategy in England signals the Government's commitment to maximising the potential benefits of investment in information and communications technology (ICT). The vision for e-learning set out in this strategy is ambitious. At this time, research has the potential to inform related decisions about e-learning at many levels, though achieving evidence-informed policy and practice requires meaningful dialogue between researchers and policy makers and practitioners. Robust evidence of the impact and added value of e-learning is at a premium, set within the context of broader educational objectives, like widening participation in learning and raising educational standards. This is not a straightforward exercise, due to the difficulties of researching complex social contexts and interventions. The challenge for researchers is to develop methodologies which both recognise the complexities of e-learning implementation and produce robust measures of impact or added value. Greater understanding is needed of the conditions under which ICT deployment impacts positively on attainment, the relationship between learner needs and e-learning, the effective deployment of staff time, assessment in an e-learning age and e-learning in post-16 education.

E-learning and Educational Change

It has been claimed many times that e-learning is about to 'take off' – to feature significantly in educational practice and to change the landscape of educational delivery (for example, Crowther, 1969; Papert, 1993). However, though information and communications technology (ICT) has already facilitated changes throughout education, especially in work-based learning, any new visions of teaching and learning are slow to be realised. So I will be necessarily cautious in making claims about the future of e-learning. Nonetheless, there is good reason to believe that e-learning in its broadest

sense – the use of ICT in teaching and learning – is at a critical stage. It is on its way to becoming a mainstream rather than a marginal feature of educational delivery. And, though some grander visions for the role of ICT in teaching and learning are unlikely to be realised, there is good reason to argue that ICT will help deliver some real changes to educational practice and delivery in the medium and long term. In this environment, research evidence assumes increasing importance to those formulating e-learning policies and approaches, and those putting e-learning into practice.

The 2003 launch of the Department for Education and Skills (DfES) e-Learning Strategy consultation in England (DfES, 2003a)[1] represents an important context for this. This move not only recognises the increasing role of ICT in education, it also signals the Government's commitment to maximising the potential benefits of ICT investment by adopting and promoting a strategic approach to e-learning funding, development, deployment and use. Similarly, many educational institutions and authorities have developed, or are developing, ICT and e-learning policies which will shape education business decisions and impact directly on educational delivery. The success of any national e-learning strategy in fact depends on the approaches taken to e-learning in educational agencies, authorities and institutions, as well as government.

The Government's commitment to ICT in education is not new. Since the launch in 1997 of the Government's National Grid for Learning, now the ICT in Schools programme, the Government has invested heavily in ICT in schools, including major investment in infrastructure, like computers and connectivity, funding for software via the Curriculum Online programme, and ICT training for teachers. The impact of this spending can be seen in improved pupil:computer ratios, increased use of software and increasing teacher confidence and competence in using ICT in the classroom (DfES, 2003b). This picture of improvement is similar in further education (FE) and higher education (HE) institutions within the United Kingdom (UK) (British Educational Communications and Technology Agency [Becta], 2003a).

Despite this progress, most e-learning policy makers, researchers and practitioners would agree that the delivery of education happens in many of the same ways as it did before this investment. Where ICT makes a contribution at the moment, this is often as an enhancement to existing educational practice (as is often the case with the use of interactive whiteboards, for example), or as a 'bolt-on' providing some, but limited, added value as in the use of asynchronous student conferencing to enhance student learning in HE). In the increasingly online world of corporate and work-based training, the value that e-learning adds is an economic one – essential in some cases for maximising access to affordable training opportunities, but often falling short of the potential for engaging learners in new ways.

The vision for e-learning set out in the e-Learning Strategy consultation document is that e-learning can help deliver:

- means to empower learners – for example by enabling more active learning;
- more creative and innovative teaching and learning;
- an education system which is more flexible and responsive to individual needs;
- a better value education system – in terms of quality and economy of delivery;
- a system which supports continual updating of professional knowledge.

It prioritises seven strategic action areas that are necessary to embed e-learning effectively across all sectors:

- leading sustainable e-learning implementation;
- supporting innovation in teaching and learning;
- developing the education workforce;
- unifying learner support;
- aligning assessment;
- building a better e-learning market;
- assuring technical and quality standards.

These represent the focus for central government action. However, actions, including many of those above, are necessary at all levels to ensure that the potential of ICT in education is realised. So the e-Learning Strategy in England is part of a larger policy landscape. It represents a leading voice in a dialogue about the actions required at different levels in order to realise the potential of ICT and to realise it efficiently – that is, add value to the system without incurring large extra costs.

In this dialogue e-learning is rightly recognised as a means to an end – a way, alongside other elements of educational provision, to serve key educational objectives. The priorities for the DfES, across all sectors, are to:

- widen participation in learning;
- reduce barriers to achievement;
- prepare people for employment;
- improve the quality of education;
- raise educational standards.

These are not just government priorities. Educational practitioners face the realities of meeting these aims on a day-to-day basis. They are brought into stark relief in the practice of educational delivery – as, for example, when confronting the issues of how to motivate boys aged 13 towards learning, how to accelerate the literacy and language skills of a 10-year-old whose first language is not English or how to equip someone who has been

unemployed long-term with skills for work. There is potential for the use of ICT to add real value in all these cases.

E-learning policy may look different at different levels, reflecting the unique remits of government, its agencies and those developing and delivering educational provision. But the shared agenda is the same. It is about how ICT can be deployed to serve these shared aims, and how this can be done both effectively and efficiently.

The Role of Research

So the role of ICT in education is changing fast. In this context research has the potential to inform decisions at many different levels. I will address what this implies for the shape of research into e-learning and discuss gaps in relevant research evidence later. However, first it is worth striking a note of caution about the relationship between research and policy and practice and considering the 'problem' of evidence-based policy.

The term 'evidence-based' is often used in relation to the development of policy and practice. Yet many social researchers advising government, like myself, whose remit it is to ensure that policy decisions are influenced by sound social research, are aware that the relationship between research and policy is not a simple one. 'Evidence-informed' may be a more appropriate term.

Hammersley (2002) offers a critique of the role of research in policy and practice, suggesting there are broadly two models, the engineering model and the enlightenment model. The 'engineering' model applies, as the name suggests, in broadly technical fields, where the outcomes from research map directly onto practical and policy outcomes (such as identifying the causes of structural weakness in bridge design and addressing this in guidance, training and regulation).

The 'enlightenment' model reflects a less certain relationship, where research nonetheless is viewed as critical in underpinning policy and practice, but received logic to link findings to implications is absent. However, what Hammersley refers to as 'strong enlightenment' represents the position that research can still provide fairly straightforward answers or implications for practitioners and policy makers. Hammersley is critical of this position, which is implicit in much policy-focused research, and argues that research is just one element of many in the variety of professional practice and policy considerations and accountabilities.

Though Hammersley's arguments can be taken as painting a gloomy picture of the scope for research to inform practice and policy, a 'weak enlightenment' position has important implications for approaches to enhancing the impact of research. It tells us that achieving research impact is not just about disseminating findings effectively, nor simply responding to

policy makers as research 'customers'. The success of research as a source of knowledge for policy makers and for practitioners depends on professional attitudes, values, norms and accountabilities. Where these converge, or where there is a sharing of minds, or a meaningful dialogue between the worlds of research, policy and practice, evidence-informed policy is afforded. This dialogue and understanding should play into all stages of the research process, from planning to dissemination.

This is not an argument for the need for all research to be explicitly policy or practice focused. Research can have many different uses and be of value in different ways. Research which serves to establish and refine theoretical underpinnings, which then inform practical research projects (sometimes invisibly or implicitly), is critical to the overall value of research. Similarly, research that offers an analysis of, for example, organisational or pedagogical processes, but without great practical or policy import, nonetheless can serve to enhance overall understanding of the educational world. It can contribute to a bigger picture – a backdrop for understanding the significance of any outcomes from policy-focused research.

In the world of 'weak enlightenment', the e-Learning Strategy represents a valuable reference point to researchers wishing to engage in policy-relevant research. It is the explicit articulation of the vision, actions and priorities for e-learning at a national level. It also articulates the considerations and accountabilities of those who influence and implement e-learning policy. Thus it is an important step in a dialogue between researchers and e-learning policy makers.

It tells us that policy decision makers, and those deciding how to implement policy, are ultimately accountable to the broader educational priorities presented earlier – to widen participation, reduce barriers to achievement, prepare people for employment, improve the quality of education and raise educational standards. They are also often answerable in terms of providing evidence that investment decisions were wise ones. I will return to this issue in the next section, and discuss some of the methodological implications for researchers arising from it.

The e-Learning Strategy consultation paper is explicit that research is critical in the overall picture. The Strategy consultation recognises the need to foster a practice-based research environment, and to develop better evaluations of e-learning in order to understand what is effective in e-learning, including better analysis of its costs and benefits.

A more coherent approach to research (and development) is essential. Building a coherent body of knowledge is difficult in any area, and particularly so in human and social sciences. But the consequence of failing to do so will result in e-learning progressing on a less than solid research footing, and expensive mistakes may be made.

Overall, the message is that research to inform the development of e-learning policy should be robust (or as robust as possible), meaningfully placed within a context of broader educational objectives, generalisable beyond the immediate context (or transferable to other contexts in meaningful ways) and accessible to non-theorists. In addition, to serve policy and practice well, the standard approaches to research dissemination, such as papers and reports, should not be viewed as ends in themselves, but as tools in a dialogue with policy makers and practitioners – attuned to particular audiences, and ideally designed to engage them actively.

Robust Evidence of Impact and Added Value

Researchers can contribute in many ways in the context of rapidly developing e-learning policy and provision – for example, by researching and monitoring the penetration and 'maturity' of e-learning within educational delivery, understanding learner needs and preferences towards e-learning, identifying the factors which maximise effectiveness, identifying strategies for transferring effective practice within and between sectors, and researching innovations in the use of ICT which can deliver real benefits to learners. However, an overriding consideration, identified in the e-Learning Strategy and recognised by many in the ICT research field, is the need for better evidence of 'what works' in e-learning.

At all levels in the educational delivery chain there is a need to understand whether investment decisions are being made which maximise educational benefits. This includes asking 'What is the impact of e-learning on educational (and other) outcomes?' At government, and arguably other, levels, evidence of this kind is needed to address the question 'Was it worth it?' For HM Treasury, this is often an economic question. It is a frustrating question to be asked for many in the system, but not an unreasonable one in the context of competing public spending priorities and a limited public purse. But, though robust evidence of impact is at a premium in policy and delivery circles, outputs from the e-learning research community rarely address the impact of e-learning on outcomes such as attainment, employability and learner progression. If they do, these are often not robustly demonstrated, for example, they may rely on learner or tutor reports and perceptions, rather than more objective measures, or there may be a demonstration of attainment gains, but it is difficult to judge whether this was due to the application of e-learning, or to other factors.

Of course, 'What is the impact of e-learning?' is a naive question. E-learning is always embedded within a broader educational context. In understanding the 'impact of e-learning' it is just as important to understand the broader context and to consider the factors or conditions that enable e-learning to impact positively on educational outcomes. It is also essential to

acknowledge that we are playing the long game. ICT takes time to embed within organisations and, once embedded, takes time to make a difference. What might be viewed as 'intermediate' outcomes become important in this context: outcomes like increased teacher confidence and competence (including subject knowledge and pedagogical skills), changes to teaching and learning (like levels of learner independence) and learner engagement and motivation.

Researchers have the expertise to operationalise these outcomes and to help understand the extent of progress (or indeed lack of it in some cases) resulting from the introduction of e-learning. At its simplest, this requires a good assessment of the starting point (baseline measures) and progress made (follow-up measures). At a more complex level, it is about measuring progress in outcomes against what would have been expected of learners, for example by adopting 'value added' methods like pupil-level predictions of attainment utilised in PIPS and YELLIS systems (Defty et al, 2002; Tymms & Albone, 2002).

It has been argued, though, that the most robust approach to assessing the impact of any educational policy or intervention is to employ a randomised control trial (RCT) research design (for example, Fitz-Gibbon, 2000). The validity and feasibility of this kind of research design is worth discussing in the context of the essential project of advancing our understanding of 'what works' in e-learning, and the impact that e-learning has on educational outcomes. This kind of research, of course, employs an experimental design, whereby participants are randomly assigned to a control group (for example, no use of e-learning) or an intervention group (for example, use of e-learning). There may on occasion be more than one intervention group if the relative impact of two competing interventions is to be assessed.

The aim of this approach is to isolate e-learning as a factor from other factors in the educational context in order to understand its unique impact. By assigning enough participants on a random basis, the impact of learner characteristics is controlled for, and, as long as all other factors remain constant, any significant differences in learning and attainment outcomes can then be accounted for by the presence or absence of e-learning. At least that is the argument.

This approach is appealing in terms of its potential to offer conclusive findings and to firmly quantify differences between conditions. It also has the value of minimising the potential biases of alternative research approaches, like those relying heavily on participant reports as opposed to 'objective' measures.

However, it is worth considering some of the assumptions on which RCT methodology is based in light of our understanding of ICT in teaching

and learning to judge its value and place in the overall picture of e-learning research.

A key assumption of RCT methodology is the 'principle of atomism' (Greenwood, 1991). This assumption holds that that e-learning, or the use of ICT, can be defined and isolated as a factor in its own right, and treated as a separable variable in the educational experience. In the sense that teaching and learning can happen either with or without the use of ICT, this may be argued as unproblematic. However, there is very little 'pure' e-learning in education. ICT is most commonly utilised as part of a blended learning experience, led by the teacher or tutor and highly linked to other aspects of context, notably the teacher's/tutor's subject-specific pedagogical approaches. The key argument here is about the embedding of e-learning into teaching and learning.

As North Central Regional Educational Laboratory (2003), a regional educational laboratory in the United States, highlighted:

> In final analysis, e-learning isn't about digital technologies any more than classroom teaching is about chalkboards. E-learning is about people and about using technology systems to support constructive social interactions, including human learning.

The context of learning is critical to this, as is the competence of participants (for example, technical and pedagogical competence).

Similarly, Cox et al (2003a) argue in a review of studies of ICT and attainment:

> The crucial component in the use of ICT within education is the teacher and her pedagogical approaches. Specific uses of ICT have a positive effect on pupils' learning where the use is closely related to learning objectives. The positive effect on attainment is greatest for those ICT resources which have been integrated in some teachers' practices. (p. 3)

This suggests of randomised control trials of e-learning interventions that:

1. If the e-learning condition *does not* produce significantly better outcomes than the control, it is difficult to conclude that e-learning has no value, as it may be that it is yet to become embedded effectively in teacher/tutor practice.

2. If the e-learning condition *does* produce significantly better outcomes than the control, it is difficult to conclude that e-learning has the most value, as it may be that e-learning has become embedded in (i.e. intrinsic to) teacher/tutor practice, such that teaching and learning without it is adversely affected as a result.

In addition, there is the rather obvious argument that a particular e-learning application may be poorly designed. The 'e-learning' condition is in fact the

'e-learning with this particular application/technology' condition. There is a danger in generalising about e-learning from specific cases (for example, particular age groups, studying specific subjects using particular applications) to e-learning as a whole. Good researchers resist this of course, but press reporters tend not to – in this sense it is a lesson for the reporting of findings. Beyond this, in the fast-changing world of ICT, even reviews of a range of trials, which have the potential to offer a more generalisable picture (for example, Harlen & Deakin-Crick, 2003; Low & Beverton, 2004) should be treated or scrutinised with caution. They may not fully reflect current and emerging uses of ICT.

Robust measurement of impact is important, arguably critical, in developing a coherent understanding of the value of e-learning. RCT approaches cannot be dismissed, as they represent a fundamental framework for researching impact. As a rule, in the UK (as opposed to the United States) researchers employ this approach or similar approaches (such as the use of matched samples in 'natural experiments') infrequently. This may explain a paucity of impact evidence overall. However, there are arguments for very cautious consideration of when it may or may not be appropriate to adopt experimental approaches. Notably, there should be reflection on the extent to which an assumption of 'atomism' is valid. In addition, reporting of results from trials of this kind should take into account the tendency for others (including policy makers and practitioners, as well as the press) to over-generalise, and therefore researchers should be alert to the need to advise appropriately on interpretation, scope and possible use of any findings.

So there is a tension between the need for robust evidence of impact, and the complexities of e-learning implementation and use. The backdrop for this is a possible tension between the more general educational policy appetite for robust evidence of 'what works' and the challenges of researching complex social contexts and interventions. The research hurdles are high, but not insurmountable, however. There is a real need and potential for further development of theoretical and methodological approaches which *both* recognise and accommodate the complexities of e-learning implementation and use, *and* produce robust (and quantified) measures of the impact or added value of e-learning. This is not an easy task, but is a project well worth pursuing via professional research networks and forums. Some good work has already been done, notably the methodology adopted in the 'ImpaCT2' attainment study (Harrison et al, 2002). This drew on 'added value' methodologies, allowing key factors, other than pupils' levels of use of e-learning, to be controlled for in the attainment analysis. There is current promising work, like the development of a capabilities maturity model in the evaluation of the DfES ICT Test Bed project (DfES, 2004) and work commissioned by Becta on behalf of the DfES, due to be

published shortly, using activity theory to link a contextually rich view of ICT deployment to pupil learning outcomes.

Future Directions

It is not my intention here to set out a plan or agenda for future policy-relevant e-learning research, as this should be based in a dialogue pursued via policy and practice research networks. Nonetheless, I shall offer some indications of what policy makers understand from e-learning research at this point, and discuss some gaps in current understanding. In all this I will draw on what we know from larger-scale studies, which can legitimately be used to infer a 'big picture' and inform policy at a national level.

On balance, the weight of current large-scale research evidence indicates that using ICT in schools does indeed impact positively on learner attainment, and also on motivation and approaches to learning. We know from the ImpaCT2 attainment study, for example, that generally something positive happens to the attainment of pupils who make relatively high use of ICT in their subject learning, at least in certain subjects at certain key stages (Harrison et al, 2002). We also know that there is a relationship between school standards (measured in terms of key stage test scores and GCSE grades[2]) and the quality of school ICT resources and the quality of their use in teaching and learning (as judged by the Office for Standards in Education). This is true regardless of the socio-economic characteristics of the school (Becta, 2003b, c). This suggests that getting ICT resources and teaching right can have a real impact on school standards.

But ImpaCT2 also told us that in some schools there was no added value to attainment outcomes from relatively high subject ICT use, and in some cases a negative impact. The report rightly concluded what is commonly accepted – that it is *type of ICT use* that adds educational value, rather than the amount of pupil use of ICT.

ImpaCT2 looked at how technology was being used where it added value to pupils' educational outcomes (in the subjects where this was found to be the case). The overall picture suggests that ICT use which is *both* varied (and therefore helps develop students' general ICT skills), *and* closely targeted to the subject delivery and, importantly, to assessment (like GCSE revision packages), leads to gains in attainment.

This knowledge is valuable to both practitioners and policy makers, and is supplemented by research into other 'intermediate' outcomes like the DfES-funded ICT and Motivation study (Passey et al, 2003). This linked ICT use in schools systematically to complex measures of motivation. It found that ICT use facilitated *motivation to learn*, as opposed to simply motivation to listen, or pay attention (also the case). It also found significant gender

differences, with boys even more motivated to learn as a result of using ICT than girls, although neither were disadvantaged by ICT use.

In taking this knowledge forward, we need to understand more robustly and in more detail the links between *types of ICT use* and attainment or other outcomes, such as motivation, and ideally we should be quantifying these. Closely related to this is the need for research into links between subject ICT pedagogies and attainment. In particular, are there certain types of use and approach that really add value compared to others, and do so fairly consistently (that is, in many different contexts, even if just for one key stage subject)? If so, these (with caution) could be prioritised, or relevant advice offered to institutions about ICT resource prioritisation.

We know from accumulated evidence, as well as common sense, that the impact of introducing ICT into teaching and learning depends critically on the decisions of schools, teachers and pupils about how it is deployed and used. We also have evidence that the link between the quality of ICT learning opportunities and school standards depends on overall quality of teaching and quality of school leadership (Becta, 2003b, c).

Again, there is more work to be done here. There is more to learn about the conditions under which ICT deployment and use impact positively, notably the institutional conditions underpinning success. Work on institutional maturity modelling fits in here. This work is very important in policy terms, as it has potential to enable schools to understand what should be in place in order for the benefits of ICT investment to be realised. Models that can link institutional conditions to learning and other outcomes, like that currently being developed for the ICT Test Bed evaluation, are of most value.

Included in 'institutional conditions', of course, are teachers' or tutors' skills, ideally relating to the genuine advancement of subject teaching using ICT. The learner is important in this picture, utilising e-learning in the development of their own skills, knowledge and understanding, and adopting particular learning approaches in doing so. In order to be effective, e-learning (including related teacher pedagogies) needs to address learners' requirements. There is a good range of research on ICT and pedagogy (see Cox et al, 2003b). This needs to draw further on wider research on cognition and learning to further advance our understanding of the best ways to meet learners' needs using technology.

But research needs are not just about efficacy; they are also about efficiency. The e-Learning Strategy presents a vision of educational transformation, yet this will happen necessarily within a similar resource envelope to that available currently. Public bodies and institutions really wanting to exploit the potential of e-learning in the belief that it can add real value need to plan their resources – ICT, staffing and training – carefully. The impact of ICT deployment on the productive time of frontline staff is an

important aspect of this picture. These issues are rarely considered or costed in e-learning research, but this is critical knowledge in delivering economically viable and sustainable e-learning. Cost-benefit studies are also important here. This kind of research can only be achieved via interdisciplinary dialogue and working.

A further area worth mentioning is the complex topic of assessment. This will be increasingly important, arguably critical, over the next few years, and could usefully be supported by further research. Of concern to policy makers is the question of what are the most appropriate forms of assessment in an e-learning world? Research cannot definitively answer this question, but it could provide some interesting evidence. For example, are learners who make significant use of ICT disadvantaged by written examinations? What unique learning outcomes are derived from intensive engagement with ICT? Then there is the application of remote and e-assessment. If learning happens increasingly outside traditional institutional boundaries of space and time, what are the issues in assessment following this pattern? For example, can assessment using a computer at home, rather than sitting an exam paper in college, be valid, efficient and secure?

Finally, much of this article has focused on evidence relating to e-learning in schools. The picture is less clear in the post-16 sector, where the impact of e-learning on attainment and related outcomes is less well understood. However, arguably, e-learning has more potential to transform educational provision in FE than other sectors. FE has links to adult and community learning and work-based learning, and a key role to play in widening participation to HE. Robust related research is at a premium, but the research tradition is less strong than that focusing on e-learning in schools, or indeed HE. The key message is that this area of research can usefully benefit from links into and support from those working in other sectors.

So the future is a challenging one for e-learning researchers, but a very interesting one, in which e-learning research has the potential to make a significant positive difference to educational delivery, and ultimately to learners. The key to success here is dialogue, with a view to achieving more coherence in research development, shared understanding of innovative research methodologies and a further meeting of minds between policy makers and researchers.

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Notes

[1] In consultation to January 2004, publication of final strategy due 2004.

[2] GCSEs (General Certificates of Secondary Education) are examinations in individual subjects taken by students usually aged 16+.

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