Technology, Pedagogy, and Education

Concluding Comments[1]

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The papers in this volume elaborate some of the critical issues in the work to knit together the opportunities of technology with the requirements and aspirations of education. The papers show how researchers from the separate disciplines of education and computer science are now collaborating to build an interdisciplinary approach to innovation in teaching and learning. Pedagogy is a pivotal point around which we can see the balance tilting now towards technology, with its seductive offers of freedom from formality, now towards education, with its driving forces of assessment, inspection and accreditation, still powerfully conventional. As one way of abstracting from the wealth of material in this volume what it means for teaching and learning, we can focus here on the critical issues it raises, of 'interdisciplinarity', 'collaboration' and 'pedagogy'.

Interdisciplinarity

Technology enhanced learning (TEL) as a research field is necessarily interdisciplinary, because it brings together two research fields, technology and education, that mutually challenge each other. ICT creates a new kind of medium for the discovery, articulation, and dissemination of knowledge, and therefore affects what it takes to learn the knowledge and skills developing within a culture or society. Conversely, education, as a formal activity designed to assist individuals in learning the knowledge and skills of their culture and society, creates testing challenges for the technology. TEL is not yet a discipline. It has not yet evolved the clear methodologies and ways of thinking that define the disciplines of technology and education. As a research field that stands at the interface between two highly complex disciplinary areas, there is bound to be a longish struggle to work out how best to work together. What is clear, and well demonstrated in the papers here, is that we can only do it by collaborating on a common project, and maintaining a mutually respectful and constantly iterative dialogue.

The volume offers some good examples of interdisciplinary collaboration. The papers from Laterza et al and Wilson et al, on Virtual Research Environments (VREs) show how technology can support the dialogue we need, within and across research teams. Digital capture of the developing exchanges as research unfolds, is an important way of supporting an interdisciplinary dialogue.

But they go further than this. They also suggest how we can use such environments to invite others into the research space. TEL research is essentially oriented towards users and beneficiaries, and it if is building new ways for education practitioners to operate, it may as well engage them in that process. The design and development of technology for education is necessarily a long iterative process of analysing user requirements, testing, validating, evaluating, expanding the scope of the design, and re-testing. The user-oriented nature of design research means that the close

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involvement of users in the research process is essential. This brings us to another key theme of the volume.

Collaboration

Laterza et al show how difficult it is to make sure that online collaborative environments work. It is important to carry out contextual experimentation, and to continually adjust its functionality to the needs of the users. Teachers are not keen to have to work out how to use the digital tools being offered to them. Neither do they need any additional administrative burden requiring 'self discipline'. Using them has to be simple and transparent. We have to move to shifting the burden of administration away from the user and towards the technology in its next generation.

Wilson moves the discussion on to a more specific form of collaboration – 'communities of enquiry'. The community here is not just the research team, but also the users of the research findings, and the task is to work out how best to engage them. They show the importance of differentiation within the virtual space for teachers who feel uncertain about their work and the quality of their innovation. Interestingly, however, the teachers' behaviour contrasted with the behaviour of their 'vulnerable' learners, who, despite their problems, were comfortable with the space because of its emerging tone of respect and supportiveness among their peers. Pupils collaborating on a project online were also fully engaged, though inevitably affected by the other school assessment demands on their time. For teachers, time is the problem, and the main issues for them are prioritisation and reward. Again, if the collaborative environment shoulders the burden of administration, it creates a clear enough benefit for teachers.

We now need to migrate this same collaborative approach to learning about 'teaching with technologies'. This volume of papers is an important illustration of how this can work. It documents the work of the Teaching and Learning Research Programme (TLRP) as a co-authorship network – a nice metaphor for how innovative teachers could work together. If research is to go beyond the researchers, and connect with classroom practice, in all the education sectors, if we are to succeed in integrating research into practice, then it will be important to engage mainstream teachers as participants in research projects. It should be possible to imagine this further extension of co-authorship to a wider 'action research' audience, beyond the researchers involved in the original fundamental research. And the developing online environments documented here show how that might be possible.

There is the intriguing prospect in Procter's paper, that output from 'DSpace', if appropriately mediated and summarised, could be linked through to teachers engaged in learning design, but careful attention to abstracts and summaries by the research community is clearly a pre-requisite here. The TLRP has worked hard to make its findings accessible to users in a variety of ways, using website summaries, briefing notes, commentaries, and links to more elaborated descriptions, – far more than just a link to the usual kind of abstract. This has to be the model for all education research.

Tanner and Jones suggest ways in which teachers can become co-researchers, though the process is essentially mediated by the researcher. Could the researcher's role here be taken by other teachers, eventually, in a community of practice for TEL? The paper illustrates that pupil responses, even with very young children, can be of great value in enabling teachers to reflect on their learning designs, and use of TEL. With collaborative online environments, this process could be exemplified for other teachers, and built into TEL innovation as formative feedback to the teacher.

Pedagogy

As education and computer science researchers collaborate with each other, and with the teaching community, to discover how to optimise our use of learning technologies, the focus has to be on pedagogy – what does it take to learn, and how do we help learners in the process? Technology offers a range of different ways of engaging learners in the development of knowledge and skills. Precisely because of the richness of possibilities, we have to be careful not to focus simply on what the technology offers, but rather on what the pedagogy requires.

The papers in this volume that use the technology to record and analyse learner data show that we could build a good representation of what the pedagogy requires. Technology-supported enquiry, as demonstrated by Cox, uses data-logging and interpretation of learner engagement to critique the design of TEL. The paper provides some intriguing exemplars for using data-logging to generate forms of support that can be adaptive. Eventually, they could be extended also to teachers, as 'action researchers', enabling them to develop and improve new pedagogies and ways of designing for learning.

This means that researchers and teachers will not simply be led by the technology but will begin building the evidence of what more it needs to do to be truly pedagogically effective. And by building in that kind of data collection functionality, research innovation also supports design innovation and could be extended to teachers. One important advantage of TEL is that it provides immediate formative feedback to learners, but the digital capture of learner data can act as formative feedback to teachers as well. Learners should be learning how to learn, but with this kind of technology support, could teachers also be more explicitly learning how to teach?

Lundy describes an Interesting application of e-consultation, which engages learners in policy, as a means of developing their discursive skills. This research is valuable for illuminating the pedagogy of dialogue and discussion. It shows that other learners' responses to questions prompts an individual learner's own responses, supporting a more dialectical approach, helping to develop thinking skills. The teachers' own community was equally important here – it was through the functioning of the interdisciplinary team that the focus remained on the curriculum and the promotion of children's rights, and was not diverted.

A similar point is made by Tanner and Jones – interactive feedback is valued by the learners, so interaction is important, and is much more productive than copying and listening, whether it is social or technology-based.

Concluding points

We are still in the early stages of understanding the relationships between technology, pedagogy and education. The technology moves fast, and although the underlying theories of pedagogy are reasonably stable, their instantiation within the context of a formal education system is a complex process. If the teaching community can work together to problematise this potentially radical innovation, then there is some hope that it will proceed in the best interests of learners. This volume of papers shows how the research disciplines can come together with the teaching community, by taking a user-oriented approach to understanding how best to develop pedagogy through technology.