Educational Technology: Does Pedagogy Still Matter?

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Failure to transform educational institutions through the use of new technologies has been blamed on the continuation of outmoded pedagogy. However, the new spaces opened up by using technology are leading to new pedagogical approaches and an expansion in its role. Three areas currently important for European educational technologists are explored in relation to their implications for pedagogy: open educational resources, learning design, and mobile learning. Each has fostered new forms of pedagogical creativity. Pedagogy is necessary at many stages in implementation, across stakeholders and users groups, and has new tools with which it can specify learner activity and make its own processes explicit to others. Pedagogy may be a difficult term, with its hints of top-down control, but its core meaning of facilitating learning is more important than ever. Here also is the key to sustainability. Learner needs change and opportunities created by technology also change and interact dynamically. Effective learning can only be sustained by a proactive pedagogy, working creatively with technology.

Introduction

It is often claimed that educators have not used technology to transform the processes and outcomes of education and that outmoded pedagogy is the cause of this failure. Bush and Mott (2009), for example, argue that the focus of institutions and educational leaders is on teaching rather than learning, and on the role of technology in achieving efficiencies based on old models of pedagogy, rather than the role of technology in developing learning. European educational technologists have expressed similar views, but we need to explore what this means for pedagogy and whether pedagogy is still core to the possibility of transformation and sustainability in the practices of technology enhanced learning (Beetham & Sharpe, 2007).

This article addresses the implications for pedagogy of the new spaces for learning that technology makes possible and the way these are changing pedagogy practices. The issues are explored in relation to three areas that currently dominate thinking among educational technologists in Europe, namely open educational resources (OERs), learning design, and mobile learning.

Open Educational Resources (OERs)

UNESCO in 2002 defined OERs as 'open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes.' This definition of openness as enabling use and adaptation points towards the precursor of OERs in the reusable learning object (RLO) initiatives that brought together international standards bodies and educational technologists. Some aimed to create an economy of learning object provision working synergistically with those finding, reusing, and adapting them to suit their own purposes (Campbell, 2003).

Pedagogy was one of the most debated aspects of this approach. For some, pedagogy had to be stripped away in a search for a kind of context-free resource, while others argued to the contrary, that teaching for a specific target group created convincing resources that would be more likely to be reused as a result (Wiley, 2003). The movement towards opening up resources for learning purposes builds on the RLO precursor in that it offers digital resources for reuse, but has significant differences. These relate to the idea of openness itself, bringing a sense of values, from sharing with other educators to creating or extending opportunities to the disadvantaged (Wiley & Hilton, 2009).

OERs for Health Professions

The OER movement has recognized that without building producer and user capabilities, repositories risk stagnation and low usage (McAndrew *et al.*, 2009). Windle *et al*. (2010), for example, describe a process of resource creation for the health professions of nursing, midwifery, and physiotherapy at the University of Nottingham, involving teams of tutors, students, and media developers who discuss what needs to be learned and how. This leads to a specification for resources which are then produced by a media developer and subsequently reviewed and refined at least twice prior to release under Creative Commons copyright. The project involved local teaching staff as well as technologists, in order to build-in pedagogy in terms of content selection and a teaching approach which was driven by the needs of local students of nursing who find biosciences difficult. A further level of pedagogical design was then built in to the online resources in terms of their consistency and quality, which assured users about the likely benefits of reuse. Over a 10-month period in 2007/08, the authors report that 58 resources had users who returned over 1200 online feedback forms. Roughly two-thirds of the users were from other institutions, many from other countries.

The authors make a direct link between the way in which they foster a local pedagogical community and

their ability to connect with other stakeholders and thus transform their local practice: 'One of the greatest benefits of an open, accessible framework for content creation and sharing is the ability to engage a much wider range of stakeholders in educational resource development and thus to bring whole new areas of experience, perspective, and knowledge into the educational arena. This alone could have a transformative effect on higher education. In our case it has enabled us to work with patients, careers, health care practitioners, and students to enrich the resources available to our students and other OER users' (Windle *et al.*, 2010, p. 7).

OERs for Teacher Education

In a very different project, where European educators have brought the OER movement to teacher education in Sub-Saharan Africa, we see a similar expansion in the scope and types of activity encompassed by pedagogy. The project, Teacher Education in Sub-Saharan Africa (TESSA), involves 13 African institutions and five international organizations in using OERs to support school-based teacher education across nine countries, funded by the Alan and Nesta Ferguson Charitable Trust and the William and Flora Hewlett Foundation. The core OER study unit links educational theories and strategies to practical activities that teachers can carry out in their classrooms, targeting a common challenge for teachers, which is how to connect theory and practice. Some 75 study units are grouped into modules of five units each, which are provided in Arabic, French, and Kiswahili as well as English, in print and online, and versioned in other ways so as to meet the different needs of nine countries and 13 partner institutions.

Thakrar, Zinn, and Wolfenden (2009) describe how local educators engage not only in initial creation of the study units but in further pedagogical activity in order to make the best use of them within their own systems for pre-service, and in-service education, on- and off-campus provision of qualifications, and continuing professional development. They define three different modes of use of OERs across the 200,000 teachers in the nine countries of Ghana, Kenya, Nigeria, Rwanda, South Africa, Sudan, Tanzania, Uganda, and Zambia: highly structured, loosely structured, and guided use.

In Nigeria and Sudan, for example, where large-scale distance education is used for teacher education, structured guides incorporating selections of the TESSA study units are provided to trainee teachers, who are likely to be located in rural areas with little or no access to the Internet or a local campus. In this context, using the study units carries a significant proportion of their learning, though even here there is additional information and contextualization to articulate with current and local issues and needs.

University teacher education programs in Kenya, Uganda, and Zambia use a loosely structured model, whereby selections of TESSA study units are integrated within existing courses, where they support course learning outcomes, and are used in a variety of ways, as lesson plans, micro teaching activities, and within face-to-face lectures.

In the guided use model, student teachers make their own selections of study units and integrate them into teaching practice and assignments. In Ghana, for example, student teachers at the University of Winneba meet weekly in a TESSA club to share experiences in using the study units in their teaching practice.

Thakrar *et al.* (2009) emphasize that the 'free' label attached to OERs belies the very great efforts that are required to ensure that use and effective learning actually do result from access. These are essentially pedagogical acts that not only adapt a common design to a local student population, but also create spaces and activities within which those adapted resources can then play a role and generate the engagement of learners, including their assessment.

OERs require pedagogical expertise in each location of use, to design how the resources will be deployed and adapted within each institution. '…implementation is a dispersed and decentralized process' (Thakrar *et al.*, 2009, p. 4).

Multi-Stage and Multi-Level Pedagogy

Lane (2010) comments on this expansion in the role of pedagogy, where he sees two key stages in the effective use of OERs. First, innovation is required for the initial creation, then an iterative process of innovation and dissemination is required to ensure that OERs are taken up and diffused among a community. He uses Fleck's (1998) term 'innofusion' as an indication of the need for both innovation and diffusion in combination. Innovation in design is needed initially and during the process of usage, which will only take place if there is an active process of dissemination or diffusion among users and user communities. Technology 'push' is weak without social 'pull.' Indeed, there has been a movement from the early emphasis on conformity to strict standards technologically, towards building user communities alongside the existence of open repositories.

Design and the Scripting of Learning

Technology enhanced learning opens up the possibility of structuring learner activity at the micro and at the macro level and of making explicit the design features that are key to particular kinds of learning. What could be left implicit in the success of an individual teacher and their relationship with their learners, is now possible to make explicit and possibly shareable as a design.

Computer-supported collaborative learning researchers in Europe have shown the way in this area of pedagogy design, demonstrating that learner activity can be designed so that learning outcomes are achieved through

the use of a mix of individual study, cooperation, and collaboration, combining offline as well as online phases of activity (Dillenbourg, 1999). Dillenbourg has developed the idea of 'scripts' that choreograph learner activity in order to ensure that collaboration does indeed deliver the learning benefits predicted for it. These benefits may be assumed to simply arise from a 'natural' process of collaboration that obviates any need for pedagogy. However, Dillenbourg's research sees the necessity of scripts as a refutation of any such assumption: 'The actual benefits of collaborative learning depend on the quality of the interactions that occur among group members. This problem led to the emergence of pedagogical methods, referred to as scripts, intended to trigger productive interactions…defining sequences of activities, by creating roles within groups and by constraining the mode of interaction among peers or between groups' (Dillenbourg, 2009, pp. 36–37).

Dillenbourg (2002) describes scripts such as the Jigsaw, where the totality of knowledge required to solve a problem is sub-divided logically and the resulting 'sets' of knowledge distributed across a group of learners. Each learner has to master their area and interact with the group effectively so as to reach the solution. Dillenbourg dismantles this and a range of other scripts using a syntax that pinpoints key features about any script. For example, the degree to which learners are forced into specific actions, choices, timings, interactions, etc., or have more freedom to choose, is a crucial determinant of outcomes. Scripts also need to address and design for the key processes involved in collaboration—how the learners communicate, how they establish goals and tackle the task or problem addressed.

In a more complex and sophisticated account than can be covered here, Dillenbourg exemplifies what design has to do in order to ensure that cognitive and social processes, such as argumentation, conflict, and communication, can support effective learning. He sees scripts as integrating collaborative learning activities 'within more traditional instructional sessions…' itemizing their key features as integrating a flow of individual and group-led activities, online and offline, and structuring timeframes, particularly in distance education (Dillenbourg, 2002, p. 25).

Mobile Learning

Interestingly, in mobile learning, where some may assume that ubiquitous access to information will harness 'natural' processes of learning, the scripting technique has also been used. Kerawalla *et al.* (2010) describe the use of a Web-based inquiry guide that structures school students' activities for the purpose of fieldwork in Geography. Being in the field with access to mobile tools required a structuring device that students used online, to guide what to do when in the field, e.g., setting hypotheses, taking measurements, analysing data, and so on. The richness of student interactions with the environment are prompted and stimulated by this scripting device, which is regularly consulted online as they go about fieldwork. Students develop an ability to connect familiar features of urban landscapes with the culturally significant practices of a novice geographer, for example, identifying key features of spatial relationships. The mobile technology supported this process when harnessed with an essentially pedagogic structuring device, in the form of the inquiry scripts (Kerawalla *et al.*, 2010).

European and government funding has gone into numerous projects exploring the effectiveness and broader implications of mobile learning (Kukulska-Hulme *et al.*, 2009; Vavoula *et al.*, 2009). The research has moved from a focus on interfaces and connectivity into recognition that the new kinds of learning arise from a combination of fixed and mobile technologies and from artful structuring of contexts that enable movement between settings, tasks, and kinds of activity. Informal learning has been a particular focus, sometimes in combination with formal education. Museum-based projects, for example, have demonstrated that individuals moving through a museum can build on personal interest by accessing in-depth information, creating their own records using a mobile phone camera, text, and audio software, communicating with others, and problem solving in groups (Vavoula *et al.*, 2007).

Mobile devices, however, can be employed in a potentially unlimited range of learning contexts, and different pedagogical orientations will be appropriate for different learning experiences, rather than a single definitive kind of mobile learning. The distinctiveness in pedagogical terms arises from the impact of multiple contexts and learner-generated contexts as individuals make use of their mobile devices in activities that follow the trajectory of their own lives and neighborhoods. Kukulska-Hulme *et al.* (2009, p. 21) propose that mobility is 'an emergent property of the interactions between people and technologies' and that context is 'an overarching term to cover interrelated aspects of mobility,' namely mobility in physical space, mobility of technology, mobility in conceptual space (where individuals divide their attention across many personal projects), mobility in social space and over time.

Pedagogy as Explicit and Reusable Design

Learning design in Europe has thus taken a variety of forms and some have sought to make design itself reusable. There have been several strands in this work, including the Educational Modeling Language work at the Open University of the Netherlands, which led into the IMS Learning Design specification, the Learning Activity Management System in Australia, and the idea of patterns in architecture (McAndrew, Goodyear, & Dalziel, 2006; Tattersall & Koper, 2005; Goodyear & Retalis, 2010). These efforts have explored different routes towards a 'language' of design that specifies key elements (such as roles and resources), modes of interaction, and stages of activity. One of the key ideas is to create a representation of a learning sequence that can be readily grasped—not in

order to replicate it exactly but to reuse and adapt it as required. The idea behind architectural patterns, for example, was to guide a process in which the pattern might be reused many times, but never done the same way twice.

Conole (2008) has used the metaphor of mapping, as a way of creating logical relationships between defined learning outcomes and taxonomies of tasks, roles, and activities. As De Freitas *et al*. (2009) have demonstrated, however, there is a tradeoff between design 'languages' and models, and the degree to which teachers with a base in different disciplines and practices can make such designs their own. There has to be freedom to use a language that fits the discipline and the local context, if teachers are to appropriate radical changes in how they teach and support learning.

Conclusion: Pedagogy Diversified, Expanded, Distributed

Returning to our opening questions, we have charted a route that shows how technology enhanced learning has led to an expansion and distribution of pedagogy practices. Instead of a single relationship between teacher and taught, we have in effect disaggregated that relationship and bounded set of activities while also expanding it. A range of other stakeholders needs to be involved, at various levels and across extended periods, locations, and activities. And the processes themselves, what learners actually do, individually and with others, can be structured and designed—indeed need to be for learning benefits to be delivered. Pedagogy has in effect been expanded and hybridised in terms of an increase in the roles and expertise of those engaged in acts of teaching and learner support and in the timing and nature of that essentially pedagogic activity.

McLoughlin and Lee (2011) have proposed that a Web 2.0 pedagogy must be participatory, personalized, and productive. Even this characterization may not go far enough, however, in a situation where learners themselves must sometimes demonstrate pedagogic knowledge, by seeing how their own use of technology can best help them with unique learning challenges. As we have seen, opportunities for learners to generate their own content, to use mobile learning to engage with authentic contexts 'in the wild' (Hutchins, 1995), to become knowledge producers via social networking—all these potentials of Web 2.0 require structuring, scaffolding, and strategic supports from a range of actors—only some of whom may carry the designated 'teacher' role. Pedagogy may be a difficult term, with its hints of top-down control, but its core meaning of facilitating learning is if anything, more important than ever.

Here also is the key to sustainability. Learner needs change and opportunities created by technology also change and interact dynamically. Effective learning can only be sustained by a proactive pedagogy, working creatively with technology. If we find the educational achievements stimulated by technology less impressive than their promise, it is in part a reflection of the enormity of the task that faces pedagogy—where there is never any stasis and always new technologies and new responses to those technologies. As Cousin rightly asserts, pedagogy can never simply lead technology—pedagogy and technology are co-constitutive, combining dynamically in ways that change our identity and our social relations:

> …all pedagogies necessarily involve technologies of communication and thus the history of pedagogy is inextricably linked to the history of media…pedagogies never live independently of prevailing media… technologies work dynamically with pedagogies, not for them, and in the process they become mutually determining. (Cousin, 2005, pp. 118–119)

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Educational Technology in Europe: Current Issues from the Learning Sciences Perspectives

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The article describes Web 2.0 as a revolutionary technology for actual learning. Using the example of the Wikipedia article about Fukushima, it discusses emergent processes of knowledge building and explains how they can be used for learning purposes. The examples make it obvious that it is the social system that makes groups work so effectively. This system is established through an artifact-centered collaboration, based on specific and self-given rules of knowledge building. This example of cooperation in Wikipedia can serve as a model also for formal education.

Introduction

Revolutionary technology for learning may be found in recent development of the Internet, especially those related to Web 2.0. Although the Web is not a learning technology itself, it changes the learning culture dramatically. The Web gives access to people and information and provides many tools that support users in communicating and collaborating, in searching for information, and then exchanging and processing it. Web-related activities are not "learning" in the sense that people acquire knowledge according to a fixed, required curriculum. Instead it allows people to make use of an abundance of resources for their own individual purposes.

Users may not have an explicit intention to learn when they search the Internet for information about a disease or a product, when they subscribe to a blog or a podcast in order to receive actual information about a topic they are interested in, or when they search for a proven solution for a problem they face. But in all these situations they deal with new information and—in order to make adequate use of it—they have to process it deeply. So, from a psychological perspective, they learn and acquire new concepts.

But it is not only the accessibility of resources through