Virtual Teaching Tools: Bringing academics closer to the design of e-learning

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ABSTRACT
The paper argues that, for e-learning to be successful, academics need to remain close to the capabilities of the media, as they must design the learning experience to help students engage with the knowledge and skills they are teaching. This means that the teaching tools we create for academics must embody the experience of what works for the learner, and must be easy for academics to use. A ‘generic learning activity model’ should provide a virtual teaching tool for the academic that embodies good pedagogic practice, building on an iterative design and evaluation process. Such tools are feasible, but research results show, for example, that as teaching ideas are shared and practice transfers, the original pedagogic ideas can develop differently in the new teaching context.

INTRODUCTION
As professional teachers, academics are facing a difficult challenge from learning technologies, as they have to renew and develop their model of the learning process well beyond the traditional transmission model. Exploration of an innovative medium requires a teaching approach that turns academics into reflective practitioners as professionals in teaching as well as research. Schön’s description of the ‘reflective practicum’ and Wenger’s ‘learning community’ offer similar accounts of how universities might foster professionalism (Schön 1987, Wenger 1998). As researchers, academics provide the archetype for professionals as reflective practitioners who are

1. fully trained through an apprenticeship program, giving them access to competence and personal engagement with the skills of scholarship in their field;
2. highly knowledgeable in some specialist area;
3. licensed to practice as both practitioner and mentor to others in the field;
4. able to build on the work of others in their field whenever they begin new work;
5. conducting practical work to generate and test new knowledge, using the agreed protocols and standards of evidence of their field;
6. working in collaborative teams of respected peers;
7. competing for new insights and ways of rethinking their field; and
8. disseminating findings for peer review and use by others.

In the context of research, academics measure up well to Schön’s and Wenger’s ideals. However, it is interesting to consider how many of those eight characteristics of the reflective practitioner contributing to a learning community typically apply to the academic as teacher. Realistically, none, not even the second one, since in this context it refers to a specialism in the pedagogy of the subject, not relying simply on academic knowledge. Academics are under constant pressure to do research and increase student numbers, so how can they take on the additional role of an professional approach to innovation and change in university teaching—as the new technology requires? One solution would be to persist with familiar forms of teaching, and allow technical support staff and publishers to develop teaching materials for the new media. If that became our preferred solution then academics would be ceding their influence over the nature of student learning to others. What we teach is inextricably embedded in how we teach; what students learn is inextricably embedded in how they learn. Therefore, it has to be possible for academics to be close to the design of e-learning, to be engaged in exploring and developing its capabilities, and to be collaborating to build a progressive body of knowledge. New technology turns teaching into a conceptual challenge, so our approach to teaching must take on the characteristics of research.

BEING CLOSE TO THE DESIGN OF LEARNING
To pursue the analogy with research, a very successful mechanism for fostering the reflective practicum in that context is the published research paper. It does not address the first three formative characteristics of the researcher,
but it does facilitate most of the rest. In the context of traditional forms of teaching and learning the published textbook is a close analogy. A textbook is not usually trialled to test its effectiveness, so the fifth is not covered, but the form does enable academics to build on the work of others as they begin their own book, to collaborate with others in writing it, to compete to provide better teaching through the kudos of publishing, and to disseminate for peer review. There is a clear contrast with the lecture, a form that does not facilitate any of these characteristics as it is intrinsically unshareable. The textbook, however, is a form that brings the academic close to the design of learning – through it they can govern the nature of student learning, without ceding very much influence to the publisher, except in terms of production quality.

Could we imagine a mechanism for fostering the reflective practicum for e-learning? What is the e-learning equivalent of the textbook? – capable of building good practice, facilitating collaboration, motivating competition, enabling dissemination? – and above all, easy for the academic to use? We propose ‘generic frameworks for e-learning activities’\(^1\). A textbook would be one such generic framework for learning, but as we shall see, it is incomplete.

THE FORM OF AN E-LEARNING ACTIVITY

The minimal form for a learning activity of any kind is embodied in the Conversational Framework for learning, described elsewhere (Laurillard, 2002). The framework aims to optimise the learning process by supporting the student in developing their understanding through reflection and adaptation in relation to a goal-oriented task, with feedback. It requires them to iterate through a cycle of attending, questioning, practising, adapting their actions, using feedback, reflecting, and articulating their ideas. A textbook, even with exercises and answers, is incomplete as a learning activity because of the limited iteration it offers for practice, feedback and discussion. The promise of e-learning is that the interactive media can improve on this.

There are many ways in which the Conversational Framework can be interpreted to generate effective e-learning activities, in support of a wide range of learning objectives. One example is shown in Figure 1, where an online discussion group is built around an academic text. This specific interactive learning activity fulfils several of the requirements of the Conversational Framework by

- describing the concepts, theory etc. in the article
- defining analytical tasks on the text through the structure of the discussion
- supporting questioning, feedback, reflection and articulation through the threaded discussion environment.

E-learning activities of this kind are being developed, evaluated, and refined throughout HE, and often demonstrate effective learning, once developmental testing is complete. In each case, the initial activity is designed to meet a particular learning objective, but the particular form of the activity can then be made generic, enabling us to transfer the same form to other learning content areas. The generic form of the learning activity in the example in Figure 1 is the e-learning equivalent of a reading group, where all students have read the same text, attempted the same analytical exercises, and come together to discuss it under the guidance of the tutor. We can now see how the objective, the learning activity and the content to be provided by the academic relate to each other:

**Objective:** To build a collective understanding of ideas represented in a digitised resource.

**Generic learning activity:** An asynchronous discussion around structured tasks relating to the digital resource.

**Content to be provided by the academic:** Digital document/resource with internal structure defined; a set of analytical tasks; the structure for the discussion around those tasks.

\(^1\) In a previous paper I used the term ‘generic learning activity model’. But GLAM is an ugly acronym, and I asked for suggestions for alternatives. Tom Carey, at University of Waterloo, in a personal communication suggested ‘FILAs’ Frameworks for Interactive Learning Activities, and notes that this use of framework is derived from what Apple used to call 'Application Frameworks', customisable units which provide generic functionality.
Figure 1: An online journal format defining the form of an e-learning activity
This generic framework is now available in its most general form as an open source application, D3E (digital document discussion environment), developed initially for an online journal\(^2\). It is a framework that was shown to work effectively in its original instantiation, and has since been re-used in a variety of learning community environments. The same process could work for many other existing learning activity applications. A second example from The Open University output is based on an initial design for an activity on a Classics course:

**Objective:** To analyse and articulate the internal relations within complex digital resource material.

**Generic learning activity:** Goal-oriented investigations of hyper-linked material with conditional access to expert analyses and the capability to articulate and edit outcomes of the investigations.

**Content to be provided by the academic:** Digital resources; define investigations; provide expert analyses.

This generic framework could be used in any subject area. As a software application it provides the academic with an interactive learning activity that is of proven value, and requires them only to edit in the digital resources, the definition of investigations to be done, and the experts’ analyses of those investigations. The technical capability required for this is little more than that required for using PowerPoint. The pedagogic form of the activity is designed into the software and requires no design input. The design work is in identifying appropriate digital resources, deciding on the investigations students should carry out, and in providing the expert analyses of those investigations for the students to set against their own. Compare this with the generic framework of the textbook: the technical capability required is word processing; the pedagogic form is designed into the format of chapters, sub-headings, paragraphs, diagrams, content lists, indexes, footnotes, etc. The design work is in composing the content of the text, diagrams and exercises.

There will be many such generic frameworks – as there are types of learning objectives. With a library of such generic frameworks available it would be feasible for an academic with little special training, to build their own e-learning activities, customised for their courses. The value of this approach is that it fits well with the tasks familiar to the academic. From the library of generic forms, they select one that fits with how they want their students to engage with the material, as they would select small group, lab, field work, etc, and then identify content, as they would for reading lists or lectures, and design relevant tasks, as they would for assignments. What makes this challenging is the variety of potential forms, well beyond the variety of traditional learning formats, and what makes it interesting is the way that the embedded pedagogical design can travel with the software application.

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2 The Journal for Interactive Media in Education, Editor Simon Buckingham Shum, who also developed the D3E format – see http://kmi.open.ac.uk/
BUILDING THE LIBRARY OF GENERIC FRAMEWORKS

The approach here is premised on the fact that for each framework there is an extensive design and development process in generating the initial learning activity to meet a given objective. If each framework addresses the form of the Conversational Framework, then the learning process should be optimised. The most interesting design ideas will come from academics and software designers focusing on the challenge of a particular objective in a particular learning context, rather than trying to begin with the generic form. If the design proceeds with re-use and customisation in mind, then once the initial design has been tested, refined and proven, the generic form can then be created by stripping out the particular content and providing guidelines on the form this should take. This is a bottom-up, academically-driven approach to the development of an e-learning authoring environment. By beginning with an orientation to learning needs and objectives it helps to ensure that the library of forms that results will be pedagogically sound. By embedding good pedagogical practice in a software application it is easier both to transfer the practice, and enable others to refine it, and build on each others’ work. Is this development methodology, of design, adaptation, and customisation feasible?

RESEARCH ON RE-USE AND CUSTOMISATION

In the SoURCE project we experimented with building generic frameworks for a range of software applications, and evaluated the process carefully to draw out advice and guidelines. The results showed that re-use of this kind is possible, but only if approached in the right way. Transferring good practice through software applications in this way demonstrates some interesting problems in understanding how the process has to operate.

The project looked at a range of software products, each of which was re-used across a range of contexts and institutions and enabled us to determine and evaluate a model for re-use. Once a learning activity design had been proven as valuable for students in one context, for a specific objective, it was then adapted to its generic form, customised for a new context with new content, but with a similar objective, implemented and tested in the new context, and then the whole process itself was evaluated (see Figure 2). The generic version could then be further customised for new implementations by changing the media content associated with the program.

![Diagram](figure2.png)

Figure 2: The SoURCE customisation cycle

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3 SOftware Use, Reuse, and Customisation in Education, funded by the Teaching and Learning Technologies Programme, UK – see http://www.source.ac.uk/
Within the project, customisation of a program originating in an art history learning activity transferred the same activity to a variety of subject areas, such as: the way people learn, forms of architecture, marine pollutants and childhood studies. Evaluation trials in both distance learning and campus-based courses gathered data on the experiences of the technical staff supporting the customisations, the lecturers delivering the courses, and the students learning through the programs.

The evaluation study demonstrated that the basic customisation process was achievable and cost-effective. Products of a quality comparable to the original product could be produced through consultation with the academic, and a few hours technical support to identify and capture the media assets for the new content. A cost-effectiveness analysis identified the potential to reduce the additional cost of introducing software by factors of 10 to over 100. A software application originally costing over £100,000 could be reused at a cost as low as £100 (Twining et al, 1998).

However the educational effectiveness of a customised version was not necessarily as high as the original in terms of student satisfaction. This was for partly technical reasons (lab availability, installation, home use), and partly pedagogic. The two may be interlinked. For example: changing the model of use from individual access in the learner’s own time to a directed activity in a classroom affected the nature of the activity the learner could carry out. In one example, the ideal activity, as envisaged by the program’s originators, was based on individual exploration, reflection on that process, and comparison with the work of others (both peers and experts). There was no right answer, just alternative viewpoints. In another context, the same program was used with guided worksheets to encourage the learners to work towards categories previously considered in course material, in this case acting more like revision than discovery and reflection. Learners then expressed some dissatisfaction, as some could not see the value of having used the software without sharing their findings. This was a revealing result. The original learning activity was complete in the sense that it fulfilled the requirements of the Conversational Framework. The customised version omitted a key part of the original design of the learning process, and therefore failed. Thus the transfer process must include all elements of the original learning activity design: the software with its tested capabilities and proven user interface, and the full teaching implementation with its model of the learning experience and intended outcomes.

A further finding of the study was that honest reporting of experiences was essential, including the “war stories” about re-use of the software, not just the positive aspects. There is work involved in the transfer of good practice in addition to the conversion of software. The mediation process for transfer of good practice is particularly successful if it includes software, but it must include other forms of dissemination as well.

The project also considered other types of software: discussion tools, notation and commenting packages, question and answer systems, and a learning manager to organise student time. Those tools support very specific pedagogical activities, commensurate with the specific learning activities academics think about when designing learning for their students.

Our experiences with re-use of software demonstrated that it certainly was possible to take software tools and re-use them across subject areas and across different institutions. However, it was only when the learning aims of the original software application were well understood and properly matched to the intended re-use that relatively quick implementations could be produced in a cost effective way. Successful transfer therefore requires a holistic approach to dissemination, which embraces not just the software, but support mechanisms in the form of guidelines for academics, guidelines for technical developers, and a library to support the information needs in the customisation and implementation processes.

CONCLUSION

This paper has proposed that there would be advantages in the University teaching profession acting as a learning community by sharing experiences and exchanging good practice. As a mechanism for this, it is suggested that generic e-learning activities can be developed from activities that were designed for local needs, provided the activities were designed in a well-thought out way, for example following the form of the Conversational Framework. For educational software we have demonstrated that the development methodology of design, adaptation, and customisation is feasible. However there is also significant effort required to ensure dissemination and eventual re-use of the e-learning activities. The eventual solution to this may come from systems that establish the exchange of “learning objects” (Wiley, 2001) with a standardised way for the objects to be described and to interoperate.
What we have identified in this paper is that teaching academics can play an important part in this work by producing material that supports learning well in their own context and which can then be made more generic. To meet the dissemination requirements the generic frameworks then may be described in a uniform manner and gathered together with case studies that record the ways in which they are re-used. The SoURCE project has provided a starting point for such a collection in the Reusable Educational Software Library (http://www.resl.ac.uk).

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REFERENCES


