RIDING THE TIGER: PARTICIPATORY DESIGN AND CONCURRENT DEVELOPMENT IN THE CONSTRUCTION OF COLLABORATIVE LEARNING SPACES

Michael Ryan
Faculty of Education
Queensland University of Technology, Australia
m.ryan@qut.edu.au

Andrew Rasmussen
Teaching and Learning Support Services
Queensland University of Technology, Australia
a.rasmussen@qut.edu.au

Abstract

Web-based learning management systems hold considerable promise in supporting approaches to teaching that are well-informed, both practically and theoretically. Unfortunately, this promise has often remained unrealised, especially in higher education contexts. Various reasons may be proffered including: monolithic approaches to system development, mismatches between software and pedagogic models, or attenuated communication between system developers and practitioners. This paper examines one case study involving the concurrent development (simultaneous deployment and refinement) of a general on-line collaborative tool for students and the co-development of an instructional approach based on authentic constructivist principles. This case study is used to abstract some tentative principles that relate to the effective development of learning management systems. These principles include:

- *Some pedagogical designs, while productive in terms of student learning, rely on complex interactions that are difficult to support technically.*
- *It is possible to set up conditions for a productive participant-developer dialogue in order to co-inform technical and pedagogical design.*
- *Non-traditional methods of system development are appropriate in order to support innovation, especially if measures are taken to handle the risks involved.*

The results should be of interest to teachers in higher education, administrators and developers of web-based learning management systems.

Keywords

Higher education, Web Inquiry Project, learning management systems, concurrent software development, participatory design

Introduction

This paper describes a case study involving the development and use of one part of a learning management system – the part designed to support collaborative learning. The included activities, of *system development* and of *teaching implementation* span four years. More importantly, this paper describes emergent phenomena, involving participatory design and concurrent development that proved particularly effective in satisfying the requirements of a collaborative learning environment.

Within the social constructivist tradition, *collaborative learning* is an active area for implementation and research in higher education (Stahl, 2003). Various affordances provided by

mediated communication have enabled new genres of pedagogical design such as Webquests and Web Inquiry Projects (Dodge, 1995; Molebash & Dodge, 2003). A Webquest can be characterised as a task where students in small groups collaboratively tackle an *authentic* problem, with each student taking on a different *expert role*, and where a closed set of web resources are pre-selected by the teacher. Students publish their work on the web in order to reach wider audiences. In contrast, a Web Inquiry Project (WIP): tends to be more open-ended, has a *negotiated* problem, and allows students considerable latitude in researching and using web-based resources. It is a WIP that forms a major structural element in a large first-year teacher education subject called "Learning Networks", first taught at QUT in 2003 (Ryan & Lloyd, 2003). The continuing development of this subject, and particularly the relationship between its pedagogic and technical designs forms the basis for this paper.

Designing a task and creating an environment that sets up the conditions for collaborative learning is a difficult exercise. There are a number of conditions that contribute to this difficulty. First, as Carstensen & Schmidt (2003) observe, collaborative work (as distinct from the more specialised context of *learning*) is characterised by the overwhelming complexity of orchestrating collaborative effort amongst group members because of the shifting interdependencies and the distribution of activities involved. Of course, when we shift focus to learning, this necessarily increases the complexity since this activity involves change in the knowledge and the habits of those concerned. Thus, collaborating students are faced with an uncertain environment, one that involves a complex interplay of social relations, distributed tasks and developing understandings.

Assessment adds yet another dimension to the complexity of group work. One reason for this is because the institution demands a final assessment to be mapped to an individual (rather than a group). Assessment of group work is always open to interpretation since any individual contribution can be contested. Thus, any online collaborative learning environment requires careful preparation and support in order to handle this complexity (Hoyles, Healy & Pozzi, 1994; John, 2002). In the case study presented here, an approach was adopted that separated out individual and group contributions - requiring that differently authored content was contained and restricted to different web pages. However, such an approach makes particular demands on the learning management system used. Further, these features were not present when this case study began in 2003.

Technological mediation of collaborative effort offers some attractions by overcoming some of the barriers imposed by distance and time (Flowers, 2001). Thus, there is an appeal to offer web-based collaborative spaces to students, and even for students who normally meet face-to-face on a campus, since they often have to juggle other commitments (such as part-time jobs). But such collaborative environments can present other opportunities as well, including a place to:

- consolidate group work by having a common, accessible space;
- reify conversations and decisions often lost in face-to-face communication; and
- present their work over networks to wider audiences.

Unfortunately, such exploitable affordances don't "just happen", they require careful technological choices and re-appropriations, alongside compatible pedagogical design and subsequent orchestration.

Thus, educators are faced with some choices when setting-up online learning environments for constructivist uses. They (or their institution) can *acquire* a learning management system that is purpose-built, such as Moodle (Dougiamas & Taylor, 2002). Alternatively, an institution may *build* its own system, such as QUT's Online Learning and Teaching system (OLT). Of course, it is likely that acquired or home-grown systems may not satisfy the pedagogical requirements - especially so, when a learning task such as a Web Inquiry Project is attempted. Another alternative involves a *re-appropriation* (Feenberg, 1995) or re-purposing of an existing application. Such re-purposing is commonplace in other areas, for example in the way academics have re-purposed a business presentation tool, Powerpoint, to serve as a technology to support lecturing.

This case study is based on yet another alternative, really a derivation of the home-grown approach. The choice entails the *refinement* of an existing system. As an alternative, it is particularly salient when the design knowledge is held by the practitioners (or "users") of the

system. Informed use of such knowledge, through Participatory Design (Engestrom, 1990) is appropriate when a technological application is relatively supple - open to negotiation between system developers and practitioners. Of course, participatory design requires effective and timely collaboration between participants and system developers - something that is difficult to achieve when the two actors are separated by time (e.g. in strict information systems development with discrete development and implementation phases) or organisationally (e.g. when a package is purchased from another party).

Software Development

Developing software for web-based services has undergone rapid change over the last decade. Object-orientation, re-usable components and user-centered design have all had profound impacts on how web-based systems are constructed and maintained. Eight years ago, QUT adopted a rapid development environment (ColdFusion) to help it build a learning management system for online teaching, OLT. Because of this approach, development of components has proceeded according to perceived needs (orchestrated through a generous teaching and learning grant scheme) while the system has been in production. While this approach has not been without its problems, this *concurrent development* (Aoyama, 1993, 1998) has remained a feature of OLT for some time. In the last few years, administration of the OLT system development has matured greatly to reduce the risk of failure. Version control, strict documentation, staged deployments and systematic treatment of reported errors have all served to stabilise a system that is simultaneously in active development and production.

Concurrent development, especially when coupled with participatory design is particularly effective when an application is both ill-defined and complex. This case study has demonstrated that designing a component to support web-based collaboration environments poses particular programming challenges. These deal with aspects such as security, visibility, site structure, rendering and the technical hurdles that novice content providers face. Furthermore, some of these challenges only emerge after partial deployment: participants (in this case the subject coordinators) are able to give voice to their requirements in the light of experience when working with students using the component.

Participant-Developer Threads

Two sequences of coordinated action, where pedagogical and technical considerations co-inform design serve to illustrate the work involved in this case study. We term these *participant-developer threads* because software development and educational implementation overlapped in time and co-informed each other. The first thread, *template-copying*, arose from a desire to lower the technical hurdle for new students adding web content. The second, *rights-management*, arose from a need to separate-out group and individual authored content. These threads, described in the following sections, provide a basis for the discussion that follows.

Three years ago, the Group Work Area (GWA) resource was developed as a component of QUT's OLT system as a way for groups of students to add content to a restricted web space. With this resource, students can easily create web pages by entering text and uploading images by filling out web forms. The resource deliberately places few restrictions on the content and structuring of the group's web site. Although this flexibility has advantages, it does present a technical hurdle for students who are new to web design. Because skills associated with this were not part of Learning Networks, they were an unwanted hurdle and a distraction from core objectives of the WIP task. So, this participant development thread started with the construction of a template that embodied the structure of each group's content.

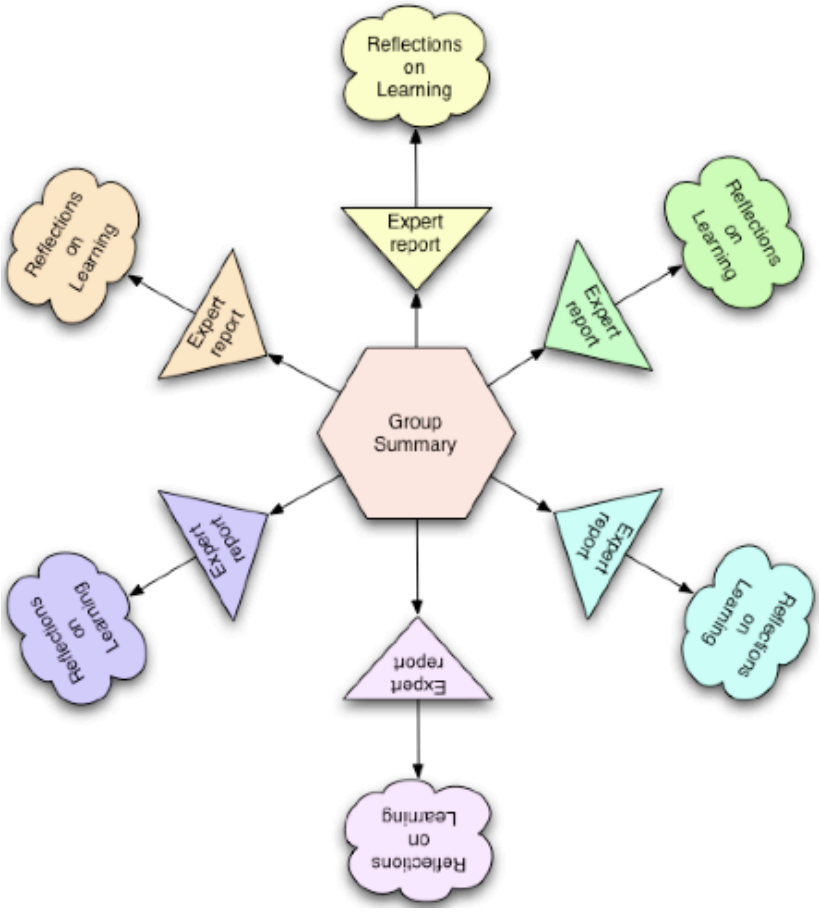

Figure 1: WIP Group Template

The template consisted of thirteen linked pages (see Figure 1) that was to hold the content of each group's Web Inquiry Project. While the Group Summary page was co-authored by all group members, each "spoke" pair (consisting of an Expert Report and a Reflections page) was written by individual members of the group. In the first year the template was created (exploiting existing flexibility in the system) and manually replicated hundreds of times, one for each group in the subject. And because Learning Networks is a large subject (up to 1000 students), there may be as many as 300 student groups. When students "signed-up" for a group, they were presented with an empty set of pages that were structured according to the template. They began by entering and editing content rather than by building links to structure a web site. In later years, the template copying process was refined, generalised and automated by OLT developers, This extended the copying tools to make this functionality/teaching style readily available throughout the OLT system.

The second participant-development thread, rights-management, relates to the visibility and edit-ability of different pages in the group site. In the first two years, each member of a group could change content of *every* page, even the individual pages of other group members. This presented a risk, in that students might inadvertently (or deliberately) change another student's work. To overcome this problem, in 2005 the account settings were adjusted so that each member of a group could only edit their own work and the Group Summary page. In this case, OLT developers adjusted the security settings on individual template pages. These settings were activated when students signed-up to a group. So, while they can *see* each other's individual work, they cannot change it. At present, the adjustment involves a manual step, undertaken by each student. A plan exists to automate this step in 2006.

These development threads illustrate some of the interplay between the technical and pedagogical domains over an extended period of time. The availability, three years ago, of the Group Work

Area resource "made possible" or "afforded" a set of pedagogical approaches. The subsequent implementation exposed demands (such as site building skills) and risks (such as changing other student's work) as well as further opportunities. Responses to these conditions involved refinement and redesign - at both the technical and pedagogical levels.

Discussion

The Web Inquiry Project has proved to be a highly successful learning and assessment task. As educators, we are constantly surprised at the high standard of presentation and evidence of critical thought that students express. In feedback, students consistently rate the task and subsequent experience as both enjoyable and as having a significant impact on their learning. As software developers, we have found the exercise to be productive, in terms of its immediate application and also in the more general spin-offs that have eventuated.

Of course, such success has not been simply determined by the technical environment (i.e. the GWA) or by the task environment (i.e. the WIP). Rather, success has been derived from a combination of the two. In a sense, the GWA established a *substrate* where a productive learning environment could be built. In its initial stages it represented an “open” technology whose most important quality was that it provided a basis for the prototyping and implementation that followed.

This case study has identified an important aspect of the subsequent refinement of the original GWA. In order to develop an effective learning environment that matches demands, refinement of both the technical and the pedagogical aspects has to be simultaneously supported. Furthermore, in the complex and emergent setting of collaborative learning, participant-developer threads allowed this co-informed, concurrent activity to successfully proceed.

Conclusion

As complex pedagogical designs are put into practice, some difficult choices emerge for those considering the implementation and support of learning management systems. These include options that are clustered around the acquisition, re-appropriation and/or traditional in-house development of systems. However, participatory design when coupled with concurrent development presents a particularly appealing alternative, at least in some circumstances. Thus, in order to innovate with complex pedagogical designs, it may be worth the risk (like riding a tiger) in order to set up a productive experience.

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