Designing Authentic Activities in Web-based Courses

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Abstract: Influenced by constructivist educational theory and advances in technology, there is increasing interest in authentic activities as a basis for learning in both face-to-face and web-based courses. Whereas traditionally, real-world activities have primarily served as vehicles for practice of skills or processes that are taught using traditional instructional methods, a more radical approach is to build a whole course of study around authentic activities and tasks. The authors of this paper argue that the value of authentic activity is not constrained to learning in real-life locations and practice, but that there are critical characteristics of authentic activities that can be incorporated into the design of Web-based courses to enhance learning online. The paper includes a description of the theory, research, and development initiatives that provide the foundations for this approach. Finally, the paper presents guidelines and examples for the design of complex authentic activities for online learning, together with the implications of this approach for teachers, students and designers.

Designing Authentic Activities in Web-based Courses

Introduction

College and university instructors have long recognized the advantages of learning in authentic situations. The apprenticeship system was once the primary method for education and training in skills and processes relevant to specific crafts. The practicum or internship, whereby students spend days or weeks performing in real-world workplace such as clinics and schools, is an effective method for learning the practices of professions such as medicine and education (Boud & Solomon, 2001), especially if strategies for encouraging reflection are included (Schon, 1987). There is increasing interest across higher education in service learning whereby students, with instructor guidance and support, perform authentic practices that have real consequences and outcomes (Stanton, Giles, & Cruz, 1999). In other higher education contexts, students are assisted to form fully operational businesses, to diagnose illnesses in real patients, to form video and multimedia production teams with real clients, and to conduct scientific experiments and data collection on the Internet.

The merits of such engaging and authentic learning environments have been well documented, particularly in reference to situated learning (e.g., Bennett, Harper, & Hedberg, 2001; Brown, Collins, & Duguid, 1989; Duffy, Lowyck, & Jonassen, 1993; Honebein, Duffy, & Fishman, 1993; Luca & Oliver, 2001; McLellan, 1996, 1997; Wilson, 1996). Nevertheless, the evidence for real-life experiences is not always positive (Eyler & Giles, 1999). For example, in discussing apprenticeships in relation to situated cognition, Wineburg (1989) noted: 'No doubt some apprentices find their apprenticeship absolutely authentic, but I can imagine others who find it absolutely tedious, inefficient, repressive, servile, tradition-bound, and in some cases, downright mean' (p. 9). Lave and Wenger (1991) also noted that

the quality and consistency of apprenticeships vary enormously. They argued that apprenticeships do not inevitably result in learning in practice, and indeed that the apprenticeship itself is not the issue. The critical issue for them, and the real value of these experiences, is the 'legitimate peripheral participation' the apprenticeship allows. Even when real experience works well, it is not always possible for higher education instructors to organize these authentic learning experiences in real life settings for reasons such as the limitations of the subject matter, practical constraints such as physically moving students to locations of practice, and precautions against risks of danger to students or others.

The argument advanced in this paper is that the value of authentic activity is not constrained to learning in real-life locations and practice, but that the benefits of authentic activity can be realized though careful design of Web-based learning environments. The design of such environments must be informed by an analysis of the critical characteristics that help to enhance learning. Lave and Wenger (1991) cautioned that the conception of situated learning was substantially 'more encompassing in intent than conventional notions of "learning in situ" or "learning by doing" for which it was used as a rough equivalent' (p. 31). The challenge they put to researchers was to identify the critical aspects of situated learning to enable it to be translated into teaching methods that could be applied in the classroom. The purpose of the research described in this paper is to distill those elements that contribute to the success of authentic learning environments, to analyze the antecedents and mediating variables, and to provide guidelines for the design of activities to embody those characteristics. Such characteristics can then be applied in a variety of learning contexts, such as simulations, case studies, role-plays, and scenarios, both in the classroom and in online learning situations.

Authentic Activities

Activities, investigations and problems have always been at the heart of student involvement in meaningful learning contexts. Teachers provide such activities to enable students to interact with the learning environment, and to learn, apply and practice newly acquired skills. Activities have been defined by Brophy and Alleman (1991) as: 'Anything students are expected to do, beyond getting input through reading or listening, in order to learn, practice, apply, evaluate, or in any other way respond to curricular content' (p. 9).

However, a well-designed activity can be so much more than an opportunity for students to practice and apply their learning. In this paper, it is proposed that the activity students perform as they complete a course of study is the single most important element in the design of the learning environment. A complex and sustained activity can motivate students to learn. It can provide meaning and relevance to complex content, enable collaborative problem solving, justify the creation of polished products, and provide integrated assessment of achievement. Indeed, it can be the central organizing element of an entire course of study.

There is no lack of research and literature written on the use of authentic activities over the past decade or more. There has been a great deal written about the differences between the kinds of activities and problems we face in real-world situations and those typically designed into courses of study. For example, Sternberg, Wagner and Okagaki (1993) differentiated between the kinds of problems learners face in academic situations and practical, real-world applications. They contended that academic problems tend to be: formulated by others, well-defined, complete in the information they provide, characterized by having only one correct answer, characterized by having only one method of obtaining the correct answer, disembedded from ordinary experience, and of little or no intrinsic interest.

For example, it is unlikely that the following typical mathematics textbook exercise would ever be encountered in this form in any realistic context, or that students would necessary know when to apply it in appropriate circumstances:

$$2x + 1 = 7. \text{ Solve for } x$$

Similarly word problems, while attempting to provide a real-world context, fail to replicate the essential elements of a meaningful and realistic problem. For example:

> Jenny and her friend left Perth to visit a winery. They bought 3 one-liter bottles of wine, 5 bottles each containing 750 milliliters, and two half-liter bottles of wine. What was the total quantity of wine bought?

Why does the student need to know how much wine Jenny bought? If the total was needed to write on a customs declaration, or Jenny needed to calculate her likely blood alcohol level after consuming this wine, this is important contextual information that is missing from the problem description. As it stands, the problem remains a simple and pointless algorithm dressed up with a few words. Bottge and Hasselbring (1993) have pointed out that such word problems are inadequate because:

> they describe situations in a textual rather than a contextual form; they typically include key words such as 'in all' or 'how many more' that can trigger a specific number operation—unlike real problems that offer no such clues; and there is usually only a single correct answer, which takes only a few minutes to solve. (p. 36)

Such activities often lead only to an enculturation into the practices of classrooms rather than the real-world transfer teachers expect. Clayden, Desforges, Mills and Rawson (1994) noted that student efforts to make sense of classroom activities generally lead them to focus on working practices rather than abstract ideas. 'What they learn … is how to do work, how to be neat, how to finish on time' (p. 164).

In direct contrast to the academic approach, practical problems tend to be characterized by: the key roles of problem recognition and definition, the ill-defined nature of the problem, substantial information seeking, multiple correct solutions, multiple methods of obtaining solutions, the availability of relevant prior experience, and often highly motivating and emotionally involving contingencies (Sternberg et al., 1993, p. 206). Key differences between the school-based approach and real life approach have also been developed and summarized by Lebow and Wager (1994) (see Table 1).

Table 1: Real-life versus in-school problem solving (Lebow & Wager, 1994)

Real-life	In-school
1. Involves ill formulated problems and ill structured conditions.	1. Involves 'textbook' examples and well structured conditions.
2. Problems are embedded in a specific and meaningful context.	2. Problems are largely abstract and decontextualized.
3. Problems have depth, complexity and duration.	3. Problems lack depth, complexity, and duration.
4. Involves cooperative relations and shared consequences.	4. Involves competitive relations and individual assessment.
5. Problems are perceived as real and worth solving.	5. Problems typically seem artificial with low relevance for students.

While the differentiation between the two approaches is largely within the context of classroom instruction, the same distinctions may be drawn for the design of online learning environments. In completing activities and solving problems online, students frequently learn to invoke 'sub-optimal' schemes to enable them to proceed, rather than deal with the content in a way that promotes true understanding. Many of these online programs are so tightly designed to process student input, they fail to account for the nature of real-world problem solving, where the solution is rarely neat and the salient facts are rarely the only ones at students' disposal.

In contrast, a number of authors suggest that authentic activities should be ill-defined so that students must *find* as well as *solve* the problems. Learners need to have opportunities to: explore a situation with all the complexity and uncertainty of the real world, have a role in determining the task and how it might be broken up into smaller tasks, select relevant information, and find solutions that suit their needs. Because authentic activities mirror real world tasks, they require students to use teamwork, interpersonal skills, technology, decision making, and other skills to complete the task successfully (Perreault, 1999). For instance, Myers (1993) developed three criteria for measuring the authenticity of an activity:

> (1) the activity provides opportunities for the students to achieve something that they perceive as real or genuine;
> (2) the activity challenges, inspires and empowers learners to take risks and exceed personal limitations; and
> (3) the activity makes some difference in the lives of the learners. (p. 72)

Others have also discussed the importance of providing an authentic context to the task. Jonassen (1991) noted that authentic activities have real-world relevance and utility, and recommended that authentic tasks be integrated across the curriculum. Similarly, Bransford, Vye, Kinzer and Risko (1990b) described the following criteria for authentic activities to maximize the effectiveness of the approach:

- A single complex problem should be investigated by students.
- Students identify and define their own questions.
- Students must have the opportunity to experience the problem from a number of different perspectives.
- Students work on the problem over a "reasonably long period of time" (p. 394), that is weeks rather than days.
- Activities are logically related to the problem.

Young (1993) also listed the attributes of real-life problems which need, where possible, to be replicated in authentic activities. The problem must provide:

- Ill structured complex goals
- Opportunity for the detection of relevant versus irrelevant information
- Active/generative engagement in defining problems as well as solving them
- Involvement of the student's beliefs and values
- An opportunity to engage in collaborative interpersonal activities (p. 45)

Many other theorists and researchers (e.g., Gordon, 1998; Lebow & Wager, 1994) have also emphasized the importance of designing collaborative, rather than independent, learning activities, and others such as Duchastel (1997) have pointed out the importance of diversity, rather than uniformity, of outcome. The Cognition and Technology Group at Vanderbilt (1990b) have stressed the importance of complexity and the necessity of providing an environment capable of sustained examination.

Some argue that it is impossible to design truly 'authentic' learning experiences. Petraglia (1998) argued that authenticity can be neither "predetermined nor preordained," and such attempts often result in little more than "preauthentication," that is, "the attempt to make learning materials and environments correspond to the real world prior to the learner's interaction with them" (p. 53). In supporting this view, Barab, Squire and Dueber (2000) argued that authenticity occurs "not in the learner, the task, or the environment, but in the dynamic interactions among these various components … authenticity is manifest in the flow itself, and is not an objective feature of any one component in isolation" (p. 38).

Petraglia (1998) contended that learners need to be *persuaded* that they are participating in an authentic learning environment. This theme is also adopted by Kantor,

Waddington and Osgood (2000) who, when referring to the kinds of goal-based scenarios they designed for Anderson Consulting, argued that: "It is a simulation of a client engagement in which the participants tacitly agree to go along with an interpretation of job reality which we have crafted" (p. 212). According to Cronin (1993), the message for designers and teachers of online learning environments is a simple one: in designing authentic activities, 'students' experiences … should more closely resemble the experiences they encounter in real life' (p. 80).

10 Characteristics of Authentic Activities

As described above, many writers and theorists have suggested quite specific design criteria for activities which, if implemented well, can enhance students' learning as they engage in tasks that reflect the critical characteristics of genuine roles and activities of professionals in real world settings. In reflecting on the characteristics of authentic activities described by researchers, we have derived ten design characteristics of more authentic activities (Reeves, Herrington, & Oliver, 2002):

1. *Authentic activities have real-world relevance*

   Activities match as nearly as possible the real-world tasks of professionals in practice rather than decontextualized or classroom-based tasks (e.g., Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1990a; Cronin, 1993; Jonassen, 1991; Lebow & Wager, 1994; Oliver & Omari, 1999; Resnick, 1987; Winn, 1993).

2. *Authentic activities are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity*

   Problems inherent in the activities are ill-defined and open to multiple interpretations rather than easily solved by the application of existing algorithms. Learners must identify their own unique tasks and sub-tasks in order to complete the major task (e.g., Bransford

et al., 1990b; Brown et al., 1989; Cognition and Technology Group at Vanderbilt, 1990a; Lebow & Wager, 1994; Sternberg et al., 1993; Winn, 1993).

3. *Authentic activities comprise complex tasks to be investigated by students over a sustained period of time*

   Activities are completed in days, weeks and months rather than minutes or hours, requiring significant investment of time and intellectual resources (e.g., Bransford et al., 1990b; Cognition and Technology Group at Vanderbilt, 1990b; Jonassen, 1991; Lebow & Wager, 1994).

4. *Authentic activities provide the opportunity for students to examine the task from different perspectives, using a variety of resources*

   The task affords learners the opportunity to examine the problem from a variety of theoretical and practical perspectives, rather than a single perspective that learners must imitate to be successful. The use of a variety of resources rather than a limited number of preselected references requires students to detect relevant from irrelevant information (e.g., Bransford et al., 1990b; Cognition and Technology Group at Vanderbilt, 1990b; Sternberg et al., 1993; Young, 1993).

5. *Authentic activities provide the opportunity to collaborate*

   Collaboration is integral to the task, both within the course and the real world, rather than achievable by an individual learner (e.g., Gordon, 1998; Lebow & Wager, 1994; Young, 1993).

6. *Authentic activities provide the opportunity to reflect*

   Activities need to enable learners to make choices and reflect on their learning both individually and socially (e.g., Gordon, 1998; Myers, 1993; Young, 1993).

7. *Authentic activities can be integrated and applied across different subject areas and lead beyond domain-specific outcomes*

   Activities encourage interdisciplinary perspectives and enable diverse roles and expertise rather than a single well-defined field or domain (e.g., Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990a; Bransford et al., 1990b; Jonassen, 1991).

8. *Authentic activities are seamlessly integrated with assessment*

   Assessment of activities is seamlessly integrated with the major task in a manner that reflects real world assessment, rather than separate artificial assessment removed from the nature of the task (e.g., Herrington & Herrington, 1998; Reeves & Okey, 1996; Young, 1995).

9. *Authentic activities create polished products valuable in their own right rather than as preparation for something else*

   Activities culminate in the creation of a whole product rather than an exercise or sub-step in preparation for something else (e.g., Barab et al., 2000; Duchastel, 1997; Gordon, 1998).

10. *Authentic activities allow competing solutions and diversity of outcome*

    Activities allow a range and diversity of outcomes open to multiple solutions of an original nature, rather than a single correct response obtained by the application of rules and procedures (e.g., Bottge & Hasselbring, 1993; Bransford et al., 1990a; Bransford et al., 1990b; Duchastel, 1997; Young & McNeese, 1993).

Investigating Authentic Activities Online

As stated by Lebow and Wager (1994): "When authentic activity is the model for appropriate learning activity, the perceptions of the learner and the affordances of the

environment represent an integral and inseparable context of learner/environment" (p. 241). The Cognition and Technology Group at Vanderbilt (1990b) describe authentic activities as 'generative' because the completion of the task requires the students to generate other problems to be solved. They draw a distinction between these authentic tasks and simple word problems that already define the problem, such as: "If you travel 150 kilometers at 90 kph, how long will the journey take?"

Compare this simple problem with one described by Reeves and Laffey (1999) in an undergraduate engineering course where the students' task is to plan a mission to Mars, encompassing the design a research station there as well as the creation of a renewable power source to sustain life once a station is established. Such activities guide learning in entire courses of study. They are not provided simply to enable students to practice skills taught in more didactic, content-focused ways. They are integral to the way students approach and study the course, and provide meaning to complex curricula.

At Edith Cowan University in Western Australia, a *Graduate Certificate in Online Teaching and Learning* has been developed according to the guidelines of authentic activity described above. The aim of the program is to assist instructors to have the confidence to design and plan effective online learning environments themselves. The program consists of four courses: *Online Teaching and Learning, Resources for Teaching and Learning Online, Designing Effective Online Learning Environments,* and an *Online Learning Project Unit*. The design of the courses is characterized by strongly student-centered environments, with authentic and conceptualized learning tasks in collaborative settings, using integrated assessment strategies and learning scaffolded by instructor support. The courses are designed to be delivered online and to embody a variety of online teaching and learning strategies.

The first course entitled *Online Teaching and Learning* (Figure 1a) was designed to explore issues associated with the creation of effective learning environments, and draws heavily on recent theory and research. The course is based upon a task (Figure 1b) wherein the student takes on a role in a scenario set in a fictitious university. The student is required to evaluate a website that has been set up as an exemplar for a consortium of universities planning to develop a joint online course. The students then, in collaboration with other students (posed as representatives from the other universities) recommend a set of guidelines for website development, and then redesign the original website (or one of their own choosing) according to those guidelines. While comprising a single sustained task, the activity can be evaluated at three points.

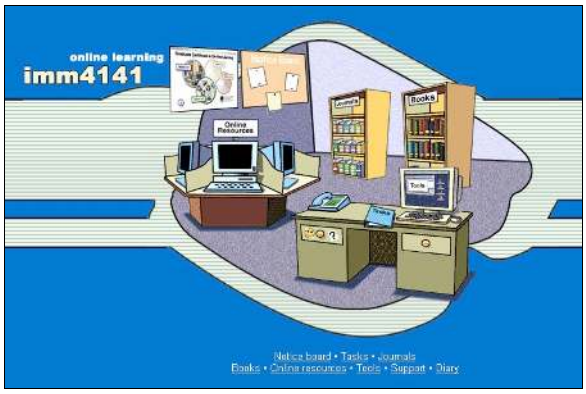

Figure 1a: The main interface for *Online Teaching and Learning*

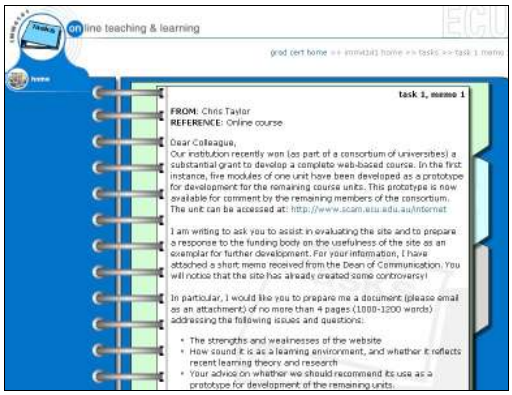

Figure 1b: The task presented in a memo

Our current research project (Herrington, Oliver, & Reeves, 2002), entitled *Authentic activity as a model for web-based learning,* has sought to investigate examples of courses or instructional units that embody the critical elements described above. Using these

characteristics as criteria for the selection of appropriate courses to study, our research has sought to investigate the characteristics of authentic activity that facilitate a whole course of study being encapsulated within complex tasks, and to determine the factors that contribute to the successful adoption and implementation of activity-based online courses. We have used the criteria listed above to select courses or units of study that use authentic activities as a central core of their presentation. The courses must have a major online component, not simply comprise supplementary material to on-campus delivery. Examples of the types of online courses that use authentic activities are given below.

In a post-graduate unit entitled *Research Preparation: Research Methods,* students do not learn research methods by studying texts describing research methodologies and appropriate applications. Instead they work virtually in a graduate research center (Figure 2a) where they are given the task of investigating the closure of a rural school. They do this using both qualitative and quantitative methods, and they are assisted by two virtual researchers who have collected data from the community and assembled the data in raw form. The students can examine school records, population data, interviews with teachers, parents and community members, newspaper reports and other documents (e.g., Figure 2b). Students produce a report that analyses the impact of the closure of the school on the rural community.

Figure 2a: The graduate research center

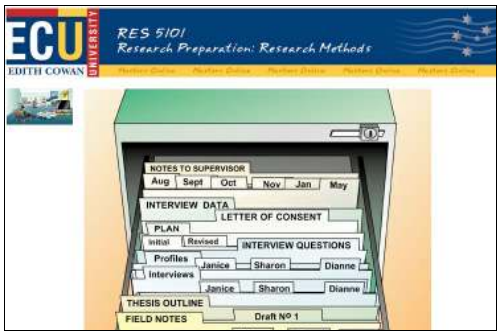

Figure 2b: Qualitative data in the filing cabinet

In a semester long course entitled *North American Fiction and Film*, (Figure 3a) students study novels written by North American writers such as Melville, Hemingway, DeLillo, Vonnegut, Atwood, and Esquival, and they view film versions of the same works (if appropriate). In the course, they are given the role of Editorial Board Members of an online scholarly journal (Figure 3b), to which they submit book reviews and articles based on their study of the literature. The students collaboratively design a guide for novice reviewers on how to write a book review. The teacher of the course is the journal editor, and an edition of the journal is published online at the end of the semester. A range of literary resources, articles and reviews are accessible from the website. The theoretical and design framework of the course is described in Fitzsimmons (2001).

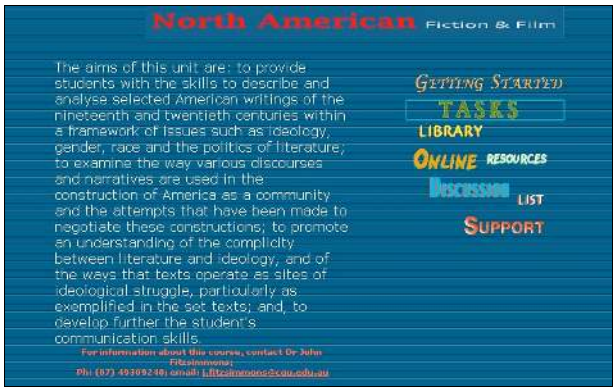

Figure 3a: Main interface of North American Fiction and Film

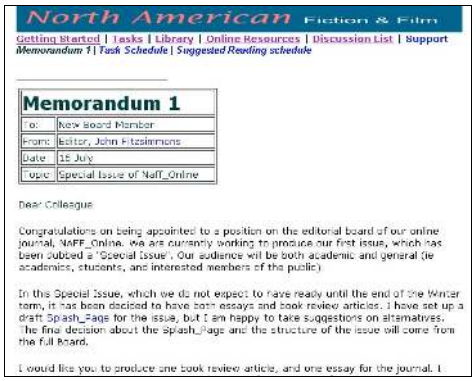

Figure 3b: Memo inviting students to join Editorial Board

Coastal and Marine Systems is a post-graduate course where activities are specifically designed to mirror the typical problems that a coastal manager or an environmental consultant might encounter. For example, in one major task (Figure 4a), it is proposed that a marina has been developed, and as part of the approval process, annual monitoring of water quality is required. The monitoring encompasses water inside the marina as well as a site several hundred meters outside the marina, in well-flushed ocean conditions. The students are provided with a set of real data collected by the course teachers from inside and outside the marina, and they are required to understand, analyze and interpret the data and draw conclusions as to whether the water quality within the marina is different to that outside, and if so explain the possible causes. The evaluation is presented as a report within the context of the renewal of the marina license. The course is constrained, to a degree, to the requirements of the proprietary software, Blackboard (originally the plan included a more realistic interface with clickable visual links and metaphors) (see Figure 4b) but nevertheless, the task incorporates the characteristics of authentic activities described earlier.

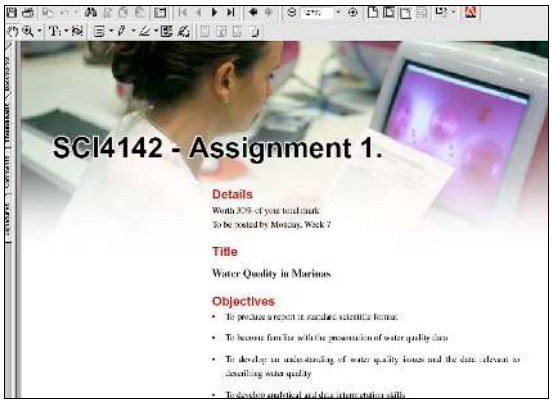

Figure 4a: Major activity on marina development and water quality

Figure 4b: Main interface of Coastal and Marine Systems in Blackboard

In another example of complex activity, Pennell, Durham, Orzog and Spark (1997) described a web-based environment, *Writing in Organizations*, part of the third-year curriculum for Bachelor of Arts (Communication Studies) where students learn business communication skills by accepting temporary employment in a virtual recording company (Figure 5a). They are given a complex task to complete, specifically preparing a report on whether the company would benefit from the introduction of an internal newsletter. In order to complete this activity, they make appointments, keep a diary, 'interview' the director and other employees (Figure 5b), and write letters, and memos as required.

Figure 5a: Main interface of Virtual Records

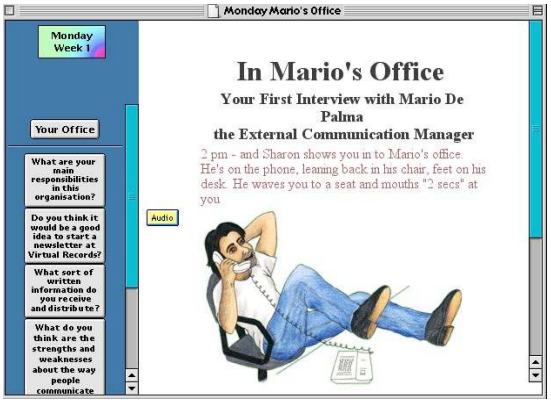

Figure 5b: Interviewing one of the employees

While most of the online learning environments we have studied have involved the creation of simulated work places and often incorporate extensive resources such as graphics, video, and sound files, other examples studied are less resource intensive while still retaining fidelity to the authentic characteristics described. For example, in an introductory biology course for online delivery (described in Koenders, 2002) students investigate a simulation of the discovery of new life forms, and are introduced to the interpretation of microscopic images of cellular structures. In the scenario, students are given a role as biologist who has joined an expedition to a remote lake in Siberia where several microorganisms are found that cannot be classified. They 'collect' the specimens and return to the university to analyze them. On the website, they are provided with images of unicellular organisms apparently unknown to science. Students are assigned to groups of four where they analyze the specimens and prepare a report. The scenario is not drawn in an elaborate, resource intensive manner, but built up through the creation of an interesting and engaging idea.

The learning environments described have varying degrees of fidelity to the characteristics of authentic activities defined earlier, but all have strong linkage to real-world professional practice. Faculty members, instructional designers, and others associated with the design and delivery of the courses are being interviewed, and the websites analyzed. Student responses are being gained through online questionnaires. The research is ongoing, and analysis is focusing on the identification of conceptual themes and issues emerging from the data, using techniques such as clustering, and making contrasts and comparisons (Miles & Huberman, 1994).

Some Issues Arising from our Research

While analysis is preliminary at this stage, several trends have emerged, and there are implications for the design of online learning environment, the teaching of such courses, and further research efforts.

Generally, the teachers involved in units and courses featuring complex, authentic activities (as described above) are enthusiastic and positive about their teaching and about the quality of student learning in the course. All have found the experience of designing and teaching the course to be professionally enhancing, through their own learning of recent educational research and pedagogy, through the experience of teaching in new and innovative ways, and in many cases through publications and conference presentations about the course and other professional activities. In short, they are engaged in the "scholarship of teaching" (Shulman, 2000).

One theme which has emerged strongly from a number of different sources in our research is the nature of authenticity, and how 'authentic' environments are often the creation of the teachers', authors' and instructional designers' imaginations, and are thus inevitably someone's *view* of what is authentic. Petraglia (1998) has been critical of this shortcoming,

calling it ‘the real world on a short leash’ (p. 53). There is nevertheless, much evidence to suggest that these learning environments can provide a great deal of meaning to otherwise decontextualised facts and skills, and can enhance the transfer of deep and lifelong learning (Barab & Landa, 1997). At what point do students become engaged, if ever, in these scenarios? Is there a pattern to their acceptance of the terms of the authenticity, and how important is the suspension of disbelief? (Herrington, Oliver, & Reeves, 2002).

Another recurring theme is time, in terms of both the teachers’ and the students’ commitment to authentic activities. Many of the teachers interviewed to date have mentioned the inordinate amount of time involved in both the preparation of the authentic tasks and environments, and the teaching of the online course (Reeves, 2002). Teachers also reported that students were likely to spend much more time on the tasks, some complaining of the demands, others appreciative of the sense of deep engagement they experienced with the learning context. The time commitment problem has also been noted in many other authentic learning environments, some of which have reverted to more traditional modes despite strong evidence of effectiveness, including the Mission to Mars engineering course described earlier (Reeves & Laffey, 1999). If the large time commitment is a ‘labor of love’, willingly given by the intellectual owners of the course, it is also likely that this commitment is not sustainable over the long term, and courses based on authentic tasks will be abandoned for more manageable—and more traditional—lecture/tutorial modes of instruction.

Proponents of authentic activities as described here are generally enthusiastic and committed teachers who willingly provide time and effort beyond the usual expectations. Further research may help to identify authentic activities in online units that are offered to large student cohorts. Investigation of large scale, successful initiatives will possibly yield a

great deal of information on how these environments can be sustained with standard resources and faculty allocations, rather than an abundance of goodwill and generosity on the part of teachers. Longer term studies may also reveal the kinds of support that host institutions can develop to facilitate course units employing authentic and complex activities.

It is hoped that analysis of our own and further research data will help to suggest those characteristics of authentic activity that facilitate a whole course unit of study being encapsulated successfully within complex tasks, and to determine the factors that contribute to the successful and sustainable adoption and implementation of activity-based online course units. We encourage others to engage in this research agenda with us.

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References

Barab, S.A., & Landa, A. (1997). Designing effective interdisciplinary anchors. *Educational Leadership, 54*, 52-55.

Barab, S.A., Squire, K.D., & Dueber, W. (2000). A co-evolutionary model for supporting the emergence of authenticity. *Educational Technology Research and Development, 48*(2), 37-62.

Bennett, S., Harper, B., & Hedberg, J. (2001). Designing real-life cases to support authentic design activities. In G. Kennedy, M. Keppell, C. McNaught , & T. Petrovic (Eds.), *Meeting at the Crossroads. Proceedings of the 18th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education* (pp. 73-81). Melbourne: Biomedical Multimedia Unit, The University of Melbourne.

Bottge, B.A., & Hasselbring, T.S. (1993). Taking word problems off the page. *Educational Leadership, 50*(7), 36-38.

Boud, D. & Solomon, N. (Eds.) (2001). *Work-Based Learning: A New Higher Education?* Buckingham, UK: SRHE and Open University Press.

Bransford, J.D., Sherwood, R.D., Hasselbring, T.S., Kinzer, C.K., & Williams, S.M. (1990a). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds.), *Cognition, education and multimedia: Exploring ideas in high technology* (pp. 115-141). Hillsdale, NJ: Lawrence Erlbaum.

Bransford, J.D., Vye, N., Kinzer, C., & Risko, V. (1990b). Teaching thinking and content knowledge: Toward an integrated approach. In B.F. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp. 381-413). Hillsdale, NJ: Lawrence Erlbaum Associates.

Brophy, J., & Alleman, J. (1991). Activities as instructional tools: A framework for analysis and evaluation. *Educational Researcher, 20*(4), 9-23.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Clayden, E., Desforges, C., Mills, C., & Rawson, W. (1994). Authentic activity and learning. *British Journal of Educational Studies, 42*(2), 163-173.

Cognition and Technology Group at Vanderbilt. (1990a). Anchored instruction and its relationship to situated cognition. *Educational Researcher, 19*(6), 2-10.

Cognition and Technology Group at Vanderbilt. (1990b). Technology and the design of generative learning environments. *Educational Technology, 31*(5), 34-40.

Cronin, J.C. (1993). Four misconceptions about authentic learning. *Educational Leadership, 50*(7), 78-80.

Duchastel, P.C. (1997). A Web-based model for university instruction. *Journal of educational technology systems, 25*(3), 221-228.

Duffy, T.M., Lowyck, J., & Jonassen, D.H. (Eds.). (1993). *Designing environments for constructive learning*. Heidelberg: Springer-Verlag.

Eyler, J., & D. E. Giles, J. (1999). *Where's the Learning in Service-Learning?* San Francisco: Jossey-Bass.

Fitzsimmons, J. (2001). *Designing an effective online unit: Theory and practice.* Paper presented at the Teaching Online in Higher Education Online Conference, Indiana University-Purdue University Fort Wayne, Indiana. Available: http://www.ipfw.edu/as/tohe/2001/abstracts/fitzsimmons.htm.

Gordon, R. (1998). Balancing real-world problems with real-world results. *Phi Delta Kappan, 79*, 390-393.

Herrington, J., & Herrington, A. (1998). Authentic assessment and multimedia: How university students respond to a model of authentic assessment. *Higher Education Research and Development, 17*(3), 305-322.

Herrington, J., Oliver, R., & Reeves, T.C. (2002, December). *The suspension of disbelief in authentic online learning environments,* Paper presented at the Australasian Society for Computers in Learning in Tertiary Education Conference, Auckland, New Zealand.

Honebein, P.C., Duffy, T.M., & Fishman, B.J. (1993). Constructivism and the design of learning environments: Context and authentic activities for learning. In T.M. Duffy, J. Lowyck , & D.H. Jonassen (Eds.), *Designing environments for constructive learning* (pp. 87-108). Heidelberg: Springer-Verlag.

Johnson, D. W., Johnson, R. T., and Smith, K. A. (1998). *Active learning: Cooperation in the college classroom*. Edina, MN: Interaction Books.

Jonassen, D. (1991). Evaluating constructivistic learning. *Educational Technology, 31*(9), 28-33.

Kantor, R.J., Waddington, T., & Osgood, R.E. (2000). Fostering the suspension of disbelief: The role of authenticity in goal-based scenarios. *Interactive Learning Environments, 8*(3), 211-227.

Koenders, A. (2002). Creating opportunities from challenges in on-line introductory biology. In A. Goody, J. Herrington , & M. Northcote (Eds.), *Quality conversations: Research and Development in Higher Education, Volume 25* (pp. 393-400). Jamison, ACT: HERDSA.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lebow, D., & Wager, W.W. (1994). Authentic activity as a model for appropriate learning activity: Implications for emerging instructional technologies. *Canadian Journal of Educational Communication, 23*(3), 231-144.

Luca, J., & Oliver, R. (2001). Developing generic skills through on-line courses. In C. Montgomerie & J. Viteli (Eds.), *Proceedings of Ed-Media 2001* (Vol. 2, pp. 1163-1164). Tampere, Finland: Association for the Advancement of Computing in Education.

McLellan, H. (1997). Creating virtual communities via the web. In B.H. Khan (Ed.), *Web-based instruction* (pp. 185-190). Englewood Cliffs, New Jersey: Educational Technology Publications.

McLellan, H. (Ed.). (1996). *Situated learning perspectives*. Englewood Cliffs, NJ: Educational Technology Publications.

Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd. ed.). Thousand Oaks, CA: Sage.

Myers, S. (1993). A trial for Dmitri Karamazov. *Educational Leadership, 50*(7).

Oliver, R., & Omari, A. (1999). Using online technologies to support problem based learning: Learners responses and perceptions. *Australian Journal of Educational Technology, 15*(158-79).

Pennell, R., Durham, M., Ozog, M., & Spark, A. (1997). Writing in context: Situated learning on the web. In R. Kevill, R. Oliver , & R. Phillips (Eds.), *What works and why: Proceedings of the 14th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education* (pp. 463-469). Perth, WA: Curtin University.

Perreault, H.R. (1999). Authentic activities for business education. *Delta Pi Epsilon Journal*, 41(1), 35-41.

Petraglia, J. (1998). The real world on a short leash: The (mis)application of constructivism to the design of educational technology. *Educational Technology Research and Development, 46*(3), 53-65.

Reeves, T. C. (2002). Distance education and the professorate: The issue of productivity. In C. Vrasidas and G. V. Glass (Eds.), *Distance education and distributed learning* (135-156). Greenwich, CT: Information Age Publishing.

Reeves, T.C., Herrington, J., & Oliver, R. (2002). Authentic activities and online learning. In A. Goody, J. Herrington, & M. Northcote (Eds.), *Quality conversations: Research and Development in Higher Education, Volume 25* (pp. 562-567). Jamison, ACT: HERDSA.

Reeves, T.C., & Laffey, J.M. (1999). Design, assessment, and evaluation of a problem-based learning environment in undergraduate engineering. *Higher Education Research and Development Journal, 18*(2), 219-232.

Reeves, T.C., & Okey, J.R. (1996). Alternative assessment for constructivist learning environments. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 191-202). Englewood Cliffs, NJ: Educational Technology Publications.

Resnick, L. (1987). Learning in school and out. *Educational Researcher, 16*(9), 13-20.

Schon, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.

Shulman, L. (2000). Inventing the future. In P. Hutchings (Ed). *Opening lines: Approaches to the scholarship of teaching and learning.* Menlo Park, CA: Carnegie Publications. Available online at: http://www.carnegiefoundation.org/elibrary/docs/inventing.htm

Stanton, T. K., Giles, Jr., D. E., & Cruz, N. I. (1999). *Service-learning: A movement's pioneers reflection on its origins, practice, and future*. San Francisco: Jossey-Bass.

Sternberg, R.J., Wagner, R.K., & Okagaki, L. (1993). Practical intelligence: The nature and role of tacit knowledge in work and at school. In J.M. Puckett & H.W. Reese (Eds.), *Mechanisms of everyday cognition* (pp. 205-227). Hillsdale, NJ: Lawrence Erlbaum Associates.

Wilson, B.G. (Ed.). (1996). *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Wineburg, S.S. (1989). Remembrance of theories past. *Educational Researcher, 18*(5), 7-10.

Winn, W. (1993). Instructional design and situated learning: Paradox or partnership. *Educational Technology, 33*(3), 16-21.

Young, M.F. (1993). Instructional design for situated learning. *Educational Technology Research and Development, 41*(1), 43-58.

Young, M.F. (1995). Assessment of situated learning using computer environments. *Journal of Science Education and Technology, 4*(1), 89-96.

Young, M.F., & McNeese, M. (1993). A situated cognition approach to problem solving with implications for computer-based learning and assessment. In G. Salvendy & M.J. Smith (Eds.), *Human-computer interaction: Software and hardware interfaces.* New York: Elsevier Science Publishers.