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Authentic e-learning in higher education: Design principles for authentic learning environments and tasks

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Abstract: With many learners failing to engage with didactic and outmoded instructional methods, and unwilling to use technology that simply replicates the one-way transfer of information from teacher to student, authentic learning designs have the potential to improve student engagement and educational outcomes. This paper argues that online technologies afford the design and creation of truly innovative authentic learning environments. The theoretical foundations of this approach are strong, and they are also explored, together with discussion of the importance of tasks as the focus of authentic activities. Finally, the case is made for a more comprehensive approach to investigating the effectiveness of authentic learning environments through design-based research.

Authentic learning environments

Despite the intuitive appeal of authentic learning environments, and much anecdotal evidence that they are effective in promoting higher order learning, such complex learning environments appear to be used only rarely in higher education courses. With many learners failing to engage with didactic and outmoded instructional methods (ref), and unwilling to use technology that simply replicates the one-way transfer of information from teacher to student, authentic learning designs have the potential to improve student engagement and educational outcomes. This paper describes the origins of 'authentic learning,' drawing largely on the theoretical constructs of situated learning and cognitive apprenticeships, and I summarize some of its defining characteristics. It then focuses more specifically on the task as the central focus for authentic activity, and concludes with suggestions for the dissemination of good practice and theory development through design-based research.

Based largely on the work of Lave and Wenger (1991), and in particular two important papers published in 1989, by Brown, Collins and Duguid (1989) and Collins, Brown & Newman (1989), teachers and researchers in education began to investigate the notion of apprenticeships and to try to distinguish those characteristics which were critical to its success. Their aim was to begin the process of developing a theoretical perspective for learning based on the apprenticeship model, that cognitive science had, to date, not been able to explain. Brown, Collins and Duguid (1989) were the first to use the ideas to produce a proposal for a model of instruction that has implications for higher education. In their model of situated cognition, Brown et al. (1989) argued that meaningful learning will only take place if it is embedded in the social and physical context within which it will be used. At its most simple, situated learning was defined by Collins (1988) as: 'the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life' (p. 2). Further development of the theory meant that in the next decade, situated learning was more fully explored and described. During the 1990s, the further exploration of cognitive apprenticehips and situated learning (e.g., McLellan, 1996) coincided with rapid development in the educational uptake of multimedia and web-based learning environments.

In 1993, Brown and Duguid noted: 'One of the most persistent educational questions following discussions of situated learning has been: How can these situated theories be operationalized?' (1993, p. 10). Although many people were writing in the area at the time, and despite calls for a model of instruction to isolate those 'critical elements' that make apprenticeships successful, no comprehensive model of the approach for classroom practice had emerged. A comprehensive literature review and analysis conducted later in that decade proposed a model of critical characteristics of situated learning, developed in reference to the design of multimedia learning environments (Herrington, 1997; Herrington & Oliver, 2000). This was later applied to web environments (Oliver & Herrington, 2000), and then more generically to learning environments in higher education (Herrington & Herrington, 2006).

The characteristics of situated learning that emerged from that research are listed below, together with a short but not exhaustive list of references of researchers who advocated each element. In effect, a situated learning environment employs:

1. ***An authentic context that reflects the way the knowledge will be used in real life***

   In designing online learning environments with authentic contexts, it is not enough to simply provide suitable examples from real-world situations to illustrate the concept or issue being taught. The context needs to be all-embracing, to provide the purpose and motivation for learning, and to provide a sustained and complex learning environment that can be explored at length (e.g., Brown, Collins, & Duguid, 1989; Honebein, Duffy, & Fishman, 1993; Reeves & Reeves, 1997).

2. ***Authentic activities***

   The learning environment needs to provide ill-defined activities which have real-world relevance, and which present a single complex task to be completed over a sustained period of time, rather than a series of shorter disconnected examples (Bransford, Vye, Kinzer, & Risko, 1990; Brown, Collins, & Duguid, 1989; Reeves & Reeves, 1997; Lebow & Wager, 1994).

3. ***Access to expert performances and the modelling of processes***

   In order to provide expert performances, the online learning environment needs to provide access to expert thinking and the modelling of processes, access to learners in various levels of expertise, and access to the social periphery or the observation of real-life episodes as they occur (Collins, Brown, & Newman, 1989; Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). The facility of the World Wide Web to create global communities of learners who can interact readily via email, also enables opportunities for the sharing of narratives and stories.

4. ***Multiple roles and perspectives***

   In order for students to be able to investigate the learning environment from more than a single perspective, it is important to enable and encourage students to explore different perspectives on the topics from various points of view, and to 'criss cross' the learning environment repeatedly (e.g., Collins, Brown, & Newman, 1989; Honebein, Duffy, & Fishman, 1993; Spiro, Feltovich, Jacobson, & Coulson, 1991).

5. ***Collaborative construction of knowledge***

   The opportunity for users to collaborate is an important design element, particularly for students who may be learning at a distance. Consequently, tasks need to be addressed to a group rather than an individual, and appropriate means of communication need to be established. Collaboration can be encouraged through appropriate tasks and communication technology (e.g., discussion boards, chats, email, debates etc.) (e.g., Brown, Collins, & Duguid, 1989; Collins, Brown, & Newman, 1989; Hooper, 1992; Reeves & Reeves, 1997).

6. ***Reflection***

   In order to provide opportunities for students to reflect on their learning, the online learning environment needs to provide an authentic context and task, as described earlier, to enable meaningful reflection. It also needs to provide non linear organisation to enable students to readily return to any element of the site if desired, and the opportunity for learners to compare themselves with experts and other learners in

varying stages of accomplishment (e.g., Boud, Keogh, & Walker, 1985; Kemmis, 1985; Collins & Brown, 1988).

7. ***Articulation***

   In order to produce a learning environment capable of providing opportunities for articulation, the tasks need to incorporate inherent—as opposed to constructed—opportunities to articulate, collaborative groups to enable articulation, and the public presentation of argument to enable defence of the position (e.g., Edelson, Pea, & Gomez, 1996; Collins, Brown, & Newman, 1989; Lave & Wenger, 1991).

8. ***Coaching and scaffolding***

   In order to accommodate a coaching and scaffolding role principally by the teacher (but also provided by other students), the online learning environments needs to provide collaborative learning, where more able partners can assist with scaffolding and coaching, as well as the means for the teacher to support learning via appropriate communication technologies (e.g., Collins, Brown, & Newman, 1989; Greenfield, 1984).

9. ***Authentic assessment***

   In order to provide integrated and authentic assessment of student learning, the online learning environment needs to provide: the opportunity for students to be effective performers with acquired knowledge, and to craft polished, performances or products in collaboration with others. It also requires the assessment to be seamlessly integrated with the activity, and to provide appropriate criteria for scoring varied products (e.g., Wiggins, 1993; Reeves & Okey, 1996; Linn, Baker, & Dunbar, 1991; Duchastel, 1997; Bain, 2003).

This framework of critical elements have been used to design and/or evaluate a number of technology-based learning environments that have been based on a theoretical foundation of situated learning, for example, (e.g.,Pennell, Durham, Ozog, & Spark, 1997; Kennedy, Judd, Keppell, Ginns, Crabb, & Strugnell, 2001; Pountney, Parr, & Whittaker, 2002; Taylor, 2003; Keppell, Wlodek, Ping, Kennedy, Kirk, & Judd, 2003; Lee, Lee, & Kim, 2005; Koppi & Pearson, 2005; Ferry, Kervin, Hedberg, Turbill, Cambourne, & Jonassen, 2005; Gulikers, Bastiaens, & Martens, 2005; Östlund & Svensson, 2005)

However, our research has also revealed an influence in the design of online learning courses that often militates against the effective use of situated learning, namely, learning management systems. The tendency for universities to place courses on the web (using systems such as WebCT and Blackboard) has often resulted in the focus being placed on information delivery rather than learning (Herrington, Reeves, & Oliver, 2005). Teachers often yield to the seductive appeal of a learning management system, where it is easy enough to populate a weekly schedule with readings and activities, rather than create a complex and engaging task as a vehicle for substantial learning in the course. Their role can be trivialized by the technology, and many become preoccupied with the summary statistics readily available in the system, and frequency of access can be equated with learning.

The importance of authentic activities or tasks in a learning environment was highlighted by Brown, Collins and Duguid (1989) who described them as ‘the ordinary practices of the culture’. Since then, others have focused on the central function of the task in an authentic learning environment as of paramount importance (e.g., Reeves & Reeves, 1997; Honebein, Duffy, & Fishman, 1993; Lebow & Wager, 1994; Stein, Isaacs, & Andrews, 2004; Chambers & Stacey, 1999). Our own recent research has focussed on the task as a critical component of authenticity in online learning environments, and we have explored online courses of study that use a single complex and sustained task to provide a meaningful context for student learning. While it is possible for such complex online learning environments to be designed within course management systems, it requires persistence and skill on the part of the teacher, and it remains a fact that few such environments exist within the course offerings of universities using course management systems.

Authentic tasks

Authentic tasks are an integral component to situated learning environments, and it was felt important to investigate and describe their design more fully in order to explore their effective use in online learning

environments. A literature review and study was undertaken where examples of online courses were investigated. The courses needed to use complex and sustained tasks that comprised an entire semester's work, so that in completing a single task, students would fulfil the requirements of the course. Such courses have been described in face-to-face and on-campus courses, such as the *Mission to Mars* Engineering course evaluated by Reeves, Laffey, & Marlino (1997), but little was known of courses that attempted such tasks online.

Ten characteristics of authentic tasks were distilled from a review of papers on authentic learning environments from the literature and the characteristics were used to select cases for investigation:

1. *Authentic tasks have real-world relevance:* Activities match as nearly as possible the real-world tasks of professionals in practice rather than decontextualised or classroom-based tasks (e.g., Brown, Collins, & Duguid, 1989; Jonassen, 1991; Lebow, 1993; Oliver & Omari, 1999; Cronin, 1993; Young, 1993; Winn, 1993; Resnick, 1987; Cognition and Technology Group at Vanderbilt, 1990a)
2. *Authentic tasks 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., Lebow & Wager, 1994; Bransford, Vye, Kinzer, & Risko, 1990; Cognition and Technology Group at Vanderbilt, 1990a)
3. *Authentic tasks 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, Vye, Kinzer, & Risko, 1990; Lebow & Wager, 1994; Cognition and Technology Group at Vanderbilt, 1990b; Jonassen, 1991)
4. *Authentic tasks 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., Young, 1993; Spiro, Vispoel, Schmitz, Samarapungavan, & Boeger, 1987; Bransford, Vye, Kinzer, & Risko, 1990; Cognition and Technology Group at Vanderbilt, 1990b)
5. *Authentic tasks 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., Lebow & Wager, 1994; Young, 1993; Gordon, 1998)
6. *Authentic tasks provide the opportunity to reflect:* Activities need to enable learners to make choices and reflect on their learning both individually and socially (e.g., Young, 1993; Myers, 1993; Gordon, 1998)
7. *Authentic tasks 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., Jonassen, 1991; Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990)
8. *Authentic tasks 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., Reeves & Okey, 1996; Young, 1995; Herrington & Herrington, 1998)
9. *Authentic tasks 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, Squire, & Dueber, 2000; Gordon, 1998; Duchastel, 1997)
10. *Authentic tasks 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., Duchastel, 1997; Bottge & Hasselbring, 1993; Young & McNeese, 1993; Bransford, Vye, Kinzer, & Risko, 1990; Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990).

Using these criteria to select courses for investigation, the research explored the conditions and factors that contributed to the successful use of authentic tasks in online learning environments (cf., Herrington, 2002;

Reeves, Herrington, & Oliver, 2002; Herrington, Reeves, Oliver, & Woo, 2004). In-depth qualitative studies revealed that the most successful learning environments employing authentic tasks: are customer-oriented, offering education as a *process* rather than a *product*; they do not necessarily seek to provide real experiences or photo-realistic simulations, but provide 'cognitive realism'; and they accept the need to assist students to become accustomed to learning in what might be a totally different way, and to assist with the necessary 'suspension of disbelief' that is sometimes required in such learning environments. These factors are explored in more depth below.

Learning vs information

Especially under the influence of course management systems, an expectation has arisen in higher education that online education will comprise information in the form of content, readings, resources, and 'interactivity' of some type (such as discussions, chats, emails, etc.). Tangible information has taken priority over more nebulous notions of learning. Miller (2000) defined the information industry by its focus on the four Gs: 'Firms in this industry *generate*, *gather*, and *group* information, and then *give* (sell) information to other firms' (p. 2). Rather than the complex and challenging models of education prompted by a more constructivist philosophy to course provision, it is possible to recognise this model in the presentation of many online courses today. In such courses:

- teachers *generate* the content that they decide is appropriate for the students to know;
- they *gather* appropriate and specific resources that are relevant to the content area;
- they *group* the information into weekly portions or modules; and
- they *give* the information to the students.

Courses that used authentic tasks resisted this approach. There is a focus on educating the student (the *customer* orientation) rather than content (the *product* orientation*)*. Teachers were able to overcome obstacles such as student expectation of defined readings and well-structured tasks, technology reliability problems, and the pressures of institutions to streamline and standardize their online offerings (Herrington, Reeves, & Oliver, 2005).

Cognitive realism

Courses that employed authentic tasks recognized that there was no necessary for the environment to be real. Many teachers, when endeavoring to create authentic learning environments believe it essential to create genuinely real opportunities for students (e.g., Savery & Duffy, 1996). For example, when teaching multimedia skills or web development classes, a teacher might advertise for organizations or companies in need of a multimedia or web product, and then require students to work with the real client; or (another example). While this is often possible, and valuable if it can be readily achieved, it is not necessary in order to create a 'cognitively real' learning environment. Realistic simulations are another means to create verisimilitude in learning contexts, but they are often extremely resource intensive and expensive to develop, and are limited by predetermined outcomes that need to be predicted and created within the parameters of the scenario itself.

Smith (1987) in his review of research related to simulations in the classroom concluded that the 'physical fidelity' of the simulation materials is less important than the extent to which the simulation promotes 'realistic problem-solving processes' (p. 409), a process Smith describes as the 'cognitive realism' of the task (Smith, 1986). Luigi, Tortell, Morie, & Dozois (n.d.) also use the term 'cognitive realism' to explain the use of sensory inputs in a simulation to reduce the necessity for photorealistic graphics. Research into the realism of learning environments indicates that maximum fidelity does not necessarily lead to maximum effectiveness in learning, particularly for novice learners (Alessi, 1988). Our research proposes that the physical reality of the learning situation is of less importance than the characteristics of the task design, and the engagement of students in the learning environment (Herrington, Oliver, & Reeves, 2003a).

Suspension of disbelief

Designing a learning environment to exhibit cognitive realism is one step towards creating an immersive and engaging online learning environment. However, the fact that a learning context has been well-designed is often insufficient. Students must also commit to the environment and its parameters, often set within a story or scene that many students initially reject. In order for this to happen, students may need to engage in the process described by the early 19th century poet Samuel Taylor Coleridge as the 'willing suspension of disbelief'. The term has been applied to many instances of human response to the arts, as noted by (Milburn, n.d.). There has

been some research to indicate that this separation between real world learning and its approximation can be accommodated in learning environments (Kantor, Waddington, & Osgood, 2000). For example, Petraglia (1998) contended that learners need to be *persuaded* that they are participating in an authentic learning environment. Further, Kantor et al., (2000) who, when referring to the kinds of goal-based scenarios they design for Anderson Consulting, argued that their environments are as authentic as a staged production, that is, 'to the degree that the staging of theatrical productions is authentic' (p. 222). As noted by Barab, Squire and Dueber (2000) 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).

Our research into the patterns of students' engagement as they suspend disbelief to engage in scenario-based learning environments (Herrington, Oliver, & Reeves, 2003b) suggests that the use of authentic tasks encourages and supports immersion in self-directed and independent learning—an important success factor in online learning.

Design based research

Many questions remain unexplored about notions of authenticity in online learning environments. The use of the approach has its skeptics, such as Bain (1993) who questioned whether we should preserve some aspects of instructivism. He argued that 'left to their own devices, many students may not abstract the underlying concepts and principles from the 'narrative' of the authentic task' (p. 1386). While authentic learning, as described in this paper, includes the full support and scaffolding a good teacher provides, such arguments reveal the common misconceptions and pre-judgements of those who have not been convinced of the worth of the approach. This is understandable. Few rigorous research studies—systemic or analytic—exist to support the claims of the theorists and teachers who advocate authentic learning.

There are many teachers who employ authentic learning approaches in online courses. Widespread research at the practitioner level would add substantially to the knowledge we have about the advantages and disadvantages, affordances and limitations, and benefits and problems associated with authentic learning. But this research should be more than anecdotal. The use of *development* research or *design-based research* studies (Brown, 1992; Reeves, 2000; van den Akker, 1999) would importantly contribute not only empirical knowledge about the veracity of the approach, but also design principles to inform theory and practice in education (Reeves, Herrington, & Oliver, 2004). Instructional designers and learning designers in universities can perform an important leadership role in this regard (Seeto & Herrington, in review).

The use of such an approach in investigating authentic learning environments can assure a rigorous and valid research agenda, and contribute greatly to our understanding of how such learning environments function and succeed in real educational contexts.

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