Authentic Learning Environments

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Abstract

Authentic learning is a pedagogical approach that situates learning tasks in the context of future use. Over the last two decades, authentic learning designs have captured the imaginations of innovative educators who see the approach as a means to enable students to develop robust knowledge that transfers to real-world practice. Authentic learning has its foundations in the theory of situated cognition, together with other pedagogical approaches developed over the last two decades, such as anchored instruction. It offers an alternative instructional model based upon sound principles for the design and implementation of complex and realistic learning tasks. The technologies associated with technology-based learning provide ideal conditions for the implementation of the approach, both in blended and fully online courses. New Web-based technologies and mobile devices provide affordances—as both cognitive tools and delivery platforms—for dissemination of polished and professional authentic learning experiences. As educational institutions increasingly embrace the internet and Web-supported learning, the potential exists for authentic learning environments to be used widely to improve student learning. This chapter reviews the seminal and recent literature in the field, and provides a model of authentic learning for the design of learning environments across educational sectors.

Keywords

Authentic learning environments • Authentic assessment • Cognitive tools • Situated cognition

Introduction

> Learning methods that are embedded in authentic situations are not merely useful; they are essential. (Brown, Collins, & Duguid, 1989, p. 37)

Everyday life abounds with challenges, problems, risks and opportunities. In our personal and professional lives, we meet these challenges using the context and resources available to us—and in the process we learn. In everyday life, few successful problem-solving strategies ignore the context and limitations afforded by the real situation. However, in formal education settings, pedagogical strategies often ignore the real-world relevance of a learning context.

Authentic learning is a pedagogical approach that situates learning tasks in the context of real-world situations, and in

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so doing, provides opportunities for learning by allowing students to experience the same problem-solving challenges in the curriculum as they do in their daily endeavors. Over the last two decades, authentic learning has evolved from a situated learning model, and has captured the imaginations of innovative educators who see it as a means to facilitate the acquisition of robust knowledge that transfers more readily to real-world practice (Herrington & Herrington, 2007; Lombardi, 2007a, 2007b). The authentic learning environment model developed by Herrington and Oliver (2000) offers an alternative instructional model to a systems model such as Gagné's Nine Events of Instruction model (Gagné, Briggs, & Wager, 1992), by providing principles for the design and implementation of complex and realistic learning tasks. In 2010, Herrington, Reeves, and Oliver (2010) extended this model to e-learning environments.

Brief Account of Theoretical and Historical Foundations of Authentic Learning

Since Whitehead's *Aims of Education* (Whitehead, 1932), and Dewey's *Experience and Education* (Dewey, 1938) interest in realistic learning contexts has been strong. Such perspectives have provided a philosophical foundation for the general approach of "learning by doing". More recently, Fred M. Newmann and his colleagues at the University of Wisconsin in the USA (Newmann & Associates, 1996; Newmann, Marks, & Gamoran, 1996) have focussed on *authentic pedagogy* in the classroom and the importance of "real-world" activities and disciplined enquiry. Authentic learning as defined in this chapter has more specific origins in the theory of *situated cognition* or *situated learning* (Brown et al., 1989; Choi & Hannafin, 1995; Collins, Brown, & Newman, 1989), and *legitimate peripheral participation* (Lave & Wenger, 1991), together with other pedagogical models developed over the last two decades, such as *anchored instruction* (Cognition and Technology Group at Vanderbilt, 1990).

Theoretical Foundations of Authentic Learning in Situated Cognition and Legitimate Peripheral Participation

In the 1970s and 1980s, teachers and researchers in education began to investigate the notion of using apprenticeships for school-based instruction—the traditional model of master and apprentice that had been used for centuries—and to try to distinguish characteristics that were critical to its success in enabling learning. Their aim was to explore "cognitive apprenticeships", and to begin the process of developing a theoretical perspective based on the apprenticeship model, that cognitive science had, to date, not been able to explain. Brown et al. (1989) were the first to use the ideas to produce a proposal for a model of instruction that had implications for all sectors of 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. In its most simple form, situated learning was defined by Collins (1991) as: "the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life" (p. 122). During the 1990s, the further exploration of cognitive apprenticeships and situated learning (e.g., McLellan, 1996) coincided with rapid development in the educational uptake of multimedia, simulations, and eventually Web-based learning environments (Alessi & Trollip, 2001; Wilson, 1996).

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 (e.g., Carraher, Carraher, & Schliemann, 1985; Saxe, 1988; Scribner, 1984) and despite calls for a model of instruction to isolate those "critical elements" that made apprenticeships successful, no comprehensive model of the approach for classroom practice had emerged.

Other Related Work, Such as Anchored Instruction

Also in the late 1980s and early 1990s, researchers and developers at the Cognition and Technology Group at Vanderbilt University in the USA were exploring an approach to technology-based learning that they called *anchored instruction*, which develops specific content knowledge in the context of problem solving, and which places considerable emphasis on "creating an anchor or focus that generates interest and enables students to identify and define problems and to pay attention to their own perception and comprehension of these problems" (Bransford, Sherwood, et al., 1990, p. 123). Bransford, Vye, Kinzer, and Risko (1990) argued that this approach promotes transfer of knowledge by making it more accessible, and that students are able to distinguish between "knowing X" and "thinking to use X" (p. 391).

In designing their programs, the Cognition and Technology Group at Vanderbilt (1993) proposed that students begin with an information-rich resource which provides an effective starting point, not a final end point, for instruction. They also saw the process as a way to "equalize the preparation of the students" (p. 57), which was reminiscent of the concept of "bridging apprenticeships" proposed by Resnick (1987).

The well-known *Adventures of Jasper Woodbury* problem-solving series is a prime example of the kind of learning environment developed by the Cognition and Technology

Group at Vanderbilt (1997). Another is the Young Sherlock program (Bransford, Vye, et al., 1990) in which students use the feature-length film *Young Sherlock Holmes* as an anchor for investigating story writing, and the history of the Victorian era. Students investigate historical aspects such as contemporary inventions (Should Watson be riding in a carriage? Wasn't the car invented then?); scientific concepts such as the climate, weather and geography (Does it snow in December?); and literary elements such as grammar, plot and character development. Students use the video for a full semester to examine the film in detail often from multiple perspectives.

Numerous small and large-scale design studies were conducted to guide the development of the Jasper Woodbury Problem-Solving series that is the primary exemplar of anchored instruction. Extensive observational studies allowed the Vanderbilt team to derive design and implementation guidelines such as "…there are multiple ways to use Jasper, and that teachers need the freedom to adapt it to their own teaching styles" (CTGV, 1997, p. 62). Many small scale quasi-experimental "intervention studies" allowed the researchers to examine issues such as near and distant transfer from the problem sets in the Adventures of Jasper Woodbury Problem-Solving Series to other types of complex problems.

Eventually, the research team at Vanderbilt moved to large scale field trials of the Jasper materials. For example, a 1-year-long research project was conducted with the Jasper program in 16 schools in nine US states (Pellegrino et al., 1991). Comparing students in Jasper classes with those in traditional mathematics classes using quasi-experimental designs, the researchers investigated effects in terms of mathematical problem-solving and reasoning skills, specific mathematical knowledge and skills, standardized achievement test scores, and attitudes toward mathematics. The study used both quantitative and qualitative data collection methods. The results were generally favorable for the Jasper students. With respect to problem-solving, the Jasper students were more skilled in identifying problems and breaking them down into smaller components that would lead to solutions. Regarding specific knowledge and skills, the Jasper students outperformed the control students in areas such as decimals, fractions, and calculations of area, perimeter, and volume. The Jasper students also were better in solving three different types of word problems. Results were less positive in the attitude and achievement areas. Although the Jasper students had more positive attitudes toward mathematics at the end of the school year, they expressed no greater desire to study math than the control students. On standardized achievement tests, Jasper students tended to perform better than the others, but these particular results were not statistically significant.

The Cognition and Technology Group at Vanderbilt (1990) viewed anchored instruction as a practical application of situated cognition in formal educational settings. They acknowledged the logistical difficulties of placing learners into context-rich authentic environments within a formal schooling system, but argued that anchored instruction is a feasible way to provide context that is more manageable than organizing community-based projects (1993). Anchored instruction continues to provide a useful framework for the examination of scientific phenomena, particularly in the context of visual media within the realm of experience of the target students (Pellegrino & Brophy, 2008), and in relation to the wealth of video materials freely available on the internet, for example, on *YouTube* (Bonk, 2009, October 5).

A Framework of Authentic Learning

In response to the call by Brown and Duguid (1993) for a model of classroom practice to operationalize these theories, Herrington (1997) conducted a comprehensive review and analysis of the literature in these areas and proposed a model of critical characteristics of situated learning. Subsequently, a framework was developed in reference to the design of multimedia learning environments (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). A framework of authentic learning and authentic tasks was developed from this analysis, and was referenced to e-learning and technology-based learning in general (Herrington et al., 2010). This framework is described in more detail below.

Elements of Authentic Learning and Authentic Tasks

The characteristics that emerged to form a model of authentic learning from the research are listed below, together with a short but not exhaustive list of references of researchers who advocated each element. The framework proposes that an authentic technology-based learning environment employs the following characteristics:

An authentic context that reflects the way the knowledge will be used in real life: In designing technology-based 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 et al., 1989; Honebein, Duffy, & Fishman, 1993; Reeves & Reeves, 1997).

Authentic tasks: The learning environment needs to provide ill-defined tasks that 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 activities (Bransford, Vye, et al., 1990; Brown et al., 1989; Lebow & Wager, 1994; Reeves & Reeves, 1997). The goal for completing such tasks comprises the creation of unique products to demonstrate achievement, even if there is an accepted and established procedure for solving the problem. Further research on characteristics of authentic learning tasks and activities (Herrington, Reeves, Oliver, & Woo, 2004) proposed further refinement of the nature of authentic tasks. Authentic tasks: are ill-defined, requiring students to define the tasks and subtasks needed to complete the activity; are investigated by students over a sustained period of time; can be integrated and applied across different subject areas and lead beyond domain-specific outcomes; are seamlessly integrated with assessment; create accomplished products valuable in their own right; and allow competing solutions and diversity of outcome.

Access to expert performances and the modelling of processes: To faithfully replicate the forms of support available to problem-solving in real-life contexts, authentic learning environments need 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 (Brown et al., 1989; Collins et al., 1989; Lave & Wenger, 1991). The facility of the Internet to create global communities of learners, who can interact readily via social networking, enables countless opportunities for the sharing of narratives and stories from experts and practitioners.

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 the task from different perspectives, considering various points of view, and to "criss-cross" the learning environment repeatedly (e.g., Collins et al., 1989; Honebein et al., 1993; Spiro, Feltovich, Jacobson, & Coulson, 1991).

Collaborative construction of knowledge: Few complex problems in real-life are solved by people working independently. The opportunity to collaborate is an important element of an authentic problem-solving process. 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 and is especially significant for students studying at a distance (e.g., Brown et al., 1989; Collins et al., 1989; Reeves & Reeves, 1997).

Reflection: Reflection is a critical element in the solution of authentic tasks. In order to provide opportunities for students to reflect on their learning, the learning environment needs to provide an authentic context and task, as described earlier, to enable meaningful reflection. It also needs to provide nonlinear organization to enable students to readily return to any element of the learning environment 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; Schon, 1987).

Articulation: When students are required to articulate their ideas, the process strengthens their understanding and reasoning, and helps to identify any weaknesses or gaps in their thinking. 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 defense of the position (e.g., Collins et al., 1989; Edelson, Pea, & Gomez, 1996; Lave & Wenger, 1991).

Coaching and scaffolding: Students should not be left entirely to their own devices in authentic learning. Learning is best facilitated by the inclusion of deliberate coaching and scaffolding supports provided principally by the teacher but also by other means (e.g., a client for whom an authentic task is being undertaken). Authentic learning environments need to provide collaborative learning where, for example, more able partners can assist with scaffolding and coaching, and where teachers provide appropriate learning support (e.g., Collins et al., 1989; Greenfield, 1984).

Authentic assessment: The assessment in authentic learning settings needs to be tied directly to the successful solution of the task. As such, the learning environment needs to provide: the opportunity for students to demonstrate their effective performance 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., Linn, Baker, & Dunbar, 1991; Reeves & Okey, 1996; Wiggins, 1993).

The elements of this framework are best considered as design guidelines rather than mandatory characteristics. In this sense, any learning environment or task can only be considered more or less authentic, so that elements are best viewed across a continuum (such as the method suggested by Reeves & Reeves, 1997 for gauging effective dimensions of interactive learning on the Web). Such a multidimensional approach would allow the overall trend of the

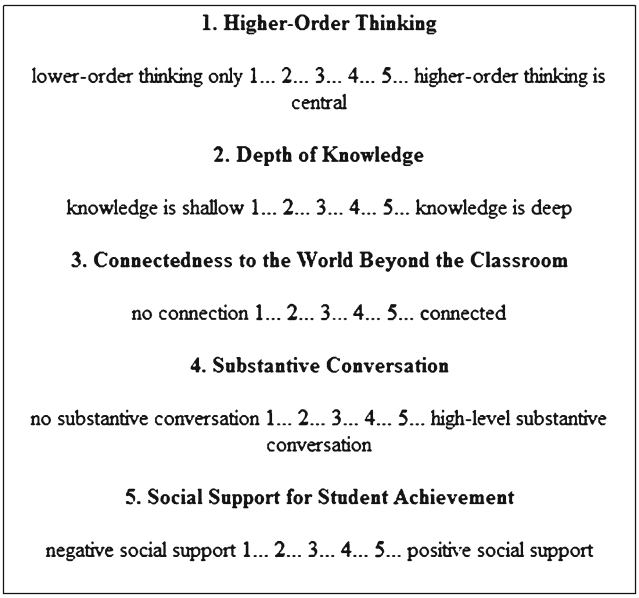

Fig. 32.1 Five standards of authentic instruction (Newmann & Wehlage, 1993)

environment's authenticity to be gauged. Newmann and Wehlage (1993) used such a multidimensional approach to describe the five standards for authentic instruction illustrated in Fig. 32.1 (cf. Marks, 2000 who used this model to estimate student engagement; and Gulikers, Bastiaens, & Kirschner, 2004 who used it to explain the notion of authenticity as a continuum).

Other models of authentic learning have been put forth, although they have not been guided to an extensive degree by previous research. For example, Renzulli, Gentry, and Reis (2004) described four essential criteria for implementing authentic learning with middle school students. First, students should seek to solve a real-life problem to which they would attach an emotional commitment as well as a cognitive interest. Second, the problem should be sufficiently open-ended so that there are a variety of strategies for its solution. Third, the problem-solving strategies and the "solutions" developed should encourage students and other participants to change their actions, beliefs, or attitudes. Finally, the problem should have a real audience beyond the classroom. An example of authentic learning activity advocated by Renzulli et al. (2004) could involve students helping seniors at a local nursing home research their genealogical records. Callison and Lamb (2004) identified seven signs of authentic learning: (1) student-centered, (2) access to multiple resources beyond the school, (3) students working as scientific apprentices, (4) students collecting original data, (5) commitment to learning beyond the assignment, (6) authentic assessment of process, product and performance, and (7) team collaboration. Finally, Rule (2006) reviewed the literature on authentic learning and synthesized a model with the following four themes:

1. The activity involves real-world problems that mimic the work of professionals in the discipline with presentation of findings to audiences beyond the classroom.
2. Open-ended inquiry, thinking skills, and metacognition are addressed.
3. Students engage in discourse and social learning in a community of learners.
4. Students are empowered through choice to direct their own learning in relevant project work (p. 2).

It is possible to see similarities and consistencies among the different models describing the elements of authentic learning, with variations typically only in emphasis or how the ideas are expressed. The model we have researched provides further explanation and discrete elements to guide teachers in the design of authentic learning environments.

Authentic Learning in Practice

Well-designed authentic tasks can be used at multiple levels of education. Beginning in 1966, the Firefox project involved high school students in publishing a magazine about the folklore of the Appalachian Mountains (Wigginton, 1985). Today, authentic tasks are being used to guide learning in entire courses of study in colleges and universities around the globe (Herrington et al., 2010). In these courses, authentic tasks are not provided simply to enable students to practice skills that been taught in more didactic, content-focused ways. Instead, these tasks are integral to the way students engage with the course (Woo, Herrington, Agostinho, & Reeves, 2007). For example, learning the practices and conventions of critiquing was integral in a course on North American literature (Fitzsimmons, 2006), where students' first task was to write a guide for reviewing before they wrote literature critiques and reviewed each other's work. The students assumed the role of members of an editorial board, and they jointly selected the best papers for publication in an online journal.

In some cases, the affordances of a Web-based delivery primarily serve to strengthen the impact of an authentic task on student learning, if other elements of authentic learning designs are also in place, such as strong support provided by the teacher and collaborators. For example, Oh (2011) conducted a 2-year educational design research study of a graduate level evaluation course that was offered online to students in multiple universities. The primary pedagogical design was built around the authentic tasks of planning, conducting, and reporting an evaluation of an e-learning program for a real client. The course Web site provided multiple forms of scaffolding for the small groups of students responsible for completing these complex authentic tasks.

Creating an event that is able to instantiate learning in a particular area, and involve community beyond the student group, is a powerful way to incorporate authentic learning principles. For example, hospitality management students created and hosted the Appalachian Growers' fair (Deale, Elders, & Jacques, 2010) where students not only created a successful community event, but were also able to showcase local produce and model sustainable tourism.

Concerns About Authentic Learning Environments

As with any innovative pedagogical model, there are many arguments and discussions about authentic learning designs. For example, Merrienboer and Brand-Gruwel (2005) wrote: "authentic learning tasks must be carefully sequenced from simple to complex, that these tasks need to be performed in environments that gradually increase fidelity (i.e., similarity with reality) if learners acquire more expertise, and that learners' task performance is scaffolded by well-chosen means of problem solving support" (p. 414). However, there is much research to support the position that a less structured approach is more appropriate in dealing with complex problems. Table 32.1 lists some of the arguments and beliefs that have been reported in the literature (or anecdotally) to argue against the use of authentic learning designs in education, together with research that responds to these claims.

Although these objections will inevitably continue to be viewed by some educators as impediments to the effective use of authentic learning designs in education, they are primarily concerns about both the intent and the processes involved in authentic learning. Authentic learning is different from service learning or on-the-job training that is commonly conducted in real work settings. Authentic learning activities can be readily created and implemented in online as well as in classroom or blended settings. As educators increasingly embrace e-learning, the opportunities for authentic learning environments to be much more widely adopted increase considerably.

Issues in Authentic Learning Environments

The model of authentic learning has its foundations in the idea of authenticity, a construct that has many meanings and perspectives, and is open to interpretation. In this section, we wish to discuss four areas of interest and debate that have emerged in the literature.

Do the Context and Problems Need to Be Real?

Many educators believe that for a learning task or environment to be authentic, it must be real. Indeed, teachers have traditionally sought to provide real experiences through field trips, excursions, and internships that go beyond the walls of the classroom or lecture hall. Some researchers have urged teachers to ensure that when creating authentic learning environments, problems must be real. For example, Savery and Duffy (1996) stated three reasons why learning problems must address real issues:

> First, because the students are open to explore all dimensions of the problem there is real difficulty of creating a rich problem with a consistent set of information. Second, real problems tend to engage learners more—there is a larger context of familiarity

Table 32.1 Reported concerns about authentic learning designs and relevant research

Concerns	Relevant research
Students do not get their money's worth because there is no teaching	Oh (2011) found that the design and implementation of an effective authentic learning environment depend heavily on the engagement and feedback provided by the instructor
Students are left to their own devices without support to abstract meaning from the environment	In the context of hospitality education, Deale et al. (2010) found that knowledgeable, highly committed community partners and instructors could assist undergraduate students in planning, and conducting a successful festival
Finding real clients for students to work with is a difficult and time-consuming task for teachers	Clinton and Rieber (2010) describe an online system that allows clients to apply to have students enrolled in instructional design studio courses to complete real-world tasks for them
Authentic e-learning environments are expensive and time consuming to develop because they require realistic simulations with multiple possible outcomes	Meyers and Nulty (2009) describe how they provided environmental science students with authentic simulations derived from the actual data that the instructors were analyzing for their own research
Authentic tasks are suitable for vocational courses but not for higher education or personal growth areas like literature and the arts	Fitzsimmons (2006) gave students enrolled in his North American Fiction and Film course the authentic roles of Editorial Board Members of an online scholarly journal
For some courses there is no real-world application for the knowledge, so there can be no authentic task	For virtually any subject, students can learn through the authentic tasks of teaching others or designing instructional materials related to the topic (Herrington et al., 2010)
Students cannot perform complex and authentic tasks until they are taught the subskills required to complete it	Diamond, Middleton, and Mather (2011) describe how college level students worked as professional game developers to produce prototype learning games for clients from diverse disciplines and in the process learned the fundamentals of those disciplines

> with the problem. Finally, students want to know the outcome of the problem—what is being done about the flood, did AT&T buy NCR, what was the problem with the patient? These outcomes are not possible with artificial problems. (p. 144)

While Savery and Duffy (1996) described nonreal contexts and issues as "artificial problems", others have focussed more on the cognitive aspects of problem-solving activities to create a "cognitively real" learning environment. For example, 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. Luigi, Tortell, Morie, and Dozois (2006) also use the term "cognitive realism" to explain the use of sensory inputs in a simulation to reduce the necessity for photorealistic graphics.

Some researchers have found that spatial and physical representation of some elements in a learning environment can be beneficial, particularly for novice learners. For example, Chang, Lee, Wang, and Chen (2010) found that when robots were used instead of entirely virtual characters, younger students' perception of the authenticity of the task was enhanced, and they were more motivated to engage in the learning tasks.

However, highly realistic simulations of the kind used in training in the military, air pilot training, and in medical education are not necessarily efficient, nor indeed effective, in most educational settings. The physical verisimilitude to real situations is of less importance in learning than the cognitive realism, provided by immersing students in engaging and complex tasks (Herrington, Reeves, & Oliver, 2007).

Whose Authenticity? The Suspension of Disbelief

Authentic learning environments, of the kind we have described here, often require the willingness of students to "buy-in" to a scenario or problem explanation. For example, the task description might ask students to imagine that they are performing specialist roles such as: a member of a space agency team planning a mission to Mars (Reeves, Laffey, & Marlino, 1997), a professional lawyer working in a firm in a small town (Barton, McKellar, & Maharg, 2007), an accomplished researcher employed to investigate the closure of a school in a rural community (Angus & Gray, 2002); an expert consultant employed to investigate imbalance in an ecosystem (Brickell & Herrington, 2006); or a practising doctor conducting cervical screening tests (Keppell et al., 2003). Students can initially reject this predetermined role, yet, if they are to fully engage with the learning tasks, they need to commit to the environment and its parameters. This process was described by the early nineteenth century poet Samuel Taylor Coleridge as the "willing suspension of disbelief". The term has been applied to instances of human response to the arts, but it can be witnessed in learning contexts as well (Herrington et al., 2010).

While some argue that perception of authenticity is a personal response that is largely "in the eye of the beholder" (Gulikers, Bastiaens, Kirschner, & Kester, 2008, p. 401), there has been some research to indicate that a 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, and that persuasion is "at the core of authentication" (Petraglia, 2009, p. 179). Further, Kantor et al., (2000) who, when referring to the kinds of goal-based scenarios they design, 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" (p. 38). Our research into the patterns of students' engagement as they suspend disbelief to engage in scenario-based learning environments (Herrington, Oliver, & Reeves, 2003) suggests that the use of authentic tasks encourages and supports immersion in self-directed and independent learning—an important success factor in online and technology-based learning.

While technology is increasingly providing opportunities for learning environments to create real products and real publications, there will always be a role for scenarios that situate a problem within a realistic rather than real context, and that enable students to explore problems with a range of resources available. Such learning environments provide opportunities for students to think and act like an expert, and it is in the design of these environments—we would argue—that the pedagogy resides.

Authentic Learning or Direct Instruction?

For decades, there has been a debate among educational researchers and learning theorists about the effectiveness of constructivist pedagogical approaches (Duffy & Jonassen, 1992). An especially provocative volley in the scholarly debate about constructivist learning theory and pedagogy was issued by Kirschner, Sweller, and Clark, long time proponents of direct instruction, when they published a paper titled *Why Minimal Guidance During Instruction Does Not Work*: *An Analysis of the Failure of Constructivist*, *Discovery*, *Problem-Based*, *Experiential*, *and Inquiry-Based Teaching* in the Spring 2006 issue of the journal *Educational Psychologist*. Their intentionally provocative article stimulated

several rebuttal papers, and an edited volume: Tobias and Duffy's (2009) *Constructivist Instruction*: *Success or Failure*.

Kirschner, Sweller, and Clark (2006) defined learning as "a change in long-term memory" (p. 75) and maintained that the ineffectiveness of instructional models such as constructivism, discovery learning, problem-based learning, experiential learning, and inquiry-based learning stems from the failure to account for "human cognitive architecture." They declare that "Any instructional procedure that ignores the structures that constitute human cognitive architecture is not likely to be effective" (p. 76). It is not possible in this chapter to argue directly with the positions that Kirschner et al. (2006) have taken regarding the status of long-term memory as the bedrock of human cognitive architecture and the purportedly unassailable effectiveness of direct instruction. We leave such point-by-point debates to others such as Jonassen (2007) who has long argued convincingly that learning is more than a change in long-term memory.

However, it is unlikely to surprise anyone that the instructional model Kirschner et al. (2006) recommend is direct instructional guidance, defined as "providing information that fully explains the concepts and procedures that students are required to learn as well as learning strategy support that is compatible with human cognitive architecture" (p. 75).

Direct instruction is the antithesis of most instructional models that employ minimal guidance, but direct instructional guidance is regarded by Kirschner et al. (2006) as the only means to guarantee the transfer of knowledge and skills from experts to novices. The authors express disdain for instructional models that "challenge students to solve 'authentic' problems or acquire complex knowledge in information-rich settings based on the assumption that having learners construct their own solutions leads to the most effective learning experience" (p. 76). Kirschner et al. further conclude that any qualitative studies that purport to provide evidence of the impact of authentic or situated learning models are merely anecdotal in nature. They maintain that, by contrast, "Controlled experiments almost uniformly indicate that when dealing with novel information, learners should be explicitly shown what to do and how to do it" (p. 79). One problem with this contention is that few of the studies cited by Kirschner et al. deal with learning environments at the macro level of an entire semester-length course. Instead, the treatments used in their studies are more episodic and artificial, lasting from a few minutes to an hour. These studies do not generally examine long-term engagement in learning in which learners have a personal stake in achieving the outcomes, nor do they deal adequately with the challenge of learner motivation.

Kirschner et al. (2006) critiqued instructional models based on constructivism and social constructivism as too minimal in guidance and advised direct instruction. In fact, direct instruction may work best for novices in a field of study marked by fixed content and specific behavioral objectives. For instance, consider a novice Emergency Medical Technician (EMT) being trained as a Certified First Responder (CFR). It would certainly be inappropriate to recommend learning emergency medical protocols via discovery learning or any other minimally guided approach.

At the same time, direct instruction may be ineffective and inefficient when helping workers who have already developed some level of expertise and on-the-job experience. Consider an experienced first responder (police, EMT, firefighter) learning to deal with complex and potentially devastating weapons of mass destruction. Direct instruction would not be appropriate for such an audience. A social constructivist learning environment centered around authentic tasks is likely to be much more effective. In the light of our theoretical and practical perspectives concerning authentic tasks and evidence from a series of qualitative studies, we argue that there is still ample room for alternative conceptions of learning and creative constructivist pedagogical designs.

Affordances of Web 2.0 Developments as Both Tools and Delivery Platforms?

Over a decade ago, Gordon (1998) described three types of authentic learning challenge, with each level increasing in "authenticity, complexity, uncertainty, and student self-direction" comprising the following: academic challenges (the transfer of existing curricular material into a problem situation); scenario challenges (where students are given real-life roles); and real-life problems (where students provide real solutions for real clients). While we would argue that each of these types of learning environments is not part of a hierarchy, and each can be equally authentic (as we have defined it), there is a fourth authentic challenge that Gordon could scarcely have imagined: the creation of authentic products in a participatory Web environment.

Such authentic learning tasks engage students in the creation of genuine products that add to understanding and the documentation of a field. In a history context, the *Not just a name on the wall* Web site (Morrissey, 2006) encourages students not only to learn about history but to *be* historians, actively researching the life of a real soldier in World War 1 (selected from the names listed on war memorials). Students write historical accounts of soldiers and their battalions during the war. Similarly, in a large-scale project entitled the *Brisbane Media Map* (Collis, Foth, & Schroeter, 2009) students collectively map media and communication industry establishments in a large city, creating a database of over 600 organizations. Students collect information on each organization, effectively mapping not only physical location and services, but trends and issues across the sector. The prod-

ucts of such authentic learning tasks are not simply academic assignments that do not see the light of day beyond the teacher's desk, but are products of genuine worth of much interest to professionals and the general public.

Future Potential and Challenges

The future of education is interdisciplinary, and authentic learning will be an important component of that future. Knotts, Henderson, Davidson, and Swain (2009) describe their collaborative effort to involve their students in authentic interdisciplinary learning in subjects as diverse as art, drama, geography, and teacher education. Their authentic interdisciplinary learning designs were inspired by Bain's (2004) recommendations for new higher education teachers in his useful guidebook titled *What the Best College Teachers Do*. Although this type of learning collaboration among teachers from multiple disciplines can be enormously innovative and potentially quite effective, it is not without costs, especially for new tenure-track faculty members who might be admonished to spend more time on their discipline-focused research. One of the major issues that must be confronted in higher education by those promoting the renewal of high-quality teaching and learning (cf. Arum & Roksa, 2011; Palmer, Zajonc, & Scribner, 2010) is the balance between teaching and research.

There are many practical and theoretical questions that remain unanswered concerning the future of authentic learning designs in education. In particular issues such as the difficulty of designing convincing tasks to carry complex and sustained learning, and the role of participatory social technologies in facilitating the creation and publication of genuine products are significant major research areas. Further research in the practical use of authentic learning in universities (institutions that in turn have their own political and administrative restrictions) is also needed, such as the impact of restrictive administrative and assessment policies in higher education, and the means to reduce the high workload associated with e-learning student support especially in times of reduced funding and resources. The role of motivation in student accomplishment in authentic learning is another area of much interest that has not been fully explained.

The current research into authentic learning has provided teachers with a strong understanding of what elements are needed to create an effective and successful authentic learning environment. However, many teachers still find difficulty in designing an authentic learning environment. Further research into the description, sharing and reuse of learning designs will help to facilitate the application of authentic learning into mainstream teaching (Oliver, Herrington, Herrington, & Reeves, 2008).

These areas of research and other questions related to the design and implementation of authentic learning environments would be best addressed, we believe, through educational design research (McKenney & Reeves, 2013; van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). Educational design research differs from traditional experimental approaches that might be used to compare authentic learning designs with traditional direct instruction designs. At best, experimental studies can inform designers and researchers about which instructional mode (e.g., classroom instruction vs. authentic learning environment) leads to greater outcomes, although the most likely outcome is "no significant differences." Educational design researchers, on the other hand, seek to define differential outcomes explained by variance in the design features of different modes. Educational design researchers investigate design features, not just alternative instructional delivery systems, allowing them to identify which design feature is more effective than another with respect to a specific outcome, and why. Although educational design research is arguably still in its infancy as a research approach, it is being more widely adopted (Kelly, Lesh, & Baek, 2008), and it should be the method of choice for those who would advance the state-of-the-art of authentic learning environments.

Conclusion

Authentic learning as a pedagogical approach is especially appealing to educational technologists. It situates knowledge in realistic contexts, thereby contextualizing knowledge, and making it less likely to remain "inert" when needed to solve problems (Wilson & Schwier, 2009). The realistic tasks in authentic learning cognitively challenge learners to solve problems and to think in the same ways as professionals working in real-world contexts (Clinton & Rieber, 2010; Oh, 2011). Technology-based cognitive tools can be used to support both the processes and the products of learning in authentic environments (Kim & Reeves, 2007). In addition, the complex tasks implicit in the approach require the creation of real products and innovations, and are more worthy of the investment of time and effort in higher education than de-contextualized exercises and tasks (Herrington & Herrington, 2006).

Authentic learning may well be the defining pedagogical orientation of education in the twenty-first century, but this will not be accomplished without more and better collaborative educational design research by researchers and practitioners in the field of educational technology and communications.

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