Information Technology and Constructivism in Higher Education: Progressive Learning Frameworks

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Chapter V

Applying Constructivism to Online Learning: A New Instructional Design Map

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ABSTRACT

Based on constructivist principles, this chapter provides a new instructional design map for online learning environments. This instructional design map includes considerations of five elements, namely, learner, knowledge, learning environment, assessment, and technology. Considerations of these elements are based on analyses of the past and existing instructional design models, online learning models, and constructive principles. Applications of the instructional design map are also discussed in the chapter.

INTRODUCTION

Dijkstra (2005) defines instructional-design theory as a set of statements that interpret why an instructional program leads to the acquisition of knowledge, skills, and attitudes. Although practitioners and researchers readily agree with this definition, there is much disagreement over which instructional theory or model can best accomplish the objective. This is not surprising as there has been considerable debate in the teaching and learning communities, over many decades about how students think and best learn.

In the past 50 years or so, three major influences have largely accounted for the many changes and debates surrounding instructional design theories
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and models. Dijkstra (2005) cites “the rediscovery of epistemology, the renewed interest in nature and knowledge acquisition, and the invention of the computer and the development of information and communication technology” (p. 187) as the dominant influences in the field of cognition and learning since the 1950s.

In this chapter, we start by briefly discussing the three major influences in the field of instructional design to underscore the importance of understanding the lineage of contemporary design theories in our quest to prepare a new generation of learners. We will then provide an overview of the ontological, epistemological, and methodological principles that guide the design of our proposed instructional design map theory for online teaching and learning. Although instructional design theories and online learning models target technology-enhanced teaching and learning environments, the developments of the two have evolved separately from one another. Therefore, we aim to bring the two together by examining each through the constructivist lens in the new media and technology environments. In the final section, we will explain how the new design map is expected to result in effective learning and why this is an improvement over existing theories. Discussions on how to apply the theory in practical settings and assessment strategies will also be outlined.

THREE MAJOR INFLUENCES IN THE INSTRUCTIONAL DESIGN FIELD

Research on Cognition and Learning which Started in the 1950s

“There are two main theoretical approaches in the field of instructional design: the systematic approach and the constructivist approach” (Faradanesh, 2006, p.3). According to Tennyson and Schott (1997), instructional design was driven by behaviorism in its early stages. Behaviorism places an emphasis on producing observable and measurable outcomes in students (Ertmer & Newby, 1993). Learning occurs when learners demonstrate the desired behavior in response to a stimulus (Smith & Ragan, 1999). Much of the research and work in 1950s and even 1960s focused on how to design systematic instructions to help learners achieve learning objectives through reinforcement, reward, and punishment.

Cognitivism gradually succeeded behaviorism in the 1970s and 1980s as researchers studied the influence of mental processes on learning. Cognitivists believe that learners participate actively in the process of knowledge acquisition and construction. Tennyson and Schott (1997) noted that the definition of instructional design at this point “shifted to considerations of learning theory and the development of models linking these theories to the design of instruction” (p.7). Some of the models and theories introduced during this period are still influential today.

In the last decade, Otting and Zwaal (2006) observed that the “traditional views of education and the focus on absolute truth have been gradually replaced by a diversity of more dynamic, pluralist, and relativists conceptions” (p. 347). Constructivists, identifying themselves with Piaget and Vygotsky and representing an array of perspectives, view learning as a process of constructing meaning from experience. Unlike the traditional instructional systems approaches of designing instruction, constructivists hold that “all knowledge is socially constructed” (Molenda, 1997, p.46). According to Gold (2001, p.37), “knowledge is not separate from but rather embedded within experiences and interpreted by the learner.” Karagiorgi and Symeou (2005, p.17) further stated that “constructivism makes a different set of assumptions about learning and suggests new instructional principles.” Learning is seen to be an internal construction of reality by the individual. The cognitive process of meaning making is emphasized both as an individual mental activity and a socially interactive interchange.
Rediscovery of Epistemology: The Renewed Interest in Nature and Knowledge Acquisition

With the proliferation of multiple competing theories and viewpoints, the landscape of instructional design is populated by various behaviorists, cognitivists, and constructivists. Even though the merits of each competing theory, models, and approaches have been avidly discussed in multiple learning communities, little attention has been paid to the underlying philosophical assumptions until the recent decade (Molenda, 1997; Dinter, 1998; Spector, 2000; Schuh & Barab, 2008). Some instructional designers dismiss the nature of such discussions as purely an academic exercise. However, it is our belief that instructional designers should examine their own epistemological and ontological beliefs about the process of learning in order to better understand their frame of reference in instructional design for the particular subject matter being investigated, while utilizing the available recursivity that can be brought to bear for each individual learning task.

Why is this important? Many learning theories and models are often vague in terms of philosophical roots (Schuh & Barab, 2008). The lack of transparency in our philosophy of learning creates inconsistency when we translate our theoretical beliefs into practices (Dinter, 1998; Barab & Duffy, 2000; Schuh and Barab, 2008). Hannifin et al. (1997) remind us why instructional design should be based on a defensible theoretical framework. The authors believe that frameworks help us identify assumptions that are consistent with our beliefs and methods of design. We run the risk of presenting conflicting and incoherent views when we attempt to merge theories with little regard for the philosophical underpinnings supporting such approaches.

Audi (2002) notes that epistemology is the study of knowledge and justification. For Schuh and Barab (2008), epistemology deals with the question of “how come we know about what exists” (p. 71). Our theories about what, if anything, can we know, or which beliefs are justified and which are not, play a significant role in how we view teaching and learning. Guarino (1998) defines ontology as “particular system of categories accounting for a certain vision of the world” (p.2). Epistemology and ontology provide important linkages “between how learning occurs and how the learning process is facilitated” (Schuh & Barab, 2008, p.76).

Over half a century ago, instructional designers viewed learning as a “process of knowledge transmission” (Jonassen and Land, 2000, p.iii). As such, “educators believe that improving learning is a matter of more effectively communicating ideas to learners by improving the clarity of the message” (Jonassen and Land, 2000, p.iii). The emphasis of knowledge transmission meant that “instructional content can be preplanned, organized, and programmed with specific outcomes defined” (Schuh & Barab, 2008, p.77). Jonassen (2005) noted that instructional design models based on an objectivist epistemology tend to be limited in their ability to support a broad range of human activities.

In contrast, constructivism moves away from prescriptive instructions driven by collective learning outcomes. Boghossian (2006) explains that “for the constructivist, each person’s subjective experience is just as valid as anyone else’s, and no one has an epistemically privileged viewpoint” (p.714). “Constructivists choose to consider knowledge as an internally coherent internally coherent system that we actively build up from within for our own purposes, coping with the world of our individual experience and participating in building a collective, coherent knowledge base” (Staver, 1998, pp.505-506). Constructivists subscribe to the view that “our knowledge and beliefs are influenced by that community and their beliefs and values” (Jonassen and Land, 2000, p.vi).

Hew (2004) notes that the “constructivist paradigm is most aligned with the interpretive ontological perspective” (p.4). It was founded on
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the principle that our individual experience is subjective in nature and that the source of knowledge is constructed internally. Therefore the notion of truth differs from one individual to another. As such, knowledge construction happens differently for all learners. Wilson and Lowry (2000) point out that constructivist learning happens all the time online and offline. It is not reserved for a specific type of learning mode because “learners are constantly trying to make sense of their environments and the information presented to them” (p.81). It is clear that epistemology – the theory of knowledge – plays a key role in how we think of instructional design, and consequently, affects how we teach and learn.

Invention of the Computer and the Development of Information and Communication Technology

Seel (2005) noted that “several paradigm shifts of psychology as well as new societal and technological demands have challenged instructional design as both a discipline and a technology in the past two decades” (p.65). The field of instructional design is heavily influenced by the rapid development of new media and technology. Technology has changed people’s assumptions and expectations on where and how learning can take place (Du Mont, 2002). The rapid development of new media and technologies, particularly, web-based technologies, web 2.0 and web 3.0 technologies, has made it necessary for designers to rethink their approaches to teaching and learning.

In the early days of the Internet, we celebrated the very existence of course materials online as cutting edge. It did not take long for designers to realize that converting our traditional courses or supplementary resources into electronic versions was nothing more than the digitization of our face to face lessons. The first phase of the internet mirrored behaviorist roots in education. The digitization of our curricula represented the knowledge acquisition model as we put up information on the web and expect our students to absorb the knowledge.

As we gradually move towards what many experts would call Web 2.0 technologies, we see a paradigm shift in how knowledge is represented. Stated by Natriello (2005), more and more public are involved in knowledge creation and transmission; the division of knowledge creators and knowledge receivers is eroding quickly; and the role of transmitting knowledge is eroding rapidly because basic transmission tasks are handled by knowledge carrying objects. Similarly, learners expect and are expected to take an active role in knowledge creation. We see users taking on new roles that challenge the traditional view. Craig (2007) noted that we are witnessing the shift from the “anyway, anytime” online learning approach to “more radical perspectives of community-based appropriation, editing, and self-publication” (p.5). In many ways, modern technologies that are social by nature enrich the learning experience by encouraging students to build knowledge from multiple perspectives and sources whether it is through blogging, modeling, or simulation (Craig, 2007).

What is Web 2.0 and how does it change the way we design our online courses? Web 2.0 has become “a collective term for a mass movement in society: a movement toward new forms of user engagement supported by Web-based tools, resources, services and environment” (Collis and Moonen, 2008, p.94). According to the Wikipedia entry on Web 2.0, it “is a term describing changing trends in the use of World Wide Web technology and web design that aims to enhance creativity, information sharing, and collaboration among users” (http://en.wikipedia.org/wiki/Web_2.0, last accessed on August 30, 2008).

There are differing opinions on the definition of Web 2.0. On the one hand, skeptics led by Tim Berners-Lee see it as “a piece of a piece of jargon, nobody even knows what it means. If Web 2.0 for you is blogs and wikis, then that is people to people. But that was what the Web was supposed
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It is no coincidence that the rise of constructivism parallels new innovations in technology. Reigeluth (2005) noted that the shift from manufacturing to a knowledge-based economy requires higher levels of learning and thinking. He added that in the past, we have focused on lower level cognitive skills which are truly antiquated and inadequate to handle today’s complex economy. We need to generate new instructional design theories to support the construction and application of knowledge in real-life contexts.

The number of students taking online courses tells the same story from a different perspective. In a 2007 report titled “Online Nation: Five Years of Growth in Online Learning,” Ellen and Seaman (2007) found that 19.8% of students took at least one online course in Fall of 2006. This is an increase from 2003 where 9.7% of students were reported as being enrolled in at least one online course (Ellen and Seaman, 2007). The report also indicated that the online enrollment grew at a rate of 9.7 percent as opposed to the 1.5 percent growth rate for the overall student population in 2006.

It is time for us to examine our approach to instructional design in view of the rapid expansion of the knowledge-based economy along with the current and projected growth of online education. In 2008 the U.S Department of Labor - Bureau of Labor Statistics expected service-oriented employment to increase in the next decade as goods-producing employment continues to decrease. It anticipated that 15.6 million jobs would be added by 2016 and they would largely come from technology and service-oriented sectors.

We have witnessed the mismatch between technology affordances and pedagogical opportunities in higher education from the early promises of microcomputers in the 1970s to the Internet in the late 1990s (Collis and Moonen, 2008). Despite the prevalent use of Web 2.0 tools among post secondary students, “the potential for pedagogical innovation through the affordances of technology is not (much) reflected in institutional practice” (Collis and Moonen, 2008, p.96). Our institutions of higher learning have failed to harness the full pedagogical potential of the social web.

Where do we start? Merrill (1999) contends that instructional theory is concerned with two primary goals: what to teach and how to teach. The first part deals with the knowledge components needed for a specific type of instruction. Deciding this is a reasonably easy task. The second part, however, specifies the ways in which we present
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the selected knowledge components to engage our students and promote learning. Gold (2001) points out that “the difficulty of online instruction is not in the transfer of knowledge but in creation of the most apt learning environments for students to acquire this knowledge” (p.42).

In traditional instructional design, learners were taught to master skills and knowledge in a sequential manner. They progress from one chapter to another, completing assignments, and reading exercises in a structured environment where instructors rarely stray from a prescribed order of teaching. With web-based instruction, the rules of engagement can be different. Learners traverse through a series of non-sequential links to view information displayed on dynamic pages.

Among constructivists, there are diverse views and opinions on how to design effective instructions. As a result, we use labels like social constructivist, radical constructivist, and cognitive constructivist to describe our own beliefs about how knowledge is constructed. On one end of the spectrum, there are researchers who feel that knowledge construction is driven by socially-negotiated processes. Others argue that knowledge is driven by the cognitive process of the human brain.

Despite the philosophical differences, Applefield, Huber, and Moallem (2001) reckoned Bruning et. al (1995) and indicated that constructivists tend to agree on four characteristics as central to all learning: learners construct their own learning; new learning depends on students’ existing knowledge; social interaction plays a critical role; and authentic tasks are needed to ensure meaningful learning” (p. 8). Using the four characteristics as the framework for constructivism, we will discuss how to apply them to online learning.

In many ways, the Internet is an ideal vehicle for the constructivist designers. Swan (2005) notes that it “provides a knowledge-centered environment where there is less emphasis on memorization of unconnected facts and procedures” (p.7). It offers what constructivists prize most in any learning environment: authentic learning context coupled with real world tasks and unique individual experiences. In order to create such an environment, Jonassen (1994) suggests that learners are presented with real-world problems that allow multiple representations of content and perspectives. In addition, instructional goals should be socially-negotiated.

Experienced online instructors and researchers agree that the main indicator of success in online teaching and learning is a well-designed course that fosters interactivity through the creation of a virtual learning community (Bender, 2003; Collison et al., 2000; Palloff & Pratt, 2001; Preece, 2000; Salmon, 2001; Swan, 2003). That is, the active communication, interaction, online presence, moderated discussions, and formation of an online learning community are the key elements for high quality online education.

Rourke et. al (1999; 2002) and Garrison, Anderson, Archer (2001; 2003) developed a Community of Inquiry model that highlights the importance of the development of social presence in the process. Their model of critical thinking and practical inquiry describes learning as occurring through the interaction of three overlapping core components: cognitive presence, teaching presence, and social presence. Swan (2003) adapted Rourke et al.’s (1999; 2002) model and highlighted interactivity as a feature of online environments that matters or is made to matter in learning. Swan provided suggestions for organizing interactivity in five areas: the learners’ interactions with course content, the learners’ interactions with instructors, the interactions among the classmates, the learners’ interactions with computer and course interfaces, and the learners’ virtual interactions (Swan, 2003). Lin (2008) proposed an online learning model – independent inquiry, collaborative inquiry, and formative inquiry towards expert knowledge – that would help learners to achieve their full rights to education and learning with new media and technologies.
These online teaching and learning models are in alignment with the constructivist principles of teaching and learning, although they did not originate from the instructional design models.

THE MERGING OF CONSTRUCTIVIST PRINCIPLES, INSTRUCTIONAL DESIGN MODELS, AND ONLINE TEACHING MODELS: INSTRUCTIONAL DESIGN MAP THEORY

We believe that there is a need to connect constructivist principles, instructional design theories, online learning models, and new media and technologies for web-based teaching and learning, rather than treating them as separate entities and disciplines. Such connections help create a synergistic effort for improving instructional design enhanced with new media and technologies. In order to tie these entities together, we will use Bransford et al. (2000)’s model as the framework because we believe Bransford et al.’s model provides a comprehensive context to start our discussions.

In “How People Learn,” Bransford et al (2000) discussed the four components of an effective learning environment: learner-centered, knowledge-centered, assessment-centered, and community-centered. For our instructional design map model, we add the fifth element, that is, the ubiquitous new media and technology environment. Therefore, our map is made up of the following five components:

1. Learning-centered environments
2. Knowledge-centered environment
3. Assessment-centered environment
4. Community-centered environment
5. Ubiquitous media and technology environment

The word “map” is chosen to describe our proposed instructional design theory because this will allow the instructional designers to choose multiple paths to achieve their goals without sacrificing the quality of effective instructions. The instructional map provides a set of guidelines that each designer can use to achieve one or more units of instructional goals.

Instructional goals are often derived from the curriculum of a course. A single unit instructional goal is made up of authentic tasks, tools, and interactions to help learners construct new knowledge. Each unit is designed to stimulate thinking in learners that results in meaningful learning, deep understanding, and transfer to real-world context (Applefield, Huber, and Moallem, 2001). We will explain each of the components below.

Learner-Centered Environment

The first but often overlooked component of an instructional map is the learner profile, specifically in terms of learning styles and strategies. Designers often dive into the process of creating instructions without any clear indicators of who their learners are. The one-size-fits-all approach fails to take into consideration that people learn best when designers take the time to understand their educational and individual needs. These one-size programs tend to be more teacher-centered and instructive in nature. Since wholesale instructional design is clearly ineffective, designers must ask questions like “who will use the online course?” and “is the audience comfortable with technology?” in order to match instructional goals to learners.

One area of considerable interest is the issue of how learning styles impact instructional designs. Chen and Macredie (2002) broadly categorize learners into two groups. When it comes to the organization of learning activities, learners who are field-dependent tend to prefer fixed pathways to learning as opposed to the
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field independent learners. Along the same line, field-independent students tend to welcome the availability of multiple paths in online learning where they can access information in a nonlinear fashion. The field-independent learners tend to thrive in self-directed learning environments as compared to field-dependent learners. In order to accommodate both groups successfully, we must create an inclusive design that blends the desire for guidance (field-dependent) and the preference for a self-discovery approach (field-independent) by presenting multiple learning affordances to the learners.

Lin, Cranton, and Bridgall (2005) found connections between learners’ personality and learning preferences while learning through online communications. For instance, more introverted learners find it most beneficial to have the time to think and reflect before sharing their thoughts, whereas more extroverted learners find it most satisfying to view multiple perspectives otherwise unavailable in their learning processes. The study pointed out that asynchronous written communication creates a bridge for some learners between conceptual and visual understandings. Web 2.0 technologies such as blog and wiki can be great tools to facilitate learner-centered environment because they take learners’ initiatives into consideration while providing an open and flexible environment for self direction, collaboration, and guidance when necessary.
Knowledge-Centered Environment

In the early days of online course development, most courses were simply text-driven. Instructors would put up their notes or slides online with the hopes that learners would absorb the knowledge automatically. There were little to no discussions on how to create a knowledge-centered environment to promote learning. The issue of inert knowledge is not a modern invention. It has been around for more than 50 years. The online learning environment can extrapolate the risk of traditional education where learners face the problem of knowing something but failing to use it (Vosniadou & Ortony, 1989). Bransford et al. (1989) found that while fact-oriented acquisition may permit learners to retain information, it fails to help learners apply their knowledge to solve new problems. Von Glasersfeld (2005, p. 5) reminds us what is often wrong with traditional teaching:

Too often teaching strategies and procedures seem to spring from the naïve assumption that what we ourselves perceive and infer from our perception is there, ready-made for students to pick up, if only they had the will to do so.

In the constructivist learning environment, learning is seen as contextual (Ally, 2004). As such, situated learning is emphasized over structured learning. Situated learning involves learners constructing “their own knowledge rather than accepting that given by instructor” (Ally, 2004, p.19) through authentic tasks in relevant contexts. In addition, students are encouraged to create their own knowledge by exploring multiple representations of reality through blogging or podcasting.

Instructors play an important role in facilitating knowledge construction in an online learning environment. The constructivist facilitator can create instructional goals, offer diverse knowledge construction paths, promote diversity in ideas, and encourage creative and inclusive social learning processes. In contrast, the traditional transmission approach tends to reduce teaching to a single and less meaningful role. In order that learning be “effective, efficient, or engaging,” Merrill (2002) argued that we need to have the following learning principles: 1) observation is a powerful way to learn; 2) learning happens when we apply new knowledge; 3) task-centered instructions engages learners; 4) prior knowledge should be activated; and 5) we learn better when we integrate new knowledge in our daily activities. While an interactive web offers the potential to create these kinds of engagements, we go a step further by noting that it also offers immediate use of the recursive nature of the subject matter and the ability to reinforce the fidelity of the learning point through social networking and simulation. In this respect, the open knowledge environment such as MIT Open Courseware, Wikipedia as well as Web 2.0 technologies such as Delicious and Classroom 2.0 are important knowledge-centered environments to be introduced to students. Students will then be able to use them as references and contribute their own knowledge when they aspire to do so.

Community-Centered Environment

Interactions with classmates are also critical in promoting community-building activities (Swan, 2004). Community-building can come in many forms. Swan (2004) suggests small group collaboration, online discussions, and building trust among learners. In any cases of community-building, authentic activities must be used to support instructional goals. Brophy and Alleman (1991) define activities 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).”

In the online environment, authentic tasks must provide “opportunities for collaboration and
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social interaction during learning and reflection after learning” (Chen, 2007, p.77). Young (1993) recommends the following test of authenticity. Learning situations should include some of the characteristics of real-life problem solving. There should also be an opportunity to distinguish between relevant and irrelevant information and “active/generative engagement in finding and defining problems as well as in solving them” (p.3). For Reeves, Herrington, and Oliver (2002), characteristics of authentic activities include real-world relevance, ill-defined activities, complex tasks that can be completed over a period of time, opportunity for learners to consider multiple perspectives and outcome diversity, collaboration, reflection, integration of multidisciplinary areas, and realistic assessment.

As much as we argue that the Internet is an ideal platform for constructivist learning, creating a rich online learning environment and populating it with authentic collaborative tasks are not easy by any means. Moellem (2001) concurs by suggesting that the task of designing web-based courses is inherently more difficult than it is to design traditional instructions. The virtual environment places more demand on the “instructor’s ability to mentor, interpret, coach, scaffold, manage, and help” (p. 12). A community-centered environment is not just about creating a virtual space for a group of students to create new knowledge. The space must be easy for students of varying technical abilities to direct their own learning and participate as a member of the community.

Learners are constantly trying to make sense of their environments and the information presented to them (Wilson and Lowry, 2000). To facilitate the learning tasks, designers must create an effective web interface to manage the contents of their online courses. Learners will certainly benefit from a carefully planned open learning channel with multiple paths through cases and tools for them to determine their own objectives and destinations (Moallem, 2001).

Since we expect learners to spend a substantial amount of time and energy to directing their own learning, our web interface must succeed in helping the learners develop their curiosity, sustain learning interest, and make meaningful connections between content, media formats, and other course participants. Navigation of learning content should be easy and intuitive for the learners. Researchers have often cautioned instructors against using complicated menus, vague metaphors, unfamiliar navigations buttons, or confusing options to prevent users from being frustrated with the interface. Insufficiencies of concepts, consistency, screen layout, interface design, navigation strategies, low-level of interactions can result in inadequate learning environments (Klett, 2002).

In addition, designers are challenged to solve the issue of disorientation among users. Learners (especially beginners) often complain about being “lost” in the navigation system. Unlike a book where one progresses steadily from one page to the next, the ability to “roam” freely in the virtual environment is a double-edged sword. Inexperienced linear learners often find themselves disoriented in a spherical or three-dimensional learning space. Oliver, Herrington, and Omari (1997) suggest three strategies to aid orientation: placement cues to provide visual clues, hierarchies and indices for ease of access, and semantic tools to indicate relationships as well as functions. The strategies will help reduce confusion among users who are not familiar with multiple learning pathways. Hence, online learners can take advantage of open and free web technologies such as Slideshare, Google Docs, Zoho, Second Life, and Ning to create their learning communities and focus on their learning goals without worrying too much about the technical aspects of technologies.

Assessment-Centered Environment

Learners must be assessed in a meaningful context. Swan (2005) reiterates that “good assessment
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practices emphasize learning with understanding and the application of knowledge, and not the memorization of isolated facts and procedures” (p.8). In online learning, designers must integrate assessments into real-world tasks to gauge whether students understand how the desired knowledge may be applied in everyday life.

Traditional assessment has been paper-based, classroom-based, formalized, synchronized, and controlled. With online learning, there is a great deal of emphasis on self-directed learning, collaborative tasks, multiple paths to knowledge construction and application help students develop their problem solving and metacognitive skills. Unlike the traditional models of assessment, constructivism examines the thinking process (Karagiorgi and Symeou, 2005). We are interested in how students construct and apply knowledge in real-world situations. Designers are encouraged to integrate assessment tools like portfolios, team reports, web pages, and blogs into authentic activities to promote what Swan and others call “meaning making.”

Gaytan and McEwen (2007) suggest a variety of online assessments to ensure that “there is a high level of interaction between students and faculty and among students” (p.130). Some of the suggestions include exams, quizzes, projects, self-tests, and peer assessments. They believe that timely and meaningful feedback is the most important component of assessment. It is not uncommon for instructors to take weeks to provide feedback to students on a project or an assignment. By then, students would have moved on to the next learning unit or project and the impact of the feedback is at best minimal. The advantages of using web 2.0 tools are that the services are typically inexpensive or free, easy to maintain, and very scalable.

Like its traditional counterpart, online assessment has its own share of criticism. Researchers have noted that online assessment often mimic classroom assessment. All assessment tools create both intended and unintended consequences and the resultant behaviors in organizations and in learners. Often the learning metrics flow from the organizational metrics. Online learning assessments need to be focused more on the learning objectives and less on the organizational agenda so as to serve the end user in authentic ways intended by the curricula. Web technologies such as digital portfolio, blogs, wikis, and websites have documented as more inclusive, comprehensive, and authentic assessment tools.

A Learning Environment Equipped with Ubiquitous New Media and Technologies

In our Instructional Design Map, new media and technologies are viewed as a means to an end. In the last few years, we have seen just how diverse these technologies are. Unlike the traditional model of online learning that was built around a closed system, i.e., a course or a course management system, the current trend suggests a push towards an open learning system. The open system has tapped into popular social networking technologies or web 2.0 technologies such as blogs, wikis, podcasts, and 3-D learning environments to promote the constructivist agenda. The most important criterion for any technology selection is that the technology must add value to the educational environment. The purpose of using such technologies must be also obvious to the learners. Experienced instructional designers routinely surpass novice instructional designers in this area more than in any other. By their creative use and selection of the most innovative and appropriately matched technologies and simulations, they demonstrate the ontological and recursive aspects of the subject matter. These experts bridge the knowledge gaps of the learners by positioning the learners where they can discover the truths for themselves.

New media and technologies, in particular, Web 2.0 technologies, enable learners to be creators, co-creators, and owners of their learning and communication environments (Lin, 2008).
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The learners’ efforts are enabled by the ease of use, ease of creation, and ease of participation afforded by the new media and technologies. We-blogs or blogs, perhaps the most familiar example in the Web 2.0 realm, allow users to create a web presence (e.g., to post reflections, images, links without having to code or learn to use web authoring programs), receive comments, and connect to other like-minded people. Wiki technologies, as another example, allow users to write collaboratively on topics, publish them immediately, and update them frequently. Wikipedia, for instance, has not only become a web-based free content encyclopedia, but also a community with more than 75,000 active volunteer contributors working on some 9,000,000 articles in more than 250 languages (http://en.wikipedia.org/wiki/Wikipedia: About, last accessed on August 30, 2008). These new but rapid developments and affordances of new media and technologies are in alignment with the constructive principles, and should be actively incorporated in constructive teaching and learning environments.

FUTURE TRENDS AND CONCLUSION

In this chapter, we have argued that constructivism is an ideal approach for online learning. As in many any other changing fields, we are constantly reassessing and revising our own dynamic theories to determine which engender best practices in designing instructions for a learner-centered environment. In predicting the future trends for instructional technologies, Reiser and Dempsey (2002) envision learning environments that are “immersive, interactive, (and) adaptive to individual learners.” Others see the inevitable shift towards an open-ended learning environment where students make autonomous decisions about their learning process (Alessi and Trollip, 2001). We happen to think that we are witnessing the convergence of both the constructivist and the open visions. From a practical aspect, we believe that instructional designers and online teachers are afforded with multiple and flexible channels and technologies to craft their designs for an interactive online learning environment. Undoubtedly, more research needs to be done to determine ways to evolve constructivism for advancing the cause of online education.

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