Applying the Principles of Constructivism to a Quality E-Learning Environment

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The work of constructivist theorists, notably Piaget and Vygotsky, identified two constructivist learning models: individual constructivism, which states that knowledge is constructed from personal experience by the individual, and social constructivism, which declares that knowledge is acquired through collaboration with meaning negotiated from multiple perspectives. Advanced new technology has provided constructivist educators with valuable tools to design, develop, and teach quality e-learning courses. Educators could use effective technology-based applications, such as microworlds, virtual realities, and case studies, along with a quality computer management system (CMS), to simulate active and quality e-learning environments that might otherwise be unavailable to the learner.

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This article focuses on the practical aspects of applying durable constructivist pedagogical strategies to design, develop, and implement quality e-learning courses and programs in which students assume significant responsibility toward their own learning; effective collaboration and meaningful engagement between students and instructor to establish productive discourse, constructive solutions to real-life problems, projects, and learning activities; and diverse evaluation approaches to assess student learning.

E-Learning

E-learning is an Internet-based instructional program which is distributed to learners electronically using electronic resources, Web features, (e.g., synchronous, asynchronous, hypermedia, and e-searching) and course management systems and technological interactive tools, such as WebCT, eCollege, or Blackboard. E-learning has taken center stage in higher education and is being developed by many national and international colleges, universities, and organizations. In a statement

released in July, 2003, the Virginia Community College System (VCCS), a higher education umbrella of 23 community colleges, reported that "currently, at least half a dozen programs at about a dozen colleges can be completed completely online" (Virginia Community College System, 2003). According to the U.S. Department of Education (2003), the number of students taking distance learning classes doubled between 1997-1998 and 2000-2001. For instance, the University of Phoenix Online experienced 70% enrollment growth from 2001 to 2002 in its undergraduate and graduate e-learning degree programs (Shea, 2002).

These institutions of higher education, educational organizations, the business community, and learners that have embraced e-learning for a variety of reasons and needs refer to key factors such as flexibility, the use of mixed interactive multimedia, Internet research, archiving, electronic networks, telecommunications, and cost to support the idea that e-learning could serve as a viable and qualitative learning alternative. Some educators and learners, however, believe that e-learning cannot, and should not, replace classroom instruction, pointing out that the quality of face-to-face education must not be compromised by e-learning. Nevertheless, professional and scholastic individuals with such reservations often recognize that e-learning can be a valuable supplement and effective learning tool for mature and responsible students, and should be pursued. Hence, quality of learning is a deciding factor as to whether e-learning should be considered as a total and effective learning environment.

Quality e-learning is a Web-based learning environment designed, developed, and delivered based on several dynamic principles, such as institutional support, course development, teaching/learning, course structure, student support, faculty support, and evaluation and assessment (Phipps & Merisotis, 2000). Community colleges and universities must offer high-quality e-learning courses and programs in order to meet the needs of the "new learner" who insists on convenience. However, institutions of higher education must take a hard look at their mission in terms of the region they serve. The availability of shared vision, technology, culture of the learning environment, instructional design, delivery options and strategies, maintaining quality and equity, cost factors, and the compatibility, aptitude, and self-discipline of participants are among the several issues that affect the success of a high-quality e-learning course and program. This article focuses on utilizing the principles of an emerging learning theory, constructivism, to construct a quality e-learning environment.

Constructivism

Constructivism is a philosophy based on the principle that knowledge is created from experience. One key characteristic that distinguishes constructivism from other learning theories, such as behaviorism and cognitivism, is the nature of reality. The constructivist learning paradigm emphasizes that there is no single or objective reality "out there," which the instructor must transmit to the learner. Rather, reality is constructed by the learner during the course of the learning process.

Smith and Ragan (1999) define constructivism as "an educational philosophy within a larger category of philosophies that are described as 'rationalism'" (p. 14). These authors also explain that rationalism is "characterized by the belief that reason is the primary source of information and that reality is constructed rather than discovered" (p. 15). Furthermore, Driscoll (2000) suggests that "constructivist theory rests on the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences" (p. 376).

Constructivists believe that learners are in control of constructing their own mean-

ing in an active way. In a constructivist learning environment, "learners are active organisms seeking meaning" (Driscoll, 2000, p. 376). This meaning is acquired on the basis of experience. Hence, learners have existing beliefs, attitudes, and knowledge that impact their learning. The learning process in the constructivist environment is focused on enabling students to use knowledge in many different settings to make the learning itself as real-life as possible.

The main tenets of the constructivist learning paradigm suggest that constructivism would be considered as a "postmodern" theory that reflects the intellectual and philosophical trends of the late 20th century. Driscoll (2000) summarizes the five major components of constructivism as being (1) a complex and relevant learning environment; (2) social negotiation; (3) multiple perspective and multiple modes of learning; (4) ownership in learning; and (5) self-awareness and knowledge construction. These tenets are useful for e-learning because they provide theoretical support for the learning activities conducted in a quality e-learning course.

Constructivism and E-learning

The principles of constructivism meet the theoretical demands of a quality e-learning environment. In a synchronous or asynchronous e-learning course, students use their prior knowledge and the knowledge of their peers and instructor to enrich the class discourse and negotiation process and, therefore, find the appropriate solutions to the problem on hand. This learning process is founded, acknowledged, and supported by the principles of social constructivism. Constructivists focus on the process of learning rather than on the products of learning. The constructivist's instructional goals constitute reasoning, critical thinking, and the active and reflective use of knowledge. To support these learning outcomes, several tools and instructional models are used in the constructivist learning environment, such as problem-based learning, communities of practice, situated learning, anchored instruction, and cognitive apprenticeship.

Oliver (2000) emphasizes the importance of the Internet and its technological tools to facilitate constructivist learning when he states that:

> In collaborative classrooms, students still collect data, but they also report and share their findings with other classes online. Students can then access a global database of information, discuss observations with peers and professionals, and seek more problem-based information [that] may help them develop a better understanding of real issues. (p.13)

Lavooy and Newlin (2003) report that Computer Mediated Communication (CMC) "can produce very effective [e-learning] environment with high levels of interactivity" (p. 165). Further, McKenzie, Mims, Bennett, and Waugh (2000) surveyed 70 e-learning instructors at the State University of West Georgia and found that 81% of these educators used the bulletin board tool to teach online courses. Further, "students accessing CMC (Computer-Mediated Communication) at home had the convenience of privacy, a more relaxed atmosphere, a strong familiarity with their own computers, and the ability to exert greater control and flexibility over their schedules" (Tu & McIsaac, 2002, p. 142). These technology tools support active and reflective use of knowledge through the process of active interaction and collaborative teamwork among learners and between learners and class instructor. For instance, eCollege system allows learners, regardless of time and place, to share documents, collaborate and communicate with peers and instructor, and actively participate in threaded discussions, listen to digitized audio clips and view PowerPoint presentations. Other types of computer models, such as microworlds, allow learn-

ers to engage in simulated environments, and the Computer Supported Intentional Learning Environment (CSILE) encourages students to express, experiment with, and construct their views as well as exposing them to different perspectives.

Constructivist-Based E-Learning Activities

E-learning students experience an authentic or meaningful activity when they facilitate a discussion and moderate a class. Oliver (2000) emphasizes that in a constructivist-based e-learning environment, "many constructivist lessons involve the use of teams or groups to facilitate discussion of concepts" (p. 7). Scaffolding by the facilitator or the instructor guiding the direction of the electronic discussion should be consistent. Vrasidas and McIsaac (1999) examined the level of interaction in an online graduate course and found only three messages posted by the course instructor in the 8-week asynchronous discussion. E-learning instructors should assume the responsibilities of the instructional expert by setting certain parameters for contributing to live or delayed electronic discussion, forming focused questions and contributing effectively and constructively in a class discussion.

Multiple perspectives and collaborative learning can also be experienced via electronic discussion. According to Driscoll (2000), "online collaboration enables insights and solutions to arise synergistically" (p. 385). This collaboration process supports and promotes multiple perspectives through dialogue and discourse and by allowing the learner to become an active member of a community of practice. Electronic discussions are one effective constructivist instructional strategy that foster social negotiation and test the viability of one's hypotheses or view on others. Oliver (2000) states that "if [e-learning] discussions are centered around a question or problem, students can learn by expressing their ideas, opinions, or solutions to others, by critiquing one another's proposed models, and by defending or modifying their initial models" (p. 9). For a quality e-learning environment, what should be done is to encourage more collaboration so that students can learn from each other as well as from the class instructor. Possibilities for learning are multiplied exponentially with group interaction (Tu & McIsaac, 2002; Vrasidas & McIsaac, 1999).

Constructivist e-learning instructors bear significant responsibility in the e-learning process. They need to empower and analyze the students and provide consistent feedback, reliable Web-based resources and ensure relevant and authentic activities in the class (Oliver, 2000). Vrasidas and McIsaac (1999) investigated the nature and level of interaction in an online graduate course and found that, due to poor class structure of asynchronous discussions, only 25% of students contributed to these discussions during the fifth week of the semester. In a quality e-learning course, "the presence of the instructor is noticed and desired—not as a personality, but as a course resource" (Conrad, 2002, p. 222). The e-learning instructor must provide the scaffolding within the learner's zone of proximal development and create relevant and engaging Web-based activities appropriate for the learner's construction of knowledge.

Oliver (2000) explains that the purpose of creating such authentic activities is to motivate e-learning students and provide them with the flexibility to conduct Internet-based research and present projects electronically that are meaningful to the class. The e-learning instructor should be an effective discussion facilitator and diplomat, able to change direction to meet the needs of students and still "maintain course" to ensure that students discuss relevant aspects of the environment, without stripping learning activities of applicable, tangential activities just because they are not directly relevant. Not surprisingly, all

the 230 e-learning courses offered by the Virtual-U included online group discussion areas (Campos & Harasim, 1999).

Problem-based learning is a constructivist instructional model in which students work in groups to solve authentic problems. Oliver (2000) states that "problem-based learning (PBL) has a constructivist framework because it encourages active construction of knowledge through personal inquiry, the use of problems to form disequilibrium and subsequent accommodating inquiry, as well as social negotiation and work with peers" (p. 6). Problem-based learning provides a problem solving process that students may use systematically to identify the nature of the problem, assign tasks to be completed, reason through the problem as data and resources are gathered and consulted, arrive at a solution, and then assess the adequacy of the solution (Driscoll, 2000). Once the problem is completed, students then reflect on their reasoning and strategies. In an e-learning course, students could use synchronous and asynchronous technology tools, such as a computer conferencing system and bulletin board, at anytime and any place to form activities for teamwork that focus on sharing ideas and experiences. Students use these tools to form hypotheses to solve real-life problems, collaborate actively to collect data, clarify findings and draw conclusions to offer a variety of alternative, constructive, and innovative solutions and recommendations.

Role of E-learning Instructor

As an e-learning instructor, I have modeled my e-learning classes in a constructivist manner. I have provided students with guidelines and class expectations through the class syllabus. Required class activities have included reading the text, searching for related information on the Web, solving problems, and presenting solutions via collaborative assignments. I have placed much of the responsibility on the students to actively cooperate with one another via the interactive synchronous and asynchronous technology tools available in HorizonLive and Blackboard technology systems, to reflect on their personal experiences, explore new ideas, manipulate data, and construct solutions for problems and learning activities presented in my e-learning classes. Driscoll (2000) stresses that the importance of "nurturing self-awareness of knowledge construction … that constructivists assert is essential to the acquisition of goals such as reasoning, understanding multiple perspectives, and committing to a particular position for beliefs that can be articulated and defended" (p. 390). I am required to turn in a grade for students to assess their level of performance. In a constructivist class, assessment would be based on how students thought they had progressed compared to what they knew when they first started. During the learning process in my online classes, students would not be graded on the same scale as others. Each student in my online classes would be graded based on his or her own personal progression.

In actual constructivist e-learning practice, instructors typically integrate some constructivist strategies in their electronic teaching. Forming a technology-supported community of learners or "Asynchronous Learning Network (ALN)" is one example of an actual constructivist design. Such a community has common goals, in which members of the same community sustain themselves through dialogue and interaction, actions and products, and have ownership of their own learning. Mayadas (quoted in Doherty, 1998) describes this community:

> In an ALN, we can think of every person on the network as both a user and a resource. This concept is critical to the power of an ALN, making it not just an electronic network but a network of people—an interactive learning community

> that is not limited by the constrains of time or place. (p. 5)

Constructivism has contributed greatly to the quality of e-learning. Through computer-mediated communication (CMC) and computer-assisted learning (CAL) tools, successful e-learning mainly emphasizes and allows interactive learning, learner-controlled exploration of ideas and information, teamwork and active collaboration within social contexts to receive constructive feedback and diverse explanations, and articulation to construct and revise existing knowledge (Dalgarno, 2002; Ocker & Yaverbaum, 2001). This e-learning process is consistent with the tenets of constructivism and the work of constructivist scholars, Vygotsky and Piaget, who stressed that learning is a social activity in which learners interact and collaborate with peers and content experts to construct knowledge and arrive at plausible solutions to real-life problems (Bielman, Putney, & Strudler, 2003).

Constructivism-Based Synchronous and Asynchronous Communications

Well-designed synchronous computer-mediated communication (CMC) provides a solid ground for building small learning communities, archiving information, and enhancing opportunities for dialogue and social negotiation within small groups of learners in a quality e-learning environment (Chou, 2001). In these synchronous e-learning communities, students need clear guidance for live discussions; immediate and positive feedback; time to become familiar with technology tools; user-friendly, accessible, and effective technology systems; and private and quiet electronic places for discussion (Chou, 2002). This e-learning process promotes learning outcomes and provides authentic and unique learning experiences for students.

In a quality-designed CMC asynchronous e-learning class, most of the communication occurs via bulletin boards, Websites, or e-mail (Lavooy & Newlin, 2003). Instructors in Web-based asynchronous classes play an important role in providing prompt feedback, pertinent educational examples and applications, and helping students refine their ideas and discussions (Hara, Bonk, & Angeli, 2000). These instructors need to evaluate and monitor students' progress, assign and consult with discussion facilitators, approve discourse topics, and group advanced and new students according to their expertise and background (Zhu, 1998). To facilitate quality e-learning using this form of communication, students should feel comfortable and be welcomed, supported, included, and encouraged to participate effectively in group learning activities and active knowledge construction (McDonald & Campbell-Gibson, 1998).

To utilize the optimal features of CMC in synchronous and asynchronous e-learning courses effectively, designers and faculty members need to structure and facilitate learning activities that give students flexible options to reflect critically on their learning and interact collaboratively and productively with peers to construct knowledge and solve practical problems in an authentic environment (Wu, 2003). In an effective interactive e-learning environment, e-learners need to share learning resources and original ideas with fellow students, have assigned roles, be provided with continuous coaching and rewards for participating regularly and effectively in class, and be given clear instructions and guidelines on how to pose related questions and bring into the discussion relevant issues and learning problems (Wu, 2003).

While synchronous and asynchronous communications have the potential to enhance the quality of e-learning, students, faculty, and staff should be aware of the limitations of these forms of interactiv-

ity. For instance, students participating in Web-based synchronous classes should possess strong reading, typing, and writing skills and be prepared to face frustrating time delay during live class discussions, whereas long threaded discussions in asynchronous courses may confuse and prevent e-learners from participating fully and effectively in collaborative and group activities (Wu, 2003). The applications of quality-designed synchronous and asynchronous communications play major roles in attaining specific learning objectives in a quality e-learning environment (Lavooy & Newlin, 2003). If these communication systems are designed, constructed, and used effectively in e-learning courses, students would reap educational benefits and valuable technological skills.

Conclusion

Constructivism is a plausible theory for e-learning. This learning theory meets the demands of the principles of quality e-learning. If instructional materials and course delivery systems are designed and developed well, this theory would provide the necessary theoretical support to implement quality e-learning courses and programs.

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