CHAPTER 2: REVIEW OF LITERATURE

Introduction

In order to situate the current study, it is important to understand the underlying development of theories for designing learning environments as well as the development of online learning tools and structures. The confluence of both has provided the impetus for this study. Changes in the way we look at learning and how we design appropriate learning situations have to be merged with online tools available today to ensure that students are provided with robust, meaningful, and appropriate learning opportunities.

This chapter begins with a review of traditional teaching practices. These practices, born of a need for efficiency and individual teaching, have been the historical mainstay of the educational system. These practices will then be shown in the context of new and developing communication technologies – online learning. Early forays into designs for online learning were, for the most part, replications of traditional face-to-face environments with the focus on the learner, the body of knowledge to be gained, and the one-to-one communication model.

Next, a review of the literature related to new and emerging ideas about learning and teaching environments is presented. Rather than focus on learning a set of facts or assimilating a body of knowledge, recent trends focus on the type of information to be learned and, more importantly, the way in which learning occurs through practice. These

ideas focus on a more social view of learning. Communities of Practice, Legitimate Peripheral Participation, social constructivism, negotiated meaning - situated cognition, authentic problems all have an influence on the design of instruction.

The review continues with an examination of the confluence of new communication technologies and emerging theories about learning and teaching. Building online communities to simulate the communities of practice in which humans learn and grow are becoming more and more prevalent in institutions.

The review of literature concludes with a comparison of two distinct designs for online learning environments. The COPLS model, designed to provide learners with a rich online experience of situated learning and the provisions for communication with an expert mentor, and a model based on a community of practice model which leverages the social nature of learning with peers in solving authentic problems.

Traditional Instructional Design Theory

According to Norton and Wiburg (1998), educational strategies for designing learning experiences for students were developed to meet the needs of an industrialized, print-oriented society. Traditional learning environments are associated with classroom instruction in which the teacher is seen as the expert and the main deliverer of knowledge (Dabbagh, 2004).

For today's educators, efficiency principles coupled with the "science" of exact measurement and precise standards continue to guide the design of learning experiences. Among the models based on this approach to instructional design are Programmed

Learning, Instructional Objectives, Mastery Learning, Gagne's Conditions of Learning, and ADDIE (Norton and Wiburg, 1998).

Programmed Instruction: B. F. Skinner is usually credited with the development of programmed instruction. Programmed instruction presents information in a sequential series of small steps or frames, each requiring a response from the learner. If correct, the learner is given the next step and reinforced positively for the response. If incorrect, the learner is retaught the concept. In the late 1950's and early 1960's, large numbers of print-based programmed instructional materials were developed for both industrial training and the public schools. In the early days of computer use in education, the programmed instruction model led to large numbers of drill and practice programs (Norton and Wiburg, 1998).

Behavioral Objectives: The behavioral objectives movement gained momentum in the 1950's and 1960's along with programmed instruction. Tyler (1975) reported that many of the problems of instruction seemed to be related to the fact that schools did not specify objectives. Teachers were unclear about what they were to be teaching, and students were not aware of what they were supposed to be learning.

Norton and Wiburg (1998) state that the major implementation of behavioral objectives occurred when Bloom and his colleagues published the Taxonomy of Educational Objectives in 1956. The use of behavioral objectives to design opportunities for learning was further supported by Mager (1962) when he wrote: "Before you prepare instruction, before you choose materials, machine, or method, it is important to be able to state clearly what your goals are (pg. viii)." To clearly state educational goals, Mager

developed a procedure for writing complete and precise objectives. According to this procedure, well-written objectives state the terminal behavior to be displayed by the learner, the criterion or standard by which the behavior will be evaluated (e.g. 70% of items correct on the test), and the conditions under which the behavior will be displayed.

Since his original work in 1962, Mager has continued to elaborate his system for the design of instruction. He believes that his system ensures that instruction correctly solves instructional problems, derives from demonstrated needs, is appropriately adjusted to the needs of each student, and contributes to student eagerness to learn more. For Mager, there are four broad phases in the instructional design process: analysis, development, implementation, and improvement. Analysis seeks to identify key skill outcomes. The development phase includes the drafting of measurement instruments, the design of relevant practice, and the selection of content derived to support learning objectives. Implementation includes showing students how the course objectives and instructional modules are related as well as collecting materials and arranging the environment. The final phase, improvement, centers on a continuous determination of how well the instruction works (Mager, 1962).

Mastery Learning: The "learning for mastery" approach (Bloom, Madeaus, & Hastings, 1981) is based on the idea that learners will succeed in learning a task if given the exact amount of time they need. Mastery Learning opposes the practice of assuming that only about a third of a class will learn the material taught, suggesting that "this set of expectations, which fixes the academic goals of teachers and students, is the most wasteful and destructive aspect of the present educational system (pg. 51)". In contrast,

Bloom suggested that at least 90% of students could master learning goals if given the time and appropriate methods and materials.

Thus, Mastery learning proposes a test, teach, retest, reteach model. Using this model, design of instruction creates opportunities for students to learn a concept or skill, tests to identify those learners who have not mastered the concept or skill, reteaches the concept or skill, and retests for mastery. This process is repeated until the concept or skill is learned. Bloom suggested a variety of strategies to provide conditions for mastery learning including the use of tutors, small group study, peer tutoring, programmed instruction, audiovisual materials, and games.

The Conditions of Learning Model: Gagne's (1965) "conditions of learning" model is based on an understanding of human learning and its relationship to instruction. Prior to Gagne, learning was often conceptualized as a single, uniform concept. No distinction was made between learning to load a rifle and learning to solve a complex mathematics problem. Gagne's “conditions of learning” model suggests that there are various types of human learning and that each type requires different kinds of instructional strategies. For example, while Thorndike advocated continuous practice as the key to learning, Gagne suggested practice was effective only for certain types of learning (e.g. learning involving kinesthetic skills, such as typing or playing ball). Conversely, when learning cognitive strategies, the learner must be presented with and assisted in solving puzzling problems. For this type of learning, practice without a change in perception can be counter-productive.

Gagne's model for the design of instruction includes a sequence of external, instructional events that guide the design of instruction. Instructional events, according to Gagne's framework, must first gain the student's attention and then provide a means to share the goals of instruction. Next, instructional events must be designed that stimulate recall, provide presentations in all modalities, and create linkages to meaningful frameworks. The final three instructional events must monitor and adjust student learning, require application, and bring closure to learning. For each of these phases, Gagne has aligned internal, learning events with each of the external, instructional events.

ADDIE: ADDIE represents a systematic approach to Analysis, Design, Development, Implementation, and Evaluation. The ADDIE process begins with a detailed analysis of who the learners are, what they already know, what their learning characteristics are, what they need or want to learn, why they need it, and in what environment the learning will be applied. Once the analysis is complete, design and development begin. Design and development depends on careful and systematic articulation of the objectives that will govern instruction, what skills are to be developed, what resources and strategies will be used, how content will be sequenced, and what techniques will be used to ascertain that objectives have been met. The third step, implementation, involves teaching learners how to make the best use of learning materials, presenting classroom instruction, and/or coordinating and managing instruction, locally or from a distance. The final step, evaluation, is the assessment of both teachers and learners in order to form a basis for improvement and further development of instruction (Fardouly, 1998).

Each of these models for instructional design share certain characteristics (Norton and Wiburg, 1998). Each of the models is teacher centered. The environment is based on the teacher as the dispenser of knowledge. Each is focused on the management of students. The efficient use of time and resources in the educational setting relies on the teacher filling the role of a manager in the classroom. Each is based on the acquisition of discrete facts. A community developed core base of knowledge, required for participation in society, is imparted to the students. Each of the traditional designs is focused on individual learning. Each depends on books as the primary source of information; and are all based on a process of analyzing, sequencing, and, ultimately, presenting material.

Traditional Designs Applied To Online Learning

With the advent of the Internet and online communication tools, many educators were quick to attempt to capitalize on the potential for teaching in alternate environments. However, initial online course offerings tended to replicate traditional, efficiency-model based approaches to teaching and learning. Dabbagh (2004) describes traditional distance learning in terms of a directed pedagogical approach. She writes that, in an online setting, there is an authoritative and knowledgeable figure charged with dispensing and assessing knowledge. Students in this setting are typically taught individually and not in groups (Dabbagh, 2004). Noting that distance education began with print-based correspondence courses, she characterizes this approach as teacher-determined with an autonomous learner. Norton (2003) discusses early online learning as an extension of traditional face-to-face environments, losing the positive aspects of social interaction. She writes that course management systems in use today have features that are similar to

management features of traditional learning environments. Course management software typically includes: management of course information; assignments; grades and record books, tests for assessing individual progress, and communication that approximates traditional face-to-face instruction (Norton, 2003). Significantly, most reviews of web-based course authoring tools focus on the technological capabilities of the tools in delivering instruction (Dabbagh & Schmitt, 1998).

Many instructors lose sight of the fact that simply creating online learning environments does not ensure that those facilities are well used by participants (Ryba, Selby, & Mentis, 2002). It is simply presumed that the application of traditional learning design can be applied successfully to online environments (Norton, 2003). The attributes and affordances of online learning tools often do not reflect the newer learning theories that were being developed at the time.

Alternative Instructional Design Theory

Notions about learning associated with the efficiency model focus on methods or techniques for analyzing and presenting what should be learned, not on learning goals. Teachers are seen as technicians charged with the job of increasing the speed of learning. These notions view knowledge as independent of the situations in which it is learned and used. Yet, researchers who have studied learning in everyday situations and different cultural settings suggest that knowledge is not some kind of independent phenomena, but rather that it is situated in the activity, context and culture in which it is learned (Brown, Collins, & Duguid, 1988). In short, how something is learned is just as important as what is learned (Norton, 1998).

There has been a shift from cognitive theories that emphasize individual thinkers and isolated minds to theories that acknowledge the role of social context in determining what is known (Barab, Barnett, & Squire, 2002). Educators who design learning experiences for today's students must design for the whole of learning. They must recognize that much of learning is social, that learning is not for later life but for living, and that students are not vessels to be filled but constructors of their knowledge. They must create environments which promote problem-solving, cooperation, communication, critical thinking, and learning how to learn--the same attributes reported as necessary for participating in evolving, non-school contexts (e.g. Committee For Economic Development, 1985).

Using the efficiency model, designs for learning rested on the clear identification and articulation of a sequence of objectives, taught systematically, chained together over time, and reinforced through repeated practice. As we search for a new design model, there are two important considerations that can serve as a platform for beginning. These considerations include: an emerging view of learning potentials and abilities, a vision of learning called constructivism, and theories about the social construction of knowledge through communities.

Constructivist Learning

Catherine Fosnot, in her introduction to The Case for Constructivist Classrooms, states, “Constructivism is not a theory about teaching. It’s a theory about knowledge and learning” (Brooks and Brooks, 1999). In discussing the impact of constructivism on education it should be repeated that, while proponents of the constructivist philosophy

see a wide range of educational applications, constructivism is a theory or philosophy about knowing and gaining knowledge and not a teaching practice in and of itself. Constructivist ideas about teaching and learning stand in stark contrast to traditional views. We have seen how the efficiency model provided for learning environments where the teacher stood as the expert ready to dispense a body of knowledge and the individual learner as the vessel ready to be filled. Constructivist theories rest on the idea that the individual learner constructs their own understandings of the world.

American philosopher and educator, John Dewey is often classified as a constructivist. His beliefs about education and ways of knowing included the premise that knowing is not done by an outside spectator but is instead constructed by a participant, with society providing a reference point or theory for making sense of the experience (Oxford, 1997). Dewey expanded on the notion that the knower constructs all knowledge by including the idea that there is a relationship between the individual, the community, and the world mediated by socially constructed ideas (Oxford, 1997). This brand of constructivism is sometimes referred to as social constructivism. Unlike philosophers before them, social constructivists believe that knowledge construction takes place, and is enhanced, by social interaction.

In the constructivist classroom, deep understanding rather than imitative behavior, is the goal (Brooks and Brooks, 1999). Further, they state that, educational settings that encourage the active construction of meaning have several characteristics:

- They free students from the dreariness of fact-driven curriculums and allow them to focus on large ideas.

- They place in students' hands the exhilarating power to follow trails of interest, to make connections, to reformulate ideas, and to reach unique conclusions.
- They share with students the important message that the world is a complex place in which multiple perspectives exist and truth is often a matter of interpretation.
- They acknowledge that learning, and the process of assessing learning, are at best, elusive and messy endeavors that are not easily managed (Brooks and Brooks, 1999).

Constructivism rests on four central tenets (Fosnot, 1989). First, knowledge depends on past constructions. We can only know the world through our mental framework. We use this framework to transform, organize, and interpret new information. This mental framework is constructed and evolves as we interact with our environment and attempt to make sense of our experiences. It is the teacher's role to assist students in making sense of the input in the classroom by structuring the learning environment, but the learner must structure their own understanding of it, checking and elaborating on their understanding through inputs drawn from social interaction.

Second, constructions come about through systems of assimilation and accommodation. We assimilate information, integrating it into our existing mental framework. When information is incongruent with our mental frameworks, it cannot be assimilated and added to our store of knowledge. When this occurs, we accommodate, that is, we develop a higher-level theory or logic to encompass the information.

Third, learning is an organic process of invention, rather than a mechanical process of accumulation. Knowledge is not just an accumulation of facts. Instead,

learners must be provided with experiences of hypothesizing and predicting, manipulating objects and data, researching answers, imagining, investigating, and inventing in order to construct knowledge.

Fourth, meaningful learning occurs through reflection and resolution of cognitive conflict, negating earlier, incomplete levels of understanding. Teachers can only mediate in this process.

In addition to these four tenets, an understanding of learning recognizes the learner's cognitive developmental abilities as a major factor in the process of constructing understanding. Students' developmental abilities range from being able to do something with assistance to being able to do something alone. This is referred to as a learner's "zone of proximal development" (Vygotsky, 1978). Teachers cannot expect students to learn below their level of development - a child who knows no Spanish will not suddenly converse in Spanish. At the same time, a child who already knows much of the common vocabulary in Spanish should not spend days filling out worksheets with common words or engaging in recitation. It makes no sense to teach students what they already know or to teach them what they are not yet ready to learn.

Alternative Design Theories Applied To Online Learning

Electronic technologies can and should be a vital part of constructivist approaches to learning. Yet, schools all too often emphasize the first order effects of technology as they struggle to use technology to support traditional learning goals. Technology is viewed as useful only in so much as particular applications can be taught and used. Viewed thusly, technology's effects are minimal. When schools look to second order

effects of technology - its effects on social organization, classrooms are significantly impacted. Salomon (1991) states:

> Not allowing computers to serve as the trigger for the design of new learning environments, holding the environment constant and only changing the means of delivery, is a wasteful abuse of powerful technology, resulting in under-whelming yield. System-wide changes may be the most important opportunities afforded by computers. These entail new designs of whole curricula and socially-based inquiry opportunities; interdisciplinary, authentic learning tasks; changing roles for teachers; and new modes of assessment (p. 44).

Today's world is one of rapidly expanding knowledge with concurrent demands to integrate that knowledge with new skills and new jobs. Technology, integrated into the ongoing educational process, can play a significant role in creating educational environments that reflect the way people interact with the real world, sharing representational and computational task burdens. It can assist in creating environments that reflect the real world contexts in which both users and tools are embedded. It can support creative and divergent thinking by allowing learners to deploy inventive problem-solving strategies in situated learning tasks. It can be used to honor the construction of knowledge by supporting conversations, reflection, and shared exploration rather than as a tool for delivering rote definitions and answers. It can provide a vehicle for moving beyond conventional problem solving by enabling issues, dilemmas, and problems to emerge from authentic activity.

Jaffee (1997) writes that the integration of new technologies into the teaching and learning process will inevitably result in a reexamination of the long-standing and sacred pedagogical assumptions underlying the conventional classroom model. One approach to facilitating teacher education is to form learning communities of preservice and practicing teachers who are engaged in transformative teaching (Barab, Barnett, Squire, 2002).

Virtual Teams

One instance of the formation of learning communities is virtual teams. Virtual teams are teams that communicate using a variety of media across a continuum of space and time configurations. Such teams allow organizational members separated by geography and time zones to work collaboratively using the Internet and other media for communication (Egea & Gregor, 2002). The team framework supports the development of interpersonal skills, sharing information, commitment to team goals, cooperation and satisfaction (Egea & Gregor, 2002). Developing teams has become important to organizations because evidence shows that productivity, quality, and morale improve when teams are utilized (Stough, Eom, & Buckenmyer, 2000).

A virtual team must have common goals and all team members need to be able to contribute to the knowledge and experience of the team (Aspin, 1999).

Roberts, Romm, & Jones (2000) describe a model for virtual teaming where lectures are dispensed with entirely and students are formed into subgroups that learn by interacting amongst themselves, and using the vast amount of existing Web-based resources, with the academic staff member(s) providing guidance as and when required.

The online discussion board is one tool that can facilitate the creation of learning communities and virtual teams. Computer-mediated communication tools create new opportunities for distance education courses and have the potential to facilitate increased instructional, as well as, social interactivity (Barab, Thomas, & Merrill, 2001). Computer conferencing tools provide the capabilities for creating learning communities online, where participants are engaged in dialogue with each other to learn, collaborate, reflect, debate, critique, expound, share, give feedback, question, answer, and various other behaviors. The benefit of the discussion board as an effective educational tool is in its proficient ability to support human interaction over distance and time (Bannan-Ritland, Bragg, & Collins, 2001). Computer-based conferencing systems allow workgroups to exchange views, ideas, or information in a discussion to overcome barriers of time and space (Stough, Eom, & Buckenmyer, 2000).

Construction of shared understanding and solutions requires more than simple exchange of explicit information. Elicitation of unarticulated ideas of participants lie at the basis of negotiated agreement upon common goals and collective solutions (Bitter-Rijpkema, Martens, & Jochems , 2002).

Recognizing the power of the discussion board to create communities of learners, Northover (2002) found that with a sufficiently self-motivated student cohort, and the right levels of facilitation by the tutor, a discussion can provide a fertile medium for the sharing and development of ideas.

Northover also recognized the importance of the facilitator in online discussions, stating that it is necessary for all class members to recognize that the collective content of

a discussion forum is to the benefit of all. It is the responsibility of the tutor to ensure that students buy into the worth and purpose of the discussion board, and to encourage enthusiastic involvement in its activities (2002). The chief intellectual task as moderator is to contribute to knowledge building. In addition [the moderator] may have designated tasks that are specific to the objectives of the conference, such as preparing ongoing summaries and/or a final report (Green, 1998).

While there is a growing body of literature that describes and prescribes the functions and roles of online instructors, there is no similar body of literature that specifically addresses the roles, tasks and functions of online discussion group moderators (Collins & Berge, 1997). The online presence and facilitation/moderation role of the tutor is one of the keys (though not necessarily the most important) to the success of a discussion activity. A tutor cannot expect a discussion to proceed productively without any input or effort on their part. This is directly analogous to a face-to-face tutor setting a starter question for a class, then sitting back quietly, expecting the ensuing discussion to stay on track. This will not happen in a traditional classroom, and it is unlikely to work in a corresponding online forum (Northover, 2002). In one study, Kayworth and Leidner (2002) found that virtual team leaders rated as effective by their members, demonstrate first and foremost a mentoring quality characterized by concern for the members, understanding, and empathy. A major complaint against low-performing leaders was that they were not authoritative enough, not clear on responsibilities, and not involved with the group.

The COPLS Model

One design that attempts the shift the design of online learning experiences is the Community of Practice Learning System (COPLS)(Norton, 2003, U.S. Patent Application No. 10/286,784). COPLS provides a pedagogical framework for a learning context apart from definitions of teacher, student, grades, tests, and classroom as defined by the traditional instructional design. In their place, COPLS provides for a learning context where learning is not the goal as is typical in a traditional educational environment. Instead, COPLS makes provisions for learning within a context where the focus is not learning but the solution of shared problems. Participation in shared activities becomes the focus of learning. All members of a community of practice (i.e. social studies teachers or elementary teachers or technology-integrating teachers) including novitiates become learners and teachers simultaneously. Each member seeks to contribute to the "work" of the community, collaborating with and assisting fellow members. Those with expertise serve as mentors and a support system for novice learners who simultaneously contribute to the community in increasingly sophisticated ways while learning. Solving shared problems is the goal; learning is an embedded activity and natural outcome of participation in the community of practice. Success is judged by increasing facility at developing solutions to shared problems and advances in meeting shared goals.

The COPLS model is comprised of 6 major subsystems: a community of practice, a learner, instructional resources, representative problems, an expert mentor, and performances of understanding. Each subsystem of COPLS is enabled by interactions

with other subsystems. Thus, the learner is guided by the representative problem and supported by the expert mentor. The representative problem is derived from and supported by the joint enterprises and shared repertoires of a community of practice. The instructional resources are structured by the instructional designer and the expert mentor and made available to the learner through learner access to distributed resources enabled by a range of delivery mediums. Mentor training, mentoring guides and prompts, and access to instructional resources and the instructional designer support the expert mentor. Performances of understanding are derived from the representative problem, shaped by the learner, and critiqued by the expert mentor (Norton, 2003).

Community of Practice

Norton's COPLS model derives its name and theory from the Community of Practice ideas described in the literature. Etienne Wenger discusses Communities of Practice by saying that they form the basis for most of the learning that occurs in humans. Wenger (1998) discusses learning in the context of participation in a community. Through this participation, the experience of the novice or apprentice is shaped. Simultaneously, the community in which the novice learns is shaped by participation of the novice. Through the participation in a community, a process of negotiated meaning occurs. In this setting, the knowledge, skills, and practices of the community are not handed down, per se, from experts. Rather the knowledge of the group develops though the participation of its members. Practice is not merely the context for learning something else; rather what novices learn is the practice (Wenger, 1998).

Legitimate Peripheral Participation

Lave and Wenger describe the process of skill and knowledge acquisition in a community as Legitimate Peripheral Participation. This denotes a mode of engagement where a learner or apprentice participates in the actual practice of an expert but only to a limited degree and with limited responsibility (Lave & Wenger, 1991). In apprenticeship, opportunities for learning are given structure by work practices instead of an asymmetrical master-apprentice relationship.

Lave and Wenger (1991) go on to say that it seems typical of apprenticeship that apprentices learn mostly in relation with other apprentices. They write that there is "…anecdotal evidence that where the circulation of knowledge among peers and near-peers is possible, it spreads exceedingly rapidly and effectively." (p. 93)

Conclusion

Given the rise in online course offerings today in institutions of higher learning, it is apparent that more attention must be paid to merging developing educational theory with online learning. The affordances of online communication technology seem particularly well suited to implementing a more social and authentic oriented learning environment.