

Chapter 1. Introduction and Background

Throughout the world of education and training today, the call to move instruction “online” - onto the Internet (or Intranet) – is loud and clear in many books, publications, newsletters, and conference announcements. The U.S. government Web-based Education Commission [WBEC] (2000) sounded the following “call to action” in a recent report:

Based on the findings of our work, the Commission believes a national mobilization is necessary, one that evokes a response similar in scope to other great American opportunities or crises: Sputnik and the race to the moon; bringing electricity and phone service to all corners of the nation; finding a cure for polio. ... The question is no longer *if* the Internet can be used to transform learning in new and powerful ways. ... Nor is the question *should* we invest the time, the energy, and the money necessary to fulfill its promise in defining and shaping new learning opportunity. The commission believes that we should. We all have a role to play. It is time we collectively move the power of the Internet for learning from promise to practice. (p. iii-vi)

Designers and teachers who choose to move into the online instructional environment are welcomed by manifold opportunities and challenges: a mix of both maturing and emerging technology, a growing commercial presence that provides both new technological opportunity and overblown “hype,” and an increasing number of students with a wide variety of academic, professional, technological, and personal backgrounds who are sometimes eager and sometimes reluctant to pursue learning in this new environment. This mix of challenges and opportunities can be overwhelming to educators. Where has online learning come from? What can be done to help educators and students who choose the online medium for instruction?

Online learning has emerged over the past two decades from several pre-existing education environments, including distance education and traditional classrooms (Mason & Kaye, 1989). For distance education environments, online learning provides new

possibilities for increased interaction among participants using “anywhere, anytime” asynchronous computer-mediated communications (CMC) technologies. For traditional classroom environments, online learning provides opportunities to extend learning interactions outside the classroom using CMC technologies. In both distance and classroom environments using a mix of synchronous and asynchronous technologies, teachers and students can communicate, collaborate, and interact with and among each other without regard to temporal or physical location. In order to take full advantage of this increasing opportunity for learning-focused social interaction, the instructional design field requires new and revised methods of instruction (for educators) and methods of learning (for students).

With all this new technology to use in learning environments, one of the most significant tasks for instructional designers is to develop instructional theories and guidelines for practice that provide useful guidance in the effective implementation of communications technologies to help facilitate learning. In other words, new instructional theory is needed to help designers and practitioners answer the question, “What instructional methods should be used in the online learning environment in order to meet the established learning goals?”

This study provides a partial answer to this question.

Growth in Online Learning

Online learning began with the use of CMC and Internet technologies such as discussion boards, electronic mail (e-mail), and File Transfer Protocol (FTP) to provide asynchronous communication between learners and instructors, usually at a distance.

With the emergence of the World Wide Web (WWW) in the early 1990's, online learning changed to include large repositories of (usually static) information accessible through course websites.¹

The growth of online learning from an economic perspective is staggering. In general terms, education and training represent the U.S. economy's second largest business sector, and approximately 9% of the gross domestic product (WBEC, 2000). The U.S. corporate online learning market has grown from essentially zero in the mid-1990's to over \$1 billion at the end of 2000, and is projected to exceed \$10 billion by 2003 (WBEC, 2000). Internationally, the market for online learning is expected to grow to in excess of \$360 billion by 2003 (WBEC, 2000). If this growth pattern continues for just five years, the world market for online learning will exceed \$10 trillion dollars by 2006.

From the perspective of academic institutions, the growth in online learning has also been amazing. In 1995, over 50% of American higher education institutions reported having distance education programs in place, or were planning to implement programs within three years (National Center for Education Statistics [NCES], 1998). In 1998, Internet-based distance education courses surpassed two-way interactive video as the most popular technology in use by U.S. post-secondary schools (NCES, 2000). As well, by 1998 virtually all (97%) post-secondary instructors had access to the Internet, many (77%) used e-mail to communicate with students and approximately half (45%) used course specific websites (NCES, 2001).

¹ For the purposes of this study, I will use the term online to include the use of any Internet technology, such as discussion boards, e-mail, FTP, websites, java applets, streaming video and audio. Another term, e-learning, has become common in popular discussions of online learning as well. My working definition of the term online learning encompasses the popular term e-learning as well.

Even though the use of online learning is growing, educators (teachers and instructors) are not necessarily prepared to teach online. One indicator of this is that in 1998 only one third (33%) of U.S. public school teachers reported that they were well prepared to use computers or the Internet in instruction (NCES, 2001). This same group reported that two of the greatest barriers to using this technology were time to learn how to use it effectively, and guidance on how to teach with it in their own situations (NCES, 2001).

With the continued growth of online learning all but assured, it is clear that research into online learning environments is critically important now and will continue to be into the foreseeable future. One of the key “calls to action” in the Web-based Learning Commission’s report is “Build a new research framework of how people learn in the Internet age.” (WBEC, 2000) This study is intended to provide a part of this new research framework. Most research frameworks are built upon the foundation laid by previous research agendas. In education, research on learning usually starts with a consideration of learning theory. Also, many educational researchers have been interested in social interactions among the participants in various learning environments. The following section briefly describes two of the major research areas that have addressed social interaction in learning.

Social Interaction in Learning Theory

Learning theories describe how people learn. A major development in the field of education in the past several decades is the growing discussion and acceptance of learning theories that rely, in part, on social interaction to explain how learning occurs.

Two of these theories, often referred to in discussion or research of online learning environments, are social constructivism and socio-cultural learning theory (Jonassen, Mayes, & McAleese, 1993; Bonk & King, 1998).

In brief, social constructivism theorizes that people learn by developing (constructing) their own understandings of new concepts (knowledge) through interactions with information and other people. This occurs most effectively when learners are engaged in completing authentic tasks, meaningful problem-centered thinking, and negotiation of meaning and reflection on learning in a social (group) environment (Dede, 1995; Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Jonassen, Dyer, Peters, Robinson, Harvey, King, & Loughner, 1997; Spiro, Feltovich, Jacobson, & Coulson, 1992). Gunawardena, Lowe, and Anderson (1997) show how online interaction using CMC can be used by participants as a vehicle for the co-construction of knowledge. Hedberg, Brown, and Arrighi (1997) conclude that student interactivity in online learning environments resides in both the recursive construction of knowledge and in interpersonal communications, stating, “The ultimate in interactivity is the process of knowledge construction.” (pg 57)

Socio-cultural learning theory asserts that effective learning takes place when learners are engaged in social interaction with teachers and more capable peers. Learners experience new information through these interactions on a social plane first, and gradually internalize them, building new personal knowledge as a result (Vygotsky, 1978). From this perspective, learning takes place as the learner progresses through their “zone of proximal development,” or ZPD (Vygotsky, 1978). In order for learning to occur, a learner must be challenged to perform, or think, just beyond their individual

capacity. In order to operate at this level, the learner requires some form of expert support – commonly supplied through some form of social interaction.

Vygotsky's approach to understanding learning as a social process has been used to design and implement many online learning environments that facilitate socially negotiated learning (Bonk & King, 1998). Teachers and students use online tools to work on collaborative projects, interact in thoughtful discussions, and mentor others (Althausen & Matuga, 1998; Collins, 1996; Cooney, 1998; Grabinger & Dunlap, 1996; Kang, 1998; Kirkley, Savery, & Grabner-Hagen, 1998; Zhu, 1998).

Others have used Vygotsky's ideas to push for a different type of school experience, one that focuses on meaningful dialogic interactions (Gallimore & Tharp, 1990; Tharp & Gallimore, 1988). One of the key arguments they make is that the teacher-student interaction pattern should change from one of recitation to one of participative discussion, especially in the online environment. Hillman (1999) showed that the interaction patterns in CMC courses resemble participative discussions, but the face-to-face discussions resembled recitation patterns. This finding supports the contention that online discussions can indeed be used to foster socio-cultural learning.

As online learning continues to grow, a continued emphasis on creating social learning environments online is also likely. Therefore, this study looks at many cases that use either social constructivism or socio-cultural learning theory to describe the learning goals and values in specific online learning environments.

Importance of Social Interaction for Effective Learning in Distance Education

Moore (1989) distinguishes between three types of interactions in distance education, a set of distinctions that can be directly applied to online education. Moore's three levels of interaction are learner-content, learner-instructor, and learner-learner. Moore concludes that educators need to design and implement an effective interaction strategy for each particular learning context, addressing each level of interaction as appropriate. This study looks at many cases that used social interaction primarily on two of Moore's levels, learner-instructor (teacher-student) and learner-learner (student-student) interactions. Other cases focused on a slightly different level, addressing group interactions involving multiple learners, instructors, and other experts.

Kitchen and McDougal (1999) studied collaborative online learning with graduate students and report that students found sharing, associating, and building knowledge together very motivating. Interestingly, Kearsley, Lynch, and Wizer (1995) report that graduate students completing a Masters degree program online have a more positive outlook towards collaboration, teamwork, and human interaction than their counterparts who complete a comparable face-to-face program. Since social interaction is valued in many learning contexts by learning theorists, educators, and students, it is important to consider how instructional methods that use social interaction can be used in online learning environments to achieve learning goals.

Need for Instructional Design Theory for Online Learning

As important as learning theory is to explaining how learning occurs, it does not provide specific guidance for instructional designers (designers) or teachers as they create

new learning environments online. Instructional design theory (instructional theory) is needed, for it “offers explicit guidance on how to better help people learn and develop.” (Reigeluth, 1998, p. 5)

The social interaction differences between learning in an online environment and learning in a traditional face-to-face learning environment are many. Common characteristics found in online learning are the physical (and geographic) separation between learners and between learners and the instructor, the asynchronicity of learning and teaching activities, and the impersonal presentation of course content (Harasim; 1990a, 1990b). These significant differences contribute to the need for instructional design theory that is specifically focused towards the online learning environment. Klemm and Snell (1995) stress that instructional design must exploit the capabilities of CMC in order to enhance online learning. As Khan (1997a) stated, “WBI (Web-Based Instruction) design requires careful consideration of the Web’s potential in relation to instructional design principles.” (p. 8) Instructional design fitted specifically to the online environment is critical.

Unfortunately, most studies of online learning stop short of creating design guidelines that are applicable to a wide range of learning situations.

Developing Instructional Design Theory

Instructional design theory must include two major aspects: presenting methods for facilitating learning, and providing guidance as to when these methods should be used (Reigeluth 1999). Reigeluth and Merrill (1979) and Reigeluth (1983) describe instructional methods, conditions, and outcomes as the key components of instructional

theory. Instructional methods refer to the approaches to facilitating learning from which a designer or educator can select – those he has the ability to change. Instructional conditions refer to aspects of the learning context that influence the effectiveness of the chosen methods and that the designer or educator cannot change. For example, an instructional condition could be the age or ability level of the students. Instructional outcomes refer to the effectiveness, efficiency, or appeal of the instruction. Reigeluth (1999) groups instructional conditions, outcomes, and values about instruction into the category of “situationalities” – knowing when certain methods are likely to achieve desired instructional outcomes based on specific instructional conditions. When developing instructional theory, it is important to be able to describe instructional methods and the specific situationalities in which they should be used.

Several prominent educational psychologists have also argued for the consideration of “situationalities” when designing instruction or trying to understand the learning process, though they do not necessarily use the term “situationality.” Snow argued consistently over many years of research that understanding student aptitude and creating effective instructional environments requires an acknowledgement of not only student differences, but also differences in the instructional tasks and processes, knowledge domain, instructional treatment program, specific learning situation, and learner population group (Snow, 1986; Snow, Corno, & Jackson, 1996; Snow & Lohman, 1984; Snow & Swanson, 1992). Sternberg has stressed the importance of acknowledging differences among student learning, or thinking, styles, and modifying instruction (teaching methods) to more appropriately match student thinking styles (Sternberg, 1994a). Sternberg has mapped student thinking style types onto various types of teaching

methods and assessment styles, arguing that matching assessment type with student thinking style leads to more successful learning outcomes, as measured by assessment (Sternberg, 1994b). Using Sternberg's approach, student thinking style would be an important instructional condition to consider when selecting instructional methods.

Reigeluth (1999) further explains the characteristics of instructional theory as being probabilistic as opposed to deterministic. In other words, instructional theory should provide guidance that is likely to lead to the desired learner and instructional outcomes, but there is no 100% assurance that outcomes will be achieved. There are too many situations and variables interacting in any instructional context to completely address with any one instructional theory. This leads to the importance of instructional values² in deciding which learning and instructional goals to pursue, which methods (among options) are chosen to attain those goals, and which criteria are chosen to assess which method works best in any given learning context.

Therefore, instructional design theories focus on design (what should be done) and offer methods that are likely to work under the specified conditions to attain given outcomes. Foundational values about learning determine the learning goals and influence the methods that will be selected based on the situationalities of any given learning environment.

² An example of an instructional value is "students should learn through cooperating in small groups." An educator who values cooperative learning, for example, will likely choose instructional methods that incorporate small groups of students, and will probably avoid methods that rely significantly upon independent study.

Study Goals

Online learning is a rapidly growing part of the instructional landscape around the world. When considering online learning environments, it is clear that the characteristics of the environment are fundamentally different than those in traditional classroom teaching environments. It is also clear that social interaction is a very important part of many online learning environments, especially those founded upon values and goals derived from social learning theories such as social constructivism and socio-cultural approaches. There is therefore a need for instructional theory that addresses socially interactive learning in online environments. The goal of this study is to contribute to the generation of this instructional theory.

Reigeluth (1983) outlines a four-step process for developing instructional theory: 1) develop formative hypotheses, 2) develop a taxonomy of variables, including the outcomes, conditions, and methods, 3) develop principles of instructional design – cause-and-effect relationships between variables that can be empirically tested, and 4) develop comprehensive theories and models of instructional design. This study will follow several steps in this process, but it will not attempt to create comprehensive instructional theory. Addressing step 1 of the process above, the basic hypothesis of this study is that methods of instruction that use or rely upon social interaction can be used in online learning to meet learning and instructional goals. This study will focus primarily on step 2 of this process: the development of the variables, methods, and situationalities (conditions and outcomes) that are important to consider in this environment. The major result will be a situationalities framework, describing methods, conditions, goals, and values for social interaction in online learning.

Study Overview

Chapter 2 is a summary of a review of the relevant literature in the instructional design and educational technology fields. This review addresses four main topics: 1) values and goals in social learning environments, 2) the basic characteristics of online learning environments, 3) social interactions in online learning environments, and 4) design guidance for social interaction in online learning environments, including a discussion of specific situationalities in case studies of environments that utilize social interaction. Chapter 2 concludes with the presentation of specific research questions.

Chapter 3 describes the methods used in the study. This study used a case survey approach to create aggregate research based on existing literature – primarily case studies of online learning environments and courses. Three general sources of data were used: 1) existing case study literature, 2) interviews with selected case study authors, and 3) surveys of all case study authors. Each case study was analyzed for the values, goals, methods (of social interaction) and conditions that affect the selection of particular methods. Interviews and surveys were used to verify and further explore the data derived from the case study literature. Data analysis was completed using a custom-designed Microsoft Access™ database in order to determine the importance of situationalities and answer the study questions.

Chapter 4 describes the analysis of the case report data. Chapter 5 describes the situationality classification scheme. Chapter 6 presents the situationalities framework, describes how it can be used to design instruction, and presents other study findings.

Chapter 7 discusses the implications and limitations of the study, and provides suggestions for further research based upon the study findings.