Chapter 1
An Ecological Model of Student Interaction in Online Learning Environments

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ABSTRACT

Ecological theory conceptualized the student as surrounded by a series of environmental systems and the processes of learning as interaction between the student (i.e., bioecology) and the systems (i.e., microsystem, exosystem and macrosystem). This chapter synthesizes the literature and proposes an ecological model of student interaction in online learning environments. Specifically, learner-learner, learner-instructor and learner-content interactions occur in the microsystem and are mediated by the interface subsystem. Student microsystemic interactions influence and are influenced by the instructional design exosystem. The macrosystem reflects the indirect influence of university culture on all aspects of the microsystem, exosystem and interface subsystem. The chronosystem captures the effect of time on the student and on all ecological systems (e.g., students mature and university culture evolves)

THEORETICAL FOUNDATIONS

According to Johnson (2014), educational theory serves two critical functions. "First, it provides a vocabulary and a conceptual framework for interpreting observations of teaching and learning. Second, it suggests solutions to improve teaching and learning under a range of circumstances including, recently, interactive online environments" (p. 298). White, Collins and Frederiksen (2011)

noted that theory construction is the central goal of science ''where theories are coherent bodies of concepts, laws and models, which account for a wide range of observations and enable humans to predict, control and explain what happens as events occur'' (p. 42).

In 1989, Moore proposed three types of student interaction in distance education; learner-learner, learner-instructor and learner-content. *Learner-learner interaction* is "between one

learner and other learners, alone or in group settings, with or without the real-time presence of an instructor" (p. 4). During *learner-instructor interaction*, the teacher seeks "to stimulate or at least maintain the student's interest in what is to be taught, to motivate the student to learn, to enhance and maintain the learner's interest, including self-direction and self-motivation" (p. 2). *Learner-content interaction* "is the process of intellectually interacting with the content that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind" (p. 2). More recent terminology as submitted by Garrison (2011) for roughly equivalent latent constructs includes *social presence* (i.e., learner-learner interaction), *teacher presence* (learner-instructor interaction) and *cognitive presence* (learner-content interaction). Moore encouraged educators to "organize programs to ensure maximum effectiveness of each type of interaction, and ensure they provide the type of interaction most suitable for various teaching tasks of different subject areas, and for learners at different stages of development" (p. 5). Anderson (2003a) suggested that a high level of one type of interaction may be sufficient to support student learning, although "it is impossible to determine with certainty which exact combination of human and nonhuman interaction is necessary for effective instruction with any group of learners or for the teaching of any subject domain" (Anderson, 2003b, p. 130).

In 1994, given the growing popularity of online courses in distance education, Hillman, Willis and Gunawardena added the concept of *learner-interface interaction* to Moore's (1989) typology. At the most fundamental level, successful online learning is based upon the student's ability to interact with hardware and software and, obviously, have reliable internet connectivity. The four types of online interaction (i.e., learner-learner, learner-instructor, learner-content and learner-interface) provide a conceptual framework for examining student interaction in online learning environments. Essentially, satisfying and instructionally-effective interaction is built upon a foundation of congruence or perceived congruence between individual student characterises and elements of the learning environment. In this regard, ecological theoretical models are particularly well-suited to conceptual organization and exploration of interaction in online learning environments (Johnson, 2010a, 2010b, 2014). While applied professions may not readily embrace theoretical models, no human behaviour can be understood without a conceptual blueprint of assumptions that guide instructional and managerial processes.

Ecological Theoretical Models

Ecological models of human learning and development situate the person within a system of relationships affected by multiple levels of the surrounding environment (Bronfenbrenner, 1977). Bronfenbrenner (1989) organized the contexts of human development into five nested environmental systems, with bidirectional influences within and between systems. The *microsystem* refers to direct environments and includes teachers, peers and family. The *mesosystem* is comprised of connections between direct environments (e.g., family support for school learning). The *exosystem* includes environmental settings that indirectly affect the person (e.g., infrastructures of instructional support). The *macrosystem* reflects overarching social ideologies and cultural values (e.g., the value of digital literacy). The *chronosystem* highlights the effect of time on the individual (e.g., cognitive maturation) and on all systems (e.g., new applications of digital technology). Bronfenbrenner (2005) subsequently proposed the *bioecology*, that is, the person's own biology is conceptualized as a dimension of the microsystem that interacts with all other aspects of the microsystem. Such an ecological framework provides "a unified but highly differentiated conceptual scheme for describing

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