# Bridging the Distance: Using Interactive Communication Tools to Make Online Education More Social

Paige D. Cunningham

## Abstract

Distance education offers geographically or time-constrained students access to the full depth and breadth of higher education offerings. Yet, distance education has significant drawbacks, including limitations to communication abilities, feelings of separation from instructors and peers, and an increased likelihood of dropping out. Educational informatics researchers argue that learning is a socially constructed activity, and thus students need to be able to communicate in order to develop a learning community. Consequently, historically, disconnected distance-learning practices were problematic for many students. As distance education has evolved to include a range of online offerings, including for-credit online degree programs and massive open online courses (MOOCs), new technologies have arisen that can make these challenges easier to surmount. Current literature suggests that faculty-encouraged use of both course-based and external Web 2.0 interactive tools may help students in online degree programs to succeed and feel connected to other students and faculty while participating in their distance-education courses. This paper examines the literature on distance education in order to provide a context for future research into communication patterns within MOOC courses, particularly within longer sequences of MOOC courses, and the role of student motivations on student-communication expectations and needs.

## Introduction

In the discourse about for-credit higher education there are two models that are most commonly discussed: traditional on-campus, residential-

LIBRARY TRENDS, Vol. 65, No. 4, 2017 ("Spanning the Information Sciences: A Celebration Marking Seventy Years of the Doctoral Program in the School of Information Sciences, University of Illinois at Urbana-Champaign," edited by Alistair Black and Emily J. M. Knox), pp. 589–614. 

based education; and distance education. On-campus education has a long and well-respected pedigree and is available worldwide—most countries have at least one institution of higher education. However, physical access to higher education can be limited, leading to a rise in demand for distance higher education. Historically, distance education utilized various methods of instruction, including mail correspondence, radio, and television. Over the past several decades, however, distance education has come to be virtually synonymous with online education, or e-learning. For-credit online education offers students depth and breadth of knowledge, as well as the potential for earning a diploma from respected institutions of higher education. Noncredit massive open online courses (MOOCs) have also become a popularly mooted remedy for increasing international access to education through the promulgation of free or low-fee short courses on specific topics. Some institutions, such as the University of Illinois, are even using MOOC platforms as a basis for degree programs. Yet, all forms of online distance education have some significant drawbacks for students who are not physically present where they are studying. These challenges include limitations to communication abilities, feelings of separation from instructors and peers, and an increased likelihood of dropping out. New technologies have arisen, however, that make these challenges easier to surmount.

While early distance-education systems were primarily unidirectional, with instructors sending out lessons and students simply returning them, over time, distance-education technology has become far more multidirectional. Content/course management systems (CMSs) and MOOC platforms provide channels for quick access to syllabi, reading materials, and course slides, but also allow for communication and immediate feedback. This communication happens directly with instructors, and with peers as well, using tools such as embedded message boards, chat rooms, and wikis. As the university systems that surround them have adopted ever more technological mediation in coursework, CMSs have evolved to serve both on-campus and distance students. Many of the communication technologies inherent to CMSs may never be used by on-campus students, as they have less need for them, yet even fully utilized CMSs or MOOC platforms cannot completely fill the communication gap for distance students. At some institutions, distance education now also utilizes virtual classrooms and Web 2.0 social-media applications to connect instructors with their students for both educational and communicative purposes. Instructor support for and buy-in to the use of these tools is a critical part of helping to close that gap.

Researchers in the field of educational informatics, which pulls from several disciplines, including library and information science, education, and computer science, are working to develop ways to assess communication within online learning groups. However, assessment has proven dif-

ficult due to challenges such as how to judge the quality and effectiveness of communication and how to make useful claims about differences in the way in which technology choices are made in different locations and at different times. Nevertheless, the existing literature demonstrates that significant strides have been made in the process of understanding the role of online communication in distance education in order to ensure successful communication tool use by students. As MOOCs become ever more popular as a method of online education, this literature provides a solid grounding for additional research into the role of online communication both between MOOC students and their instructors and among MOOC students, as well as into the connection between student communication patterns and student persistence in MOOC courses over time.

## Background

The exact definition of what constitutes formal distance higher education has proved challenging to pin down, but there are a series of generally agreed-on characteristics. Distance education primarily takes place away from a formal institution of higher education although it is usually overseen and controlled by an institution. The use of intermittent direct, face-to-face communication does not prevent an education system from being considered distance learning (Holmberg, 1986). Nevertheless, the system of distance education is primarily dependent on asynchronous communication, whether through letters, email, on a message board, or via a different technologically mediated communication technology.

Despite the potential for students and instructors to meet in person at intervals, distance education requires some degree of what has been defined as a "quasi-permanent separation throughout the length of the learning process" (Keegan, 1996, p. 45). Contemporary formal distance learning does require that, even at a distance, the student can initiate two-way communication with the institution or instructor, rather than being solely a recipient of communication. Using modern communication technology, distance-education students often have the ability to be part of an interactive learner group while still remaining physically separate from that learner group (Keegan, 1996). A key consideration, however, is that while students may be able to be part of a group, they may choose not to do so, thus failing to make full use of the communication tools available to them. Students are more likely to do well if they participate in conversations with their instructors and peers, both in terms of academics and social stability; but without encouragement from instructors and peers, many students choose to remain apart.

### *A Brief History of Distance Education Institutions and Technologies*

Distance education is over 180 years old, with some of the earliest records of mail-based correspondence courses dating to the early 1830s in Swe-

den. Sweden's lead was followed by England in 1840, Germany in 1856, and the United States in 1873. These courses were not directly related to one another and addressed a variety of subjects, including composition and shorthand, demonstrating that various forms of correspondence education had already become available to the public (Holmberg, 1986; Maeroff, 2003; Simonson, Smaldino, Albright, & Zvacek, 2000). One of the first correspondence courses to award degrees was Chatauqua College of Liberal Arts in New York State, which, between 1883 and 1891, was authorized to issue academic degrees to students who undertook both summer intensive courses and year-round correspondence courses. Other U.S. academic institutions to offer academic degrees included Illinois Wesleyan, which granted bachelors', masters', and doctoral degrees between 1877 and 1906, and the University of Chicago, which created an extension that included correspondence teaching as one of its primary departments—one of its five main founding divisions—in 1890. Illinois Wesleyan ceased granting distance-education degrees in 1906 due to concerns about the quality of the degrees; however, the University of Chicago persisted. In 1892 Penn State started offering correspondence courses through a branch that would eventually become its online World Campus, an education venture that is still in existence (Maeroff, 2003; Simonson et al., 2000). The first major commercial correspondence school, which was founded in 1891 in Pennsylvania to increase mining knowledge and safety and later became the International Correspondence Schools, grew its student body from "225,000 in 1900 to more than 2 million in 1920" (Simonson et al., 2000, p. 23). Many other academic institutions have grown and waned over the decades since the rise of the first correspondence courses, indicating that there is a strong interest in distance education, but that the technologies to offer the courses have not always been entirely effective.

Leading up to the resurgence that has come with the development of near-instantaneous online communication, distance-education providers have kept attempting to make use of new technologies that have arisen since the 1900s. As previously mentioned, the earliest correspondence education was conducted via the mail, while some institutions also supplemented the courses with in-person summer institutes, a precursor to modern blended-learning methods (Maeroff, 2003; Simonson et al., 2000). Starting in the 1920s, U.S. universities began experimenting with radio as a method of instruction, although these ventures had mostly vanished by the 1930s. Some of the ventures are still extant as university-run radio stations but are no longer used for instructional purposes. Universities began using broadcast television during the 1930s with for-credit courses first appearing in the 1950s and instructional television becoming increasingly popular (Simonson et al., 2000). The Public Broadcasting Service worked to transmit "undergraduate-level courses and resource programming" to more than 2,000 institutions in the United States, reaching a widely

dispersed audience (Chute, Thompson, & Hancock, 1999). Most instructional television is noncredit, however, and did not gain widespread usage for academic distance-learning purposes (Maeroff, 2003). One major limitation of all these technologies is that they are either single-direction, such as a broadcast from the instructor to many students, or involve very long response times, such as that which results from sending questions and answers back and forth by mail. In none of these cases is there any practical form of regular interpersonal communication between students and instructors or, especially, among students.

While communications satellites increased the ability of people to use telephony for distance education during the 1960s, it was not until fiber optics came into wider use in the 1980s and 1990s that true multimedia technology and fast and reliable two-way communication became feasible and allowed online courses to become the standard for distance education (Simonson et al., 2000). At the same time, mixed-mode classes remain strong, with programs like the University of Illinois's School of Information Sciences' LEEP program utilizing both online distance and face-to-face education, just as was done in some of the earliest distance-education courses (Maeroff, 2003; School of Information Sciences, 2016). The difference is that modern online distance technologies, more than directed two-way communication between student and instructor, have become the norm, because students are now able to communicate just as easily with one another as with the instructor, leading to the creation and expansion of networks of online students.

*The Rationale for Distance Education*

From its earliest days as mail-based correspondence courses, the rationale behind distance education has been to provide "gifted and hard-working people a possibility to study beside their jobs and other commitments" (Holmberg, 1986, p. 16). With its flexibility in regard to both space and time, distance education allows people who cannot physically attend an institution of higher education to improve their professional knowledge and/or their personal knowledge (Holmberg, 1986; Maeroff, 2003). This design fits in with the "philosophy that a lone learner in his virtual classroom of one should be able to pursue education without having to enter a formal classroom" (Maeroff, 2003, p. 23). Curiously, in many cases, the focus on self-education through less heavily directed distance-education programs has led to something of a return to the kind of education that predates formal classroom-based schooling in which people often taught themselves at their own pace. This system of removing physical boundaries is also often used to promote the new philosophy of *open learning*, a term that can be applied in many ways, but implies a kind of student-centered focus (Keegan, 1996). Within the open-learning context, distance education is seen as something that "reduces constraints and removes barriers

for learners by promoting qualities such as greater learning autonomy, independence, and flexibility" (Rovai, Ponton, & Baker, 2008, p. 1). Distance education can reach across borders to students in different cities, states, or countries, allowing them to enroll without having to move to a different country, potentially saving both the students and institution money (Chute et al., 1999). Distance education and open learning allow for institutions to reach people where they are, both geographically and chronologically. Not all systems have the same levels of flexibility, but for most students a system exists that can meet their needs as they seek to earn a higher education.

*Distance Education and e-Learning*

As can be seen from the explanations of modern distance education, today there is considerable overlap with instruction methods used in on-campus courses. A traditional distinction between *on-campus* and *distance* education has been the level of physical separation between student and instructor and, in many ways, this physical separation historically implied a loss of immediacy of contact for students at a distance. Yet, in many large lecture classes today students may never interact directly with their instructors, even via a mediating technology. In contrast, in many online classes, particularly synchronous classes, students may interact directly with their instructors every class period, whether via voice, text chat, or video chat. This shift in the level of direct contact means a reduction in the "transactional distance" which is based on the measurements of how much interaction may be had between student and instructor and how much a program can be customized to meet the needs of its students (Rumble, 1986). Modern online courses can often have smaller measures of transactional distance than larger on-campus classes without an online component. In addition, as technologies like CMSs are implemented throughout higher education as a whole, the gap between instructor and student in on-campus courses may also be reduced through the use of similar technologies as those used by distance students (Graziadei, Gallagher, Brown, & Sasiadek, 1997). Thus, although in distance learning the instructors and students may be separated in time and space, modern communication technologies can work to bridge this gap for both distance-education students as well as on-campus students.

## Pedagogical Foundations of Distance Education

Given the importance of education, it is unsurprising that there are multiple philosophies of what education is and how it should be conducted. Currently, there are two main overarching philosophies, although there is significant fragmentation within those philosophies. The main philosophies are the behaviorist/mechanist/objectivist view, which assumes that decontextualized facts can be effectively transmitted to students, and the

constructivist view, which claims that all knowledge is based within, and cannot be separated from, its context. Different threads of these views continue to evolve, affecting the development of both in-person and online education and the learning environments that surround the learners.

The behaviorist model of learning assumes that students are, in effect, the proverbial "receptacle," waiting for others, namely teachers, to fill their minds with knowledge (Freire, 1970/2000, p. 72); in essence, students are considered to know nothing of value unless it is deliberately taught to them. For behaviorists, knowledge is considered to be context-free, so, aside from information that needs to be scaffolded, all students are expected to be able to learn whatever they are taught if they try hard enough. Constructivists take the opposite approach, arguing that children start learning as soon as they are born and immediately begin giving their own context to each new piece of knowledge as it is entered into their memories (Dewey, 1938/1997). While these are reasonably broad definitions of educational philosophies, education theorists have presented subsets of these theories, many in order to provide counterarguments to their interpretations of the behaviorist model.

Some of the well-known subsets of the behaviorist model include Dewey's concept of "transmission" (1938/1997), Freire's "banking model" (1970/2000), and Bruner's "computational view" (1996). All of these models represent children as passive recipients of knowledge presented to them by teachers. In them teachers are authority figures with control over what their students are expected, and allowed, to learn. There is no accommodation made for students' own experiences and personal knowledge that, if utilized, might help them better understand confusing concepts that could relate to things they already know; there is also no sense that instructors are willing to work with these students on an individual basis. For these reasons, the theorists who framed the listed models argue that this form of education should be avoided. Yet, much of modern education is still based on the idea of attempting to teach learners decontextualized information and then expecting them to make sense of it.

The opposite side of the scale is the constructivist model. There is a somewhat larger range of theories within this supercategory, although the theories can be broken into two major areas of focus. The first area includes Dewey's "theory of experience" (1938/1997), Papert's sense of instinctive experience (1993), and Bruner's "culturalism view" (1996). Dewey suggests that educators need to recognize the existence of a structure of knowledge that is being built from experience but that students' own experiences form the foundation of actual understanding. Bruner posits that people create their own symbolic realities based on past experiences. Papert's claim is a bit less clearly defined than the other two theories because it is based on the idea of using microworlds like LOGO to let children explore and gain experience by debugging unexpected

results on their own and learning how the microworlds work. Collectively, all three of these theories revolve around the concept of creating meaning and structure from experience.

The second area of focus is conversation, the idea that students need to have a dialogue, whether with themselves, other students, their instructors, or artificial learning systems, in order to develop understanding. Falling into this category are Freire's model of "problem-posing education" (1970/2012); Pask's "conversation theory" (1976), which was expanded on by Entwistle (2001) and Ford (2004, 2005); and Laurillard's related "conversational framework" (2002). Freire's model reframes students as student-teachers and teachers as teacher-students on the premise that students and teachers always have something to teach each other. Conversation theory, broadly constructed, is based around conversation in "conversation domains" in which people develop a strong understanding of concepts of topics through either talking to themselves or others. Laurillard describes a framework that analyzes how well different media allow for interaction among combinations of instructors and learners, including learners with themselves, in order to help participants more fully develop their own understanding of concepts.

While behaviorist and constructivist theories initially seem entirely at odds with one another, some theorists have made attempts at integration. Bruner (1996) claims that both the computational and culturalism views can be integrated, such that schools can teach "logical-scientific thinking," but in a "narrative" mode that allows students to integrate information into their own cultural identities (p. 39). Nunes and McPherson (2003), on the other hand, see behaviorism and constructivism as endpoints on a continuum. They argue that constructivism is not a practical pedagogical model, so, therefore, it cannot be easily implemented in practice. They suggest that, instead, instructors and course designers need to operate in the middle where practical models can be designed that allow for a constructivist approach using objectivist delivery.

For educational informatics proponents, these different epistemologies have potential consequences on the design of online learning environments. Levy et al. (2003) identify a division between two types of online course design: they take what is typically known as "instructional design," a process that integrates "different ICT components according to learning needs and sound pedagogical approaches," and rename it "educational systems design" on the premise that "instructional" resounds too closely with behaviorist approaches (p. 305). Marshall (1993) makes the difference between the two views' applications clear by noting that for behaviorists, "software *acts on* the individual," while for constructivists, "the individual *interacts with* software, and changes in cognition or affect may occur—but not necessarily—, and what is changed depends on what is to

be learned" (p. 3). However, making these kinds of distinctions does not make course design any simpler.

"Technologies of freedom," as information and communications technologies (ICTs) are often called, are not so free as they might initially appear to be (Kling, Rosenbaum, & Sawyer, 2005). Systems cannot be totally free from boundaries if they are to function effectively, hence, within the context of educational technology, the activities available to learners using a system must be structured around the possibilities built *into* the system. System design also includes "binding time," which dictates when activities must be entered into the system and when they must be completed (Bruce, 2004). Depending on the design, a course could include video lectures that are uploaded when the course first opens to students, but can be viewed at any time, or group discussions that open during a class session and must be completed within thirty minutes. These kinds of activities and time restrictions are directly related to the designing pedagogy.

Behaviorist pedagogy, with its focus on the acquisition of decontextualized facts, fits well with the idea of learning objects—resources and content objects that are designed to meet a learner's presumed discrete learning objectives (Ford, 2008a). Since these learning objects tend to end up decontextualized, often being accessed on their own, all meaning must be contained within the object. Learning objects are the basis for many online course platforms, particularly asynchronous ones, including both CMS and MOOC systems. The most commonly recognized form of MOOC is the xMOOC, offered by specialized providers like Coursera, edX, Udacity, and others. These MOOC courses are generally highly centralized and controlled, with students watching recorded lectures, participating in particular forums, and submitting specified assignments, all within the confines of the platform itself. xMOOCs are also often highly modular with no requirement to consume the short bits of information in each module in any particular sequence (Raffaghelli, Cucchiara, & Persico, 2015; Sharples, Kloos, Dimitriadis, Garlatti, & Specht, 2015). In late 2015, Coursera's CEO even stated that Coursera intended to make course videos directly searchable in search engines, further separating lectures from any context and potentially impacting the design of MOOC-based degree programs (Levin, 2015); this function has since been implemented. In this approach little emphasis is placed on developing extensive communication tools as an intrinsic part of the system, as interpersonal communication is considered less essential than the LOMs themselves.

Constructivists take the opposite approach, insofar as possible. Some CMS systems, such as Learning Activity Management System (LAMS) and Moodle, were intentionally designed to support context-dependence and constructivist pedagogies through a deliberately sequenced structure of learning activities (Ford, 2008b). In terms of online information retrieval,

Ford (2005) applies Pask's (1976) "Entailment Mesh"—a map of topics and relationships that should have no contradictions, should have no gaps in the topic structures, and should be densely linked. Ford theorizes that this mesh structure could be valuable in online systems in which learners could create and debug their own meshes, access meshes authored by subject experts for exploration and personal mesh development, access a map of all available meshes, and create networks of meshes. He also notes that meshes may be able to be integrated with other knowledge-mapping systems such as the semantic web, but indicates that so far (as of 2004), the technology was still not quite there yet to do it effectively. Similarly, McCalla's (2004) ecological approach can be used constructively because it employs learner models to create profiles of a system's learners and then uses those profiles to build a recommender system that understands the usefulness of content for various contexts (Ford, 2008a). Such systems are designed to encourage communication and sharing by multiple learners as part of expanding the learners' contextual understanding of the subject being taught. In addition, the first MOOCs, now called cMOOCs (connectivist MOOCs), were designed to build a network of connections between and among participants (De Frietas, Morgan, & Gibson, 2015). According to Anders (2015), in the earliest MOOCs much of the learning took place outside of the location of the minimal-provided teaching material through collaborative sharing on participants' own websites, blogs, and so on—a very organic and constructivist approach.

While these latter systems are indeed designed to be pedagogically constructivist, Nunes and McPherson (2003) were likely correct that, under current technological constraints, no system can be designed to be fully constructivist. However, there are clearly major divergences in what can be and is being done with online learning environments with and without communication tools being built into the system.

## The Need for Communication in Distance Education

Educational informatics tends toward the constructivist pedagogy, as it supports a view that places importance on communication in online education systems. Ford (2008b) notes that educational informatics is "a social collaborative enterprise, since one of its key defining features is a concern with the discovery, sharing and reuse of learning resources within and between learning communities" (p. 293). While this quotation does not specifically refer to online classrooms, his point is well-taken. Modern styles of education, particularly constructivist-influenced styles, see "learning [as] the process of socially creating a communal understanding" of a subject, a concept that applies equally well to face-to-face and online education modes (Nunes & McPherson, 2003, p. 4).

Communication is the primary driving force behind the creation of social networks, which in educational settings become communities of

learners. Haythornthwaite (2006) has asked where the "local" is in for-credit online education, noting that online courses lose the automatic sense of community that comes from being geographically "local" to one another in on-campus courses (p. 9). She argues that it would be possible, but challenging, to create a sense of a "local" community in an online classroom of a size reasonably comparable to an on-campus classroom. However, things become even more complicated when very large online courses are taken into account. In that case one has to consider where a "local" might be when a student is in a course with hundreds or thousands of other learners scattered across the globe. Additionally, when operating a large and geographically dispersed class, other forms of collaboration become necessary, such as figuring out how to remotely troubleshoot technology problems when the "local" is in fact not local and a user has been inadvertently excluded from the community due to these problems (Twidale & Ruhleder, 2004).

One also needs to consider the design of educational systems. There are a variety of different forms of online education in current use, although they generally fall into two groups: *synchronous* and *asynchronous*. Synchronous systems require all participants to be active in a virtual space simultaneously part of the time; asynchronous systems allow students to fully choose their own time for participation, with some systems, especially those utilizing MOOC platforms, being offered completely on-demand, with few if any hard deadlines. The latter models make communication challenging because having a shared sense of time and (virtual) space is still needed for many forms of useful conversation (Bruce, 2004).

## New Tools for e-Learning

With the decreasing difference in information and communication tools used by on-campus and distance-education students, it becomes ever more imperative for an institution to have the right communication tools to suit the needs of its students and faculty. Many of these tools are or can be collaborative, while others are intended for individual use. The primary online education systems in use today are

- content/course management systems (CMSs);
- learning management systems (LMSs);
- learning content management systems (LCMSs);
- virtual classrooms (VCs); and
- massive open online courses (MOOCs).

They all have specific strengths and weaknesses, and some can be integrated together. The first three systems are often used by both on-campus and distance-education (online) students, while VCs and MOOCs are designed to simulate a classroom for use specifically by online students.

*CMSs, LMSs, and LCMSs*

While CMSs, LMSs, and LCMSs have similar names and acronyms and are sometimes used interchangeably, they are not identical concepts. CMSs arose in the 1990s in reaction to the expansion of the internet. Now ubiquitous, they "are used primarily for online or blended learning, supporting the placement of course materials online, associating students with courses, tracking student performance, storing student submissions and mediating communication between the students as well as their instructor" (Watson & Watson, 2007, p. 29). This definition is important, because some researchers, such as Watson and Watson, draw a clear distinction between CMSs and LMSs, arguing that while the latter may include aspects of a CMS, an LMS is broader in scale, focusing on managing learners and tracking learning activities and competencies. Lonn and Teasley (2009, p. 693) claim that "embedded in this change is the notion that learning involves more than providing course content efficiently." However, as CMS remains the most common term, it will be used hereafter to refer to both types of systems.

While CMSs and LMSs primarily track students, LCMSs are a "class of software products that include a learning object repository (LOR) with authoring and delivery interfaces for e-learning and knowledge management designed to support the express capture, delivery, and measurement of knowledge in a web-based manner" (Brockbank, 2003, p. 162). In other words, they allow for the storage of content modules that can be reused in new courses without having to start from scratch (Hall & Hall, 2004); they also allow for collaboration among knowledge creators through the use of simultaneous course editing and the sharing of resources in order to more quickly produce courses using pretested content. MOOCs share elements of both CMSs and LCMSs because they are designed to track students as well as to store reusable and transformable content modules for constant reuse.

VCs are focused on interactive delivery of instructional content. They are simultaneously quite different from the other systems but can integrate with them to form a complete overarching system. VCs utilize a range of technologies including VoIP (voice over internet protocol) and video calling; allow for the sharing of whiteboards, slides, and applications; and archive live class sessions for later consultation (Brockbank, 2003). As such, they are used for distance-education courses to support interactive class sessions that can be viewed later by both students who attended and participated in the live session and those who were unable to attend a given class.

*Implementation of Course Software*

A primary consideration when deploying and utilizing course software is meeting the needs of the users in order to engage them as much as possible.

Different systems offer different tools with so great a range of features that multiple researchers have designed systems to help instructors choose the best system for their needs (Cavus, 2009; Momani, 2010b). Admittedly, decision-making will frequently be done above the level of instructors, and may have been done years previously, but unfortunately, there is considerable churn in the learning management business as systems are retired or otherwise need to be replaced, thus requiring constant reevaluation of system options and limitations. Having to replace a system will often bring unexpected challenges, such as incompatibility with other systems, unless both the old system and the new system use an interoperable architecture (Boticario & Santos, 2007; Sturgess & Nouwens, 2004; Watson & Ahmed, 2004; "What Counts Most," 2005). Indeed, there are three primary types of systems—proprietary; standards-based; open-architecture—only some of which can communicate with one another (Brockbank, 2003). Within each of these categories are systems that support different aspects of the learning environment.

Different systems are useful within different contexts; for example, some systems are more customizable, some provide student-tracking, some work better with synchronous content, some are more user-friendly, some provide extensive student file-sharing, some support portfolios, and some provide better collaboration and communication options (Clark, Cossarin, Doxsee, & Schwartz, 2004; Momani, 2010a; Özdamlı, 2007; Uzunboylu, Özdamlı, & Özçınar, 2006). Overall, both the current and future needs of a given institution's students, faculty, and staff need to be considered when choosing learning tools, and both on-campus and online student needs must be evaluated and addressed. Where possible, implementing separate tools for separate situations may help, but when that is not possible, there are still many options to choose from.

*e-Learning Tools*

Although CMSs, VCs, and MOOCs do have a wide range of tools, many of these tools are common to the majority of them. The tools can be grouped into several categories: asynchronous noncollaborative; asynchronous collaborative; and synchronous. Within the category of *asynchronous noncollaborative tools* are highly individual tools such as reading repositories, assignment-submission interfaces, quiz tools, lesson tools, gradebooks, and blogs. These tools are asynchronous because they can be accessed at any time the system permits, and are noncollaborative because they are used on a solitary basis, involving little communication among course members (Cole & Foster, 2008; Momani, 2010a). One advantage to CMS (and some MOOC platform) software is that it is usually fairly flexible with regard to the types of media that can be submitted for both readings and assignments, and it can encompass a range of quiz types for automatic scoring. Many quizzes can be taken again and again, ungraded, in order

for students to test their own learning process. Students can keep track of their progress through the course lessons and see all of their grades in one place. Blogs can sometimes become somewhat interactive and allow communication through use of comments and tagging and even group blogging, although most educational blogging activity also tends to be solitary (Momani, 2010a). These tools are of roughly equal value to both on-campus and online students, although more necessary for online students who have no alternatives to these tools.

In contrast to the noncollaborative tools, *asynchronous collaborative tools* have slightly more usefulness for online students than for on-campus students. Some of these tools include forums, messaging, glossaries, and databases (Cole & Foster, 2008; Momani, 2010a). Forums in particular are essential for online students, especially those in asynchronous and MOOC-based programs. They may serve as a venue for both academic and social discussions, thus helping students who are not physically together in a classroom to interact in a constructive manner. Similarly, messaging functions can help provide online students with a method to talk privately about both coursework-related and non-coursework-related issues. This function could be replaced by email and, in fact, some messaging services push to email, but being able to look other students up and message them directly can be beneficial. Messaging can also be used between instructors and students for sending out notices, providing support, and encouraging participation. Glossaries may be of more use in courses where students are learning new vocabulary, whether in introductory courses or language courses, but having the ability to create a course-vocabulary list and collaboratively annotate it can be useful. Some systems also allow students to rate other peoples' contributions to the glossary, indicating which entries they find most valuable. An additional form of asynchronous collaboration uses a database-creation tool that is separate from the database that runs the CMS. This kind of tool allows students to construct a group database that can be used to store research or files or track a project. All of these tools can be invaluable for helping online students find ways to work together and share knowledge remotely (Cole & Foster, 2008).

The final group of system-based tools is that of *synchronous collaborative tools*. Not all of these tools are available to all distance students, but potential tools include chat rooms, wikis, audio/video conferencing, and the previously discussed VCs (Cole & Foster, 2008; Lee & McLoughlin, 2010; Momani, 2010a; Raman, Ryan, & Olfman, 2005). While CMSs' messaging functions are generally asynchronous, most CMSs have chat functions that allow for simultaneous and synchronous group communication. The functions are not always enabled, however; interestingly, this can apply for multiple reasons. First, the instructor may not wish to have an active chat in the course either due to being an on-campus session or personal preference; or second, the course may have a different option available

within a VC. Since the creation of the first open, collaborative wiki in 2001, wikis have become a common feature in CMSs, where they can be used for taking shared notes, managing a group project, brainstorming on ideas, and many other functions. Embedded wikis may only be accessible to specific categories of users such as individual students and instructors, small groups, or an entire class (Cole & Foster, 2008). In contrast, other instructors may use alternative wikis, either ones made available through the institution or publicly accessible wikis. The appeal of wikis is that they are often free, open source, easy to learn, synchronous and asynchronous, persistent and updatable, many-to-many, and can serve as a knowledge base (Raman et al., 2005).

The most direct and immediate online communication method offered by CMSs is embedded audio/video conference software, although, within distance-education contexts, this is more likely handed over to a VC (Momani, 2010a). Although VCs were previously discussed in conjunction with CMSs and LMSs, they count as a synchronous collaborative tool as well. Through their use of synchronous voice and text, integration of live video and audio, and instantaneous feedback, they are a primary tool for online courses (Brockbank, 2003). At the same time, not all distance courses use VCs, just as not all distance-education programs offer synchronous sessions. Students may have different preferences for the level of synchrony and type of communication, so finding a good fit between student and offering is essential.

## Learning Management Tools and Engagement

While CMSs, LMSs, LCMSs, and VCs have become ever more present in the on-campus classroom, several of the asynchronous and synchronous tools can be far more valuable for distance learners. Effective use of these tools can greatly increase the level of engagement of faculty and students alike, while their ineffective use can cause considerable damage, such as students possibly feeling dissociated from the course and institution, failing to connect with classmates, losing interest in participating in the course, or simply doing poorly in the course.

### *The Use of Tools by Faculty and Administration*

One of the primary challenges to the effective use of CMSs, LMSs, LCMSs, VCs, and MOOCs is that they are not pedagogically neutral (Coates, James, & Baldwin, 2005). Using a CMS or MOOC platform in a course will have an impact on the way in which an instructor teaches the course. This does not mean that teachers cannot be very effective when using CMSs—in fact, some classes and instructors are well-suited to their use; however, instructors often need instruction on how to use the CMS to its fullest extent, but it is a step frequently overlooked, leading to less effective use of the CMS's tools than might otherwise occur (Carmean & Haefner, 2002). Similarly,

some subjects and courses are less well-served by many of the CMS tools. Additionally, many MOOC platforms are operated by entities other than the instructor or the instructor's home institution, and those operating entities may also have specific pedagogical approaches that can be at odds with instructors (Levin, 2015).

Constructivist advocates like Carmean and Haefner (2002) claim that using a CMS can lead to deeper learning through increased social learning (using CMS interactivity tools), active learning (using the assessment tools), contextual learning (allowing for the integration of multiple types of content), engaged learning (allowing students to access materials on their own time while potentially also providing synchronous sessions), and student-owned learning (letting students take responsibility for when and where they will learn)—all of which are beneficial outcomes. As a result they expect increased and enriched student learning.

However, simultaneously, other researchers see concerns. In economic terms, some critics argue that CMSs potentially represent a focus on economies of scale rather than on true learning, and one in which institutions are finding new ways to "control and regulate teaching" in a way that will lead to "preprogrammed forms of teaching" rather than to support for learning (Coates et al., 2005, pp. 25, 27). These critics argue that institutions are placing competitive pressure on one another to adopt the systems rather than considering the impact of CMSs on themselves, their faculty, and their students. These concerns carry over to MOOC-based degree programs as well. Adopting a CMS or MOOC platform can lead to a considerable change in the way that some aspects of education take place, including in communication and engagement.

While for some students simply having the technology available is sufficient for them to make use of it, in most cases faculty need to specifically plan to encourage student engagement online; they also need to plan for their own engagement with the systems. For example, while faculty value the communications tools in CMSs higher than do students, many faculty members still regard CMSs as primarily a way to provide content (Lonn & Teasley, 2009; Lopes, 2008). A study at the University of Memphis and Tennessee State University found that of faculty who used the CMS frequently, 82 percent of both online and web-enhanced course instructors used email to reply to students within three days, but 63 percent of online instructors never used real-time discussion technology themselves, and only 26 percent of total instructors required students to participate in online discussions (Mncube-Barnes, 2010). This level of disengagement with the communications tools on the part of instructors helps to encourage disengagement on the part of students as well.

However, part of the challenge over the control and use of communication technology in online education likely relates to both buy-in and usability issues. Who is designing the systems, for whom, and how and by

whom are they being tested? If systems do not meet the felt needs of their intended users, whether instructors or students, they will not be used as intended (Kling et al., 2005). When control is taken away from the instructors who are to use the systems with their students, and they are not shown convincing uses for them, why would they use them if not forced to do so? If online communication technology is to be beneficial for instructors and students alike, it is imperative for instructors to feel that they have a vested interest in, and some degree of control over, how that communication technology is implemented and utilized.

*The Use of Tools by Students*

Although students do not necessarily enter higher education ready to take part in online discussions or other forms of interactive engagement, they do come in expecting access to the newest technologies (Coates et al., 2005). Characteristics attributed to the so-called e-generation include expectations of multitasking and immediate response to queries, a preference for typing over handwriting, a desire to stay constantly connected to friends and family using known internet applications, and a reliance upon the internet for finding information. For many of these students CMSs are viewed as a way to gain instant access to materials and grades, to catch up on missed classes, and maybe to send email to peers and instructors. They primarily use higher education information and communication technologies for convenience rather than for improving learning or building community (Krause, 2007). As such, these students are more inclined to value the efficiency of logging onto the system, extracting the materials they need, and then logging back off, rather than wasting time by stopping to use the interactive tools when they do not see a need for them (Lonn & Teasley, 2009). For such students, a primary consideration is a transparent interface in the CMS that allows them to easily find the information they want to access, rather than a system that provides challenges or unnecessary tools. They also expect instructors to be quick to respond, both to email and assignments, knowledgeable about their questions, and willing to provide constant feedback on their progress in the class (Cook & Crawford, 2010). All of the generationally attributed characteristics make the potentials inherent in interactive technology beneficial for the students, but the students may not realize this to be the case.

Overall, although students have expressed a strong preference for courses in which instructors use CMSs, they tend to be disengaged from the "discussion boards . . . course blogs and journals and wikis, podcasts and the virtual classroom"—that is, all of the interactive tools (Lopes, 2008, p. 7). For distance students especially, the lack of discussion can lead to feelings of isolation, and they may find it difficult to justify continuing in their program if the balance tips between costs and motivation due to the lack of support, lack of educational experience, and lack of skill with

the requisite technologies (Lee & McLoughlin, 2010; Rovai et al., 2008). For MOOC-based degree programs, the distance may seem even greater, especially if many of the other learners in an open-enrollment MOOC course are not part of the degree program itself, and so have different levels of investment in the course.

A number of partial solutions are being proposed for how to help remedy this separation. As part of their instruction, instructors can encourage or require group work and interactivity among students, whether asynchronous or synchronous, and if the subject is interesting enough, students will find a way to overcome the logistical challenges of working together while apart (Cook & Crawford, 2010). In an attempt to test how best to support student communication, a 2014 study from a MOOC course on "Creativity, Innovation and Change," offered by Penn State, encouraged learners to form learner-directed groups to "enhance their MOOC experience" (Zhang et al., 2016, p. 812). Early in the course students were interviewed about their preferred mode of group communication in an attempt to facilitate optimal group composition. The researchers found that of the 770 survey respondents, 53 percent chose synchronous methods (for example, text chat, audio/video, and so on), 45 percent chose asynchronous text posts, and 3 percent preferred an alternate method. They discovered a greater preference for asynchronous texts from female participants and participants with higher education levels, greater English proficiency, and older ages. However, there was no statistically significant relationship between choice of communication mode and course-completion rates, and over 60 percent of postcourse survey respondents reported feeling that their groups were unsuccessful, because many of the groups stopped communicating regularly or even at all as the course progressed. Zhang and coauthors argue that participation in the groups by instructors might have increased the success rates, further emphasizing the suggestion that communication among students be actively encouraged and supported by instructors in order for such communication to be successful and productive.

In addition to using the communication tools provided by CMSs, instructors of distance-education students can make use of Web 2.0 tools such as RSS and podcasting, media-sharing applications, and social bookmarking, as well as other social software (for example, Facebook, chat programs, and so on) that can provide conversational interaction, social feedback, and social networking (Lee & McLoughlin, 2010). This has been done effectively in some MOOC courses by crowdsourcing photographic, sensor, or geographic data from participants' cellphones for use in class activities (Sharples et al., 2015). The study conducted by Zhang et al. (2016) found that MOOC learners' preferences for synchronous tools included such Web 2.0 text-chat tools as "Skype, Google chats, QQ, WeChat, etc.," and audio/video tools like "Skype, Zoom, Google Hang-

outs, etc.," while the asynchronous tools included such Web 2.0 tools as "Blogs, QQ Zones . . . and Twitter," as well as the Coursera forums and email (Zhang et al., 2016, pp. 812–813). Online office suites like Google's Docs, Sheets, and Slides are another particularly interesting technology for distance-education students, because they combine collaborative synchronous workspaces with embedded chat/commentary functions to enable far-flung students to both work together on the same materials and to discuss those materials at the same time.

In the case of specific academic programs, students may also have the benefit of intermittent face-to-face sessions. While rare, programs such as that of the University of Illinois's School of Information Sciences' LEEP distance-education program introduces students with an intensive, face-to-face session that enables them to meet other members of their distance cohort and, until 2016, brought them back for a short on-campus session every semester. Many LEEP courses are also taken by on-campus students whom the official LEEP students may also meet while visiting the campus (Maeroff, 2003; School of Information Sciences, 2016). For some students, this kind of session where they physically meet other students at least once can also help them to connect with the institution that they are attending remotely.

Even for students who do not have on-campus sessions or use VCs, the increased use of any of these tools by instructors and students can help distance-education students feel more connected to both their fellow students and the program and thus more likely to remain part of it.

## The Challenges of Evaluating Communication

Why is research on the quality and effectiveness of communication in online learning so difficult? The quality and effectiveness of communication could be considered to be subjective because it can be difficult to judge what makes a "quality" conversation and "effectiveness" is difficult to measure without something to compare it against.

Attempts at evaluating the quality and effectiveness of online communication have taken a variety of forms. Research done on the uses of the CMS WebCT in the early 2000s found that the system itself caused communication challenges for students. WebCT was designed around disconnected learning modules, thereby causing students to be unable to develop a "community of learners" through shared concurrent experience. This led course designers to commence a project to create a "virtual social space" in order for students to be able to connect with one another. Similarly, other researchers have discovered that by providing the means for communication, they can help a learning community to develop, which can lead to more authentic, constructivist-influenced learning (Levy et al., 2003, pp. 301–302).

A longitudinal study of LEEP students conducted in the early 2000s

found that once they had become comfortable with making themselves visible in "persistent conversation"—that is, text-based forms of communication that remain available for viewing after a conversation ends—they would actively participate, helping to develop their sense of community (Haythornthwaite & Bregman, 2004). Such persistent communication would also be available for evaluation and study by researchers after the course was completed; however, knowing that their conversations will be studied may impact students' participation patterns.

In contrast to communication patterns in LEEP courses, a separate study from the same time period found that in an e-learning course for IT professionals that used a system offering communication tools, the tools went underused despite being helpful to the students, thus demonstrating that even technologically skilled students are not always as proficient as expected (Levy et al., 2003). Similarly, as previously mentioned, students in a MOOC course who specifically volunteered for communication groups also failed to maintain open channels of communication without the support and oversight of instructors (Zhang et al., 2016). This suggests that teaching students to use communication tools is as critical to quality communication as providing the tools.

Another form of evaluation of online learning communication comes from a more theoretical perspective. Laurillard (2002) constructed a "conversational framework" model for analyzing the dialogic relationship between two participants in a learning activity that uses educational media. The relationships described include four processes: discursive, adaptive, interactive, and reflective. By applying her framework to communication media, Laurillard demonstrates that different forms of communication media allow greater or lesser degrees of reflection and adaptation of ideas by students and teachers. One-way media, such as video lectures, tend to simply transmit teachers' own conceptions of subjects to their students, forcing the students to come up with their own (mis)conceptions; however, two-way media, such as interactive chat sessions, allow for actual dialogue in which both students and teachers have an opportunity to conceptualize and reconceptualize their respective understandings of subject material, thus increasing the quality of their communication and rendering the online learning process much more effective. Applying this framework broadly to current online courses can provide an insight into how well certain course designs support dialogic activity, but cannot currently influence many forms of course design.

## Future Work

My own research builds on the existing educational informatics research into the role of communication in online education, specifically examining how learners in paid MOOC courses and specializations (set courses offered in a connected series that result in an earned specialization-level

certificate of completion) offered by universities on the Coursera MOOC platform may be impacted by various forms of communication, including both in-course and Web 2.0 tools. My goal is to examine what impacts different types of courses might have on students' communication expectations and needs and how different levels of commitment to a course or specialization (paid or unpaid) may affect students' persistence and success or failure.

Students may enroll in MOOC courses for a variety of reasons, whether it is to earn a particular technical skill, gain additional job credentials, explore a topic new to them, or improve their English proficiency. Students have a wide range of motivations and a wide range of potential courses available to them, such as digital marketing, subsistence agriculture, poetry, data mining, and many more. Some of these courses appeal to lifelong learners, others to specific skill-seekers. Some courses are even part of emerging graduate-level degree programs in business and data science.

Coursera's MOOC students currently sign up for courses lasting four or more weeks, with most operating on a soft cohort system. Students are entered into sessions with new start dates scheduled every few weeks that offer internal deadlines, but, if students miss deadlines, they can be bumped over into the next cohort/session without losing their progress. Current guidelines from Coursera lead to classes that have been shortened from eight to sixteen weeks (as was the original course design) to only four to six weeks, with related material being spread across multiple courses in specializations or sequences.

Individual four-week classes may not last long enough for many students to feel the need to communicate with one another or with the instructor/community mentors unless they have a problem with either the course's material or subject, or unless they are required to do so. Their motivations for taking a given course may also play into whether they feel the need to communicate because students who only want to gain a specific technical skill may feel less need to talk to others than, say, students who want to discuss poetry or improve their English. However, even in classes of short duration, communication may impact satisfaction levels within and across courses, leading to subsequent impact on persistence and completion rates. Increasing numbers of courses are also now being offered as parts of specializations, which can add up into sequences lasting several months. Communication among the learners themselves, and between learners and faculty, may have an impact on persistence across the specializations.

Additionally, many Coursera courses now require students to pay for the course in order to have access to the graded materials and thus earn a certificate of completion, limiting nonpaying students to only viewing lectures and commenting on forums. As a result, patterns of communication between payees and auditors in limited-access courses may differ, while

also further differing from that of learners in fully free courses. Encouragement from the platform provider leads to many of the payees actually ending up prepaying an entire four to seven course specialization in advance. As prepaying for the entire sequence encourages a higher level of commitment than that considered in Zhang et al.'s (2016) study, this may also increase the potential significance of communication between learners and instructors and among the learners themselves.

For my dissertation, I plan to utilize course-discussion-group, enrollment, and completion data, supplemented by survey and interview data, to explore the following questions:

- Does the type of on-demand course (subject matter and/or format) impact communication needs and patterns of learners, and if so, how?
- Does requiring payment for full participation impact the level and type of communication?
- For specializations, students need to persist in the program for an extended period of time to gain a particular certificate; does communicating with others make persistence across the specialization more likely?

Understanding the answers to these questions can help to determine how best to support students' learning processes, encourage student persistence, and build student success.

## Conclusion

Current literature has demonstrated that the use of CMS-based and Web 2.0 communication tools is already changing the education paradigm as distance learning becomes more social (Lee & McLoughlin, 2010). Some of the Web 2.0 tools are being integrated into CMSs and MOOC platforms, while others are being used outside of them, but both forms can help to bridge the gap for distance learners. Distance education has gone through considerable changes over the past 180 years, as systems that support distance education rise and fall. From correspondence courses to modern online education, teachers and students have grown ever closer—in "transactional distance," if not geographical distance. Current students have access to asynchronous noncollaborative tools, including online reading repositories, ways to submit assignments that are returned with comments and grades, ways to take quizzes that can also be returned with comments and grades, interactive online lessons, and blogs. Students can also use asynchronous collaborative tools, such as forums, messaging services, glossaries, and databases. Finally, they have access to synchronous tools, such as chat rooms, wikis, audio/video conferencing, and VCs. Distance students can also use Web 2.0 tools, including social media, RSS and podcasting, media-sharing applications, social bookmarking, and online office suites.

Although distance students rarely have the opportunity to interact

directly face to face with their peers and instructors, through faculty-encouraged use of course-based and external communication tools they can be supported and made to feel connected to other students and faculty as part of a body of learners. Research has shown that feeling supported and connected can be a significant factor in reducing students' likelihood of dropping out, thus resulting in increased student satisfaction with and success in online academic courses and programs. The existing literature provides a firm foundation for further research on the best ways to support students in new modes of online education, such as that offered by MOOCs.

## References


Anders, A. (2015). Theories and applications of massive open online courses (MOOCs): The case for hybrid design. *International Review of Research in Open and Distributed Learning, 16*(6), 39–61.

Boticario, J. G., & Santos, O. C. (2007). An open IMS-based user modelling approach for developing adaptive learning management systems. *Journal of Interactive Media in Education, 2.* Retrieved from https://adenu.ia.uned.es/web/en/biblio/an_open_ims_based_user_modelling_approach_for_developing_adaptive_learning_management_systems

Brockbank, B. J. (2003). Learning management systems for e-learning. In G. M. Piskurich (Ed.), *The AMA handbook of e-learning: Effective design, implementation, and technology solutions* (pp. 151–169). New York: American Management Association.

Bruce, B. C. (2004). Maintaining the affordances of traditional education long distance. In C. Haythornthwaite & M. M. Kazmer (Eds.), *Learning, culture and community in online education: Research and practice* (pp. 19-32). New York: Peter Lang.

Bruner, J. (1996). Culture, mind, and education. In *The culture of education* (pp. 1–43). Cambridge, MA: Harvard University Press.

Carmean, C., & Haefner, J. (2002). Mind over matter: Transforming course management systems into effective learning environments. *EDUCAUSE Review, 37*(6), 26–34.

Cavus, N. (2009, November). *Efficient evaluation system for learning management systems.* Paper presented at the Twelfth Bilişim Teknolojileri Işığında Eğitim Kongresi (BTIE'12), Ankara, Turkey. Retrieved from https://www.researchgate.net/publication/235912719_Efficient_evaluation_system_for_learning_management_systems

Chute, A., Thompson, M., & Hancock, B. (1999). *The McGraw-Hill handbook of distance learning.* New York: McGraw-Hill.

Clark, S., Cossarin, M., Doxsee, H., & Schwartz, L. (2004). Integrated learning management systems. *International Review of Research in Open and Distance Learning, 5*(1), 1–5.

Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. *Tertiary Education and Management, 11*(1), 19–36.

Cole, J., & Foster, H. (2008). *Using Moodle: Teaching with the popular open source course management system* (2nd ed.). Sebastopol, CA: O'Reilly Community Press.

Cook, R. G., & Crawford, C. M. (2010). Addressing online student learning environments and socialization through developmental research. In B. Olaniran (Ed.), *Cases on successful e-learning practices in the developed and developing world: Methods for the global information economy* (pp. 275–297). Hershey, PA: Information Science Reference.

De Frietas, S. I., Morgan, J., & Gibson, D. (2015). Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision. *British Journal of Educational Technology, 46*(3), 455-471.

Dewey, J. (1997). *Experience and education.* New York: Touchstone. (Original work published 1938)

Entwistle, N. (2001). Styles of learning and approaches to studying in higher education. *Kybernetes, 30*(5–6), 593–603.

Ford, N. (2004). Towards a model of learning for educational informatics. *Journal of Documentation, 60*(2), 183–225.

Ford, N. (2005). "Conversational" information systems: Extending educational informatics support for the web-based learner. *Journal of Documentation, 61*(3), 362–384.

Ford, N. (2008a). Educational informatics systems: Social approaches. In *Web-based learning through educational informatics: Information science meets educational computing* (pp. 293–325). Hershey, PA: IGI Global.

Ford, N. (2008b). ICT developments: Learning design and teaching. In *Web-based learning through educational informatics: Information science meets educational computing* (pp. 191–241). Hershey, PA: IGI Global.

Freire, P. (2012). *Pedagogy of the oppressed* (M. B. Ramos, Trans.). New York: Bloomsbury Academic. (Original work published 1970)

Graziadei, W. D., Gallagher, S., Brown, R. N., & Sasiadek, J. (1997). *Building asynchronous and synchronous teaching-learning environments: Exploring a course/classroom management system solution.* Retrieved from http://files.eric.ed.gov/fulltext/ED405842.pdf

Hall, S. O., & Hall, B. (2004). A guide to learning content management systems. *Training, 41*(11), 33–37.

Haythornthwaite, C. (2006, September). *The social informatics of elearning.* Paper presented at the Information, Communication and Society (ICS) 10th Anniversary International Symposium, York, England. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.222.9186&rep=rep1&type=pdf

Haythornthwaite, C., & Bregman, A. (2004). Affordances of persistent conversation: Promoting communities that work. In C. Haythornthwaite & M. M. Kazmer (Eds.), *Learning, culture and community in online education: Research and practice* (pp. 129–143). New York: Peter Lang.

Holmberg, B. (1986). *Growth and structure of distance education.* London: Croom Helm.

Keegan, D. (1996). *Foundations of distance education* (3rd ed.). New York: Routledge.

Kling, R., Rosenbaum, H., & Sawyer, S. (2005). The consequences of ICTs for organizations and social life. In *Understanding and communicating social informatics: A framework for studying and teaching the human contexts of information and communication technologies* (pp. 13–31). Medford, NJ: Information Today.

Krause, K.-L. (2007). Who is the e-generation and how are they fairing in higher education? In J. Lockard & M. Pegrum (Eds.), *Brave new classrooms: Democratic education and the internet* (pp. 125–139). New York: Peter Lang.

Laurillard, D. (2002). Part II: Analysing the media for learning and teaching. In *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.) (pp. 79–177). London: RoutledgeFalmer.

Lee, M. J. W., & McLoughlin, C. (2010). Beyond distance and time constraints: Applying social networking tools and Web 2.0 approaches in distance education. In G. Veletsianos (Ed.), *Emerging technologies in distance education* (pp. 61–87). Edmonton, AB: Athabasca University Press.

Levin, R. (2015, November 13). Your professional success: What students, faculty, & staff need to know in the era of online education [Video file]. Retrieved from https://mediaspace.illinois.edu/media/Rick+LevinA+Your+Professional+SuccessA++What+Students%2C+Faculty%2C+%26+Staff+Need+to+Know+in+the+Era+of+Online+Education/1_a7uhax7w

Levy, P., Ford, N., Foster, J., Madden, A., Miller, D., Nunes, M. B., & et al. (2003). Educational informatics: An emerging research agenda. *Journal of Information Science, 29*(4), 298–310.

Lonn, S., & Teasley, S. D. (2009). Saving time or innovating practice: Investigating perceptions and uses of learning management systems. *Computers & Education, 53*(3), 686–694.

Lopes, V. (2008, December). *Course management systems and campus-based learning.* Canadian Society for the Study of Higher Education, Ottawa (professional file no. 29). Retrieved from http://files.eric.ed.gov/fulltext/ED535133.pdf

Maeroff, G. I. (2003). *A classroom of one: How online learning is changing our schools and colleges.* New York: Palgrave Macmillan.

Marshall, G. (1993). *Informatics and changes in learning: The American dilemma—opposing epistemological perspectives and unanswered questions.* Retrieved from http://files.eric.ed.gov/fulltext/ED395576.pdf

McCalla, G. (2004). The ecological approach to the design of e-learning environments: Purpose-based capture and use of information about learners. Special issue on the educational semantic web. *Journal of Interactive Media in Education, 7*, 1–23.

Mncube-Barnes, F. M. (2010). *The use of collaboration tools when teaching with learning content*

*management systems (LCMS)*. Retrieved from ETD Collection for Tennessee State University (paper AAI3404247), http://digitalscholarship.tnstate.edu/dissertations/AAI3404247

Momani, A. M. (2010a). *Comparison between two learning management systems: Moodle and Blackboard*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1608311

Momani, A. M. (2010b). *Web-based evaluation system for learning management systems*. Retrieved from https://ssrn.com/abstract=1574312

Nunes, M. B., & McPherson, M. (2003, July). *Constructivism vs. objectivism: Where is difference for designers of e-learning environments?* Paper presented at the IEEE International Conference on Advanced Learning Technologies (ICALT 2003), Athens, Greece. Retrieved from https://www.researchgate.net/publication/221424878_Constructivism_vs_Objectivism_Where_is_difference_for_Designers_of_e-Learning_Environments

Özdamlı, F. (2007). *An evaluation of open source learning management systems according to administration tools and curriculum design*. Retrieved from http://files.eric.ed.gov/fulltext/ED500168.pdf

Papert, S. (1993). *Mindstorms: Children, computers, and powerful ideas* (2nd ed.). New York: Basic Books.

Pask, G. (1976). Styles and strategies of learning. *British Journal of Educational Psychology, 46*(2), 128–148.

Raffaghelli, J. E., Cucchiara, S., & Persico, D. (2015). Methodological approaches in MOOC research: Retracing the myth of Proteus. *British Journal of Educational Technology, 46*(3), 488–509.

Raman, M., Ryan, T., & Olfman, L. (2005). Designing knowledge management systems for teaching and learning with wiki technology. *Journal of Information Systems Education, 16*(3), 311–320.

Rovai, A. P., Ponton, M. K., & Baker, J. D. (2008). *Distance learning in higher education: A programmatic approach to planning, design, instruction, evaluation, and accreditation*. New York: Teachers College Press.

Rumble, G. (1986). *The planning and management of distance education*. London: Croom Helm.

School of Information Sciences, The iSchool at Illinois. (2016). Leep online learning. Retrieved from https://ischool.illinois.edu/academics/degrees/mslis/leep

Sharples, M., Kloos, C. D., Dimitriadis, Y., Garlatti, S., & Specht, M. (2015). Mobile and accessible learning for MOOCS. *Journal of Interactive Media in Education, 2015*(1), 1–8.

Simonson, S., Smaldino, S., Albright, M., & Zvacek, S. (2000). *Teaching and learning at a distance: Foundations of distance education*. Upper Saddle River, NJ: Prentice-Hall.

Sturgess, P., & Nouwens, F. (2004). Evaluation of online learning management systems. *Turkish Online Journal of Distance Education, 5*(3). Retrieved from http://dergipark.ulakbim.gov.tr/tojde/article/view/5000102950

Twidale, M. B., & Ruhleder, K. (2004). Over-the-shoulder learning in a distance education environment. In C. Haythornthwaite & M. M. Kazmer (Eds.), *Learning, culture and community in online education: Research and practice* (pp. 177–194). New York: Peter Lang.

Uzunboylu, H., Özdamlı, F., & Özçınar, Z. (2006). *An evaluation of open source learning management systems according to learners tools*. Retrieved from http://files.eric.ed.gov/fulltext/ED494265.pdf

Watson, J., & Ahmed, P. K. (2004). Learning in the age of global information technology: Development of a generic architecture for an advanced learning management system. *Campus-Wide Information Systems, 21*(1), 4–21.

Watson, W. R., & Watson, S. L. (2007). An argument for clarity: What are learning management systems, what are they not, and what should they become? *TechTrends: Linking Research and Practice to Improve Learning, 51*(2), 28–34.

What counts most in choosing a learning management system. (2005). *HR Focus, 82*(10), 3–5.

Zhang, Q., Peck, K. L., Hristova, A., Jablokow, K. W., Hoffman, V., Park, E., et al. (2016). Exploring the communication preferences of MOOC learners and the value of preference-based groups: Is grouping enough? *Education Technology Research and Development, 64*(4), 809–837.

---

Paige D. Cunningham is a fourth-year doctoral student in the School of Information Sciences at the University of Illinois at Urbana-Champaign. Her field of study

is educational informatics with a focus on communication in online education. She is particularly interested in the correlation among learner motivations, learner persistence, and learner communication patterns in MOOC courses, especially within MOOC specializations and MOOC-based degree programs. She currently serves as a research assistant with the University of Illinois's Center for Innovation in Teaching and Learning's Data Analytics Group where she specializes in documenting, cleaning, and analyzing the university's Coursera data.