



The effects of technology on the Community of Inquiry and satisfaction with online courses

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ABSTRACT

This paper extends the research on the Community of Inquiry (CoI) framework of understanding features of successful online learning to include the effects of the software used to support and facilitate it. This study examines how the Learning Management System (LMS) affords people the ability to take actions in an online course. A model is proposed to explain the effect of LMS affordances on the Community of Inquiry and on course satisfaction, and propose and test several hypotheses about their relationships. A pilot study found that while two common Learning Management Systems had different tools, faculty varied widely in their use and perception of the affordances of the tools. In the subsequent quantitative study, surveys were administered to 605 online students in a large Midwestern university. Regression analysis found that perceived LMS affordances predicted teaching, cognitive and social presence among students; in addition, satisfaction with the LMS predicted course satisfaction.

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1. Introduction

Online learning is increasing in American universities; almost one-third of all post-secondary students have taken at least one online course (Allen & Seaman, 2011). In these fully online courses, all instruction is mediated by technology; in most cases this is a Learning Management System (LMS) such as Blackboard, Desire2Learn, or Moodle. Instructors provide course information, communicate and share feedback through the LMS software, and students discuss content, communicate and share their work through it. However, little is known about the effects of LMS technology on how faculty teach and how students learn. Thus, it is critical to understand the effects of LMS because both opportunities for learning and the relationships among students and teachers are developed through these tools. The present study seeks to examine the effects of LMS technologies on student perceptions of, and reactions to, online learning across multiple courses, instructors and content areas.

LMSs are extremely expensive to purchase and maintain (Butler University, 2012a; Hill, 2012). Most systems consist of proprietary software that universities can license and either access from the private company's computer servers or maintain on their own computer servers. Companies such as Blackboard charge a substantial annual fee, typically over \$100,000 per year, for access to the software and far more for hosting the system. Other LMS software, such as Moodle, is

free and openly available; however, maintaining the computer servers, installing, maintaining and upgrading the software require both investment in equipment and personnel (Butler University, 2012a). Once the LMS is available, faculty and students must be trained to use it, and course materials must be developed and instructional tools set up to support teaching and learning (Chao, 2008; Petherbridge & Chapman, 2007). This involves a significant investment of time on the part of all faculty who teach online or who use online resources to supplement their classes, as well as by instructional design staff who train and support faculty and students. It can take tens of thousands of person-hours for a university to transition to a new system. It is therefore extremely important to understand the effects of the LMS on teaching and learning.

The technology used to support an online course may affect the frequency and manner in which students and faculty interact with one another, provide and receive feedback, and interact with course materials. Successful online courses create a *Community of Inquiry* (CoI) where students interact with one another, the instructor and the learning materials to develop new knowledge and skills. When online courses have a strong CoI, students participate in discussions, perceive that they learn more, are more satisfied with the learning experience and have greater retention (Arbaugh, 2008; Boston et al., 2009; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005; Richardson & Swan, 2003; Swan, 2002). For that reason, it is appropriate to examine the relationships between the technology used to host online courses and the ability that it provides for students and faculty to take actions such as to communicate and to share and find resources, as well as the relationships with the CoI.

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This study explores how students perceive the LMS used to host an online course, and whether those perceptions affect the success of online instruction. Several questions guide the research: does the LMS, and students' perceptions of its features, affect student satisfaction and the strength of the Col in the course? Does student satisfaction with the LMS that supports an online course affect satisfaction with the course overall? This study presents a model of the effect of the LMS on the Col and satisfaction with the LMS and the course itself, and describes both a pilot study and large-scale survey examining these questions.

1.1. Community of Inquiry

The Community of Inquiry (Col) framework is an effective way to explain success in online teaching and learning (Garrison, Anderson, & Archer, 2000, Garrison, Anderson, & Archer, 2010). The Col framework is a collaborative constructivist model that views online courses as successful when students engage in a communal and individual "search for meaning and understanding" (Akyol, Garrison, & Ozden, 2009, p. 66). The instructor and students together form an online learning community consisting of three "presences": cognitive presence, social presence, and teaching presence.

Teaching presence occurs when instructors design, support and direct student activities to provide a powerful learning experience. It includes three components: the design and organization of course materials and learning activities; the encouragement and guidance of discussion and interaction that produces learning (Anderson, Rourke, Garrison, & Archer, 2001); and direct instruction through providing expertise and information (Anderson et al., 2001; Diaz, Swan, Ice, & Kupczynski, 2010). Social presence is the amount of social and emotional connection among the members of an online course (Arbaugh, Bangert, & Cleveland-Innes, 2010). It is comprised of three components: expression of affect and connectedness with others; open communication with others in the course; and group cohesion, which includes acknowledgement and trust (Diaz et al., 2010; Garrison & Arbaugh, 2007). Last, cognitive presence refers to the intellectual engagement with course concepts, and the students' ability to create meaning out of ideas and facts, developing competence through discussion, reflection and application. This concept reflects the "Practical Inquiry" Model, which focuses on thinking processes and can be used as a tool to assess higher-order thinking (Boston et al., 2009; Garrison & Anderson, 2003; Garrison, Anderson, & Archer, 2001, p. 7). The model includes four phases of learning, beginning with a triggering event that piques curiosity; continuing with exploration of information; moving on to integration of new information; and concluding with the resolution of the question or problem in ways that can be applied in the future (Diaz et al., 2010; Richardson & Ice, 2010).

These presences lead to positive outcomes in online courses, including student satisfaction (Akyol & Garrison, 2010; Arbaugh, 2008; Garrison & Arbaugh, 2007; Gunawardena & Zittle, 1997; Ice, Gibson, Boston, & Becher, 2011; Richardson & Swan, 2003; Rourke & Kanuka, 2009), perceived learning (Arbaugh, 2008; Garrison & Arbaugh, 2007; Richardson & Swan, 2003), retention (Boston et al., 2009; Garrison & Cleveland-Innes, 2005; Joo, Lim, & Kim, 2011; Richardson & Swan, 2003), and some aspects of class performance (Picciano, 2002). Arbaugh (2008) found that all three presences predicted student learning, although cognitive and teaching presence had much larger effects than did social presence. He also found that social and teaching presence predicted satisfaction with the online medium. Akyol and Garrison (2010) also found significant relationships between both teaching and cognitive presence and perceived learning, but not with social presence.

Although the three presences are proposed to overlap, one of them precedes the others. Teaching Presence includes a number of activities that develop Cognitive and Social Presence. Originally focused only on instructional behavior in online discussions (Anderson et al., 2001),

the concept has been expanded to include other instructional activities that occur outside the discussion forums, such as designing course materials and providing feedback (Archer, 2010; Diaz et al., 2010; Garrison & Cleveland-Innes, 2005; Shea, Pickett, & Pelz, 2003). The design of course materials, assignments and learning activities can support or limit cognitive presence; for example, assignments that require students to define terms will produce very different levels of cognitive engagement and critical thinking than will assignments that require students to diagnose loosely-structured, authentic problems or debate a position (Akyol & Garrison, 2010; Garrison & Cleveland-Innes, 2005; Joo et al., 2011; Richardson & Ice, 2010). Richardson and Ice (2010) found that students involved in debates and case analysis reached higher levels of critical thinking (integration and resolution) than they did when participating in a general, open discussion of topics, while other researchers have found that instruction and course design directed toward creating cognitive presence effectively created higher-order, "deep" thinking (Akyol & Garrison, 2011; de Leng, Dolmans, Jobsis, Muijtjens, & van der Vleuten, 2009).

Teaching behaviors such as welcoming students, guiding discussion, and giving feedback can support interaction and collaboration among students, and therefore increase social presence (Akyol & Garrison, 2011; Shea & Bidjerano, 2009). Instructor actions such as assigning responsibility to lead or participate in discussion support both social and cognitive presence (Akyol & Garrison, 2010). Students who report interaction with other participants in online courses describe higher levels of social presence (Kim, Kwon, & Cho, 2011).

Recent research using structural equation modeling supports the premise that teaching presence, which includes the structuring and implementation of online instruction, both precedes and causes social and cognitive presence (Garrison, Cleveland-Innes, & Fung, 2010; Joo et al., 2011; Shea & Bidjerano, 2009). Instructors' playing active roles in guiding discussion predicts cognitive presence (Shea & Bidjerano, 2009), and innovative design that requires integration and evaluation, such as peer review, creates high levels of cognitive presence in large classes (Nagel & Kotze, 2010). In online courses, all of the aforementioned teaching and learning behaviors are mediated by technology.

1.2. The role of technology in online instruction

In most online instruction, coursework is organized and paced, learning resources are accessed, work is collected and returned, discussion occurs, and feedback is delivered through an LMS (Lohr, 2000). This is the medium through which the Col is developed and maintained, and both instructors and students must manipulate the electronic interface in order to communicate (Gunawardena & Zittle, 1997; Hillman, Willis, & Gunawardena, 1994).

However, there has been some controversy about the importance of the technology used to support learning. Clark (1983) famously argued that the technology does not affect learning, writing that "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (Clark, 1983, p. 445). He reiterated this position over time (2007, 1994), even as instructional technology changed enormously.

This view was challenged by Kozma (1991, 1994), who reviewed research on media such as television, books and computers, and concluded that learning is affected by "characteristics of the medium, designs that take advantage of these characteristics, and the characteristics of learners and tasks" (Kozma, 1991, p. 180). He focused on how learners interact with technology to perform operations (Kozma, 1994), such as using a joy stick to interact with images on a computer screen, and interacting with an interface to pause, replay, and search for information on a disk. These were called *capabilities* of a technology, and Kozma argued that different capabilities enabled learners to interact and construct knowledge in different ways. He called for research on

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