How the Use of Virtual Learning Environment Tools Affects the Online Learning Experience?

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Abstract

This ongoing study examines affordances of two different Virtual Learning Environments (VLEs) or Learning Management Systems (LMSs), Blackboard and Desire2Learn, and their effects on faculty and student satisfaction and the elements of the Community of Inquiry (CoI) model: social presence, teaching presence, and cognitive presence (Garrison, Anderson & Archer, 2000). In this paper, we shall share the initial results of the study. Although data collection and analysis are still ongoing, preliminary findings describe (a) faculty perceptions of different affordances of these tools leading to different support for effective and efficient teaching, (b) the effects of faculty tool use on student satisfaction and CoI, and, (c) the effects of student satisfaction with the LMS on satisfaction with the course.

Introduction

In many fully online courses, all instruction takes place through the mediation of the LMS (e.g., Blackboard). Coursework is organized and paced, learning resources are accessed, work is shared and feedback is delivered through the system (Lohr, 2000). An effective LMS must support active engagement, access to elements of the course, communication, and the provision of formative and summative feedback. Actions that are made easy by the system are more likely to occur, while those that have barriers are less likely to.

Community of Inquiry

A great deal of research has established the Community of Inquiry as a key framework for creating successful online learning (Garrison, Anderson & Archer, 2000). A recent meta-analysis found 252 studies on the topic, many of which found empirical evidence that a Community of Inquiry leads to positive outcomes in online courses, including student satisfaction (Richardson & Swan, 2003; Rourke & Kanuka, 2009), cognitive engagement, learning and retention (Boston, et al., 2009; Garrison & Cleveland-Innes, 2005; Richardson & Swan, 2003). According to this model, online courses are successful when the course design, instructor and students together create three "presences": cognitive presence, social presence and teaching presence (Figure 1).

Social presence has been defined as "the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as ``real people'" (Garrison, Anderson and Archer,

2000, p. 89). Teaching Presence is "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001, p. 5). Cognitive Presence is "the extent to which learners are able to construct and confirm meaning through sustained communication" (Garrison, Anderson and Archer, 2000, p. 89).

Most of the research in this area has examined the factors that create a Community of Inquiry, particularly course design features such as the assignment of group learning activities and faculty teaching behaviors such as facilitation of online discussion to support deep inquiry (Boston, et al., 2009; Richardson & Swan, 2003; Rourke & Kanuka, 2009). Little research however has examined the effect of the technology platform through which the online course is delivered.
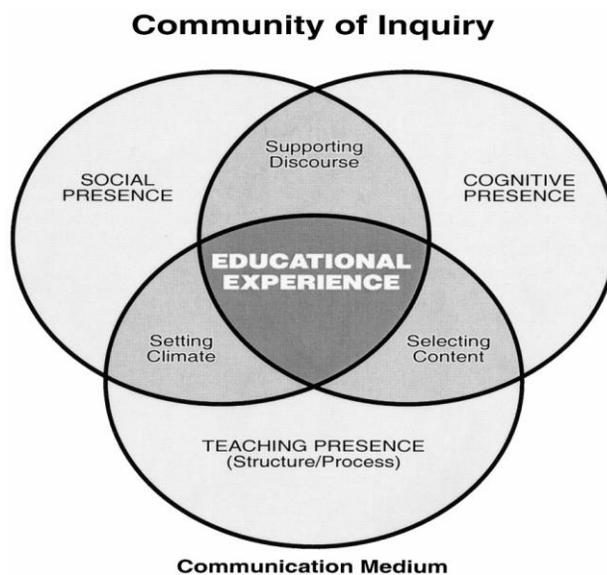

Figure 1. Community of Inquiry: Presences and model (Garrison, et al., 2000)

LMS Affordances
Course Administration and Structure

Students in online courses have an extensive amount of material to read every week, such as topic overviews, learning objectives and online readings, as well as numerous tasks such as asynchronous discussion, group activities and tests. Each task is typically completed through a specific tool such as a discussion board, group area, online test, or assignment tool. An LMS that allows all the materials needed in one week to be visually grouped on a single page by means of contiguous placement makes it easier for students to consider all the elements as part of the week's tasks, and therefore more likely for them to access all the materials (Clark & Mayer, 2008; Mayer, 2005; Vicario, 1998). For example, some LMSs have limited tools to enable grouping across different kinds of tools (e.g., Discussion, Assignments). This means that the elements needed for the week's work are spread across several pages, and require multiple clicks to access the materials within the folders. Other LMSs allow all learning elements and tools to be placed contiguously in a hierarchy or outline structure that visually represents the grouping.

Alternative means of supporting the integration of different technology tools include a "next" button on each learning element in a module, and the ability to easily embed links that lead seamlessly from one element to the next. Systems that allow such links to copy from course to course make them easier to use. An LMS also may provide a checklist with links to all learning elements and tools required in a section of the course. It is hypothesized that an LMS with contiguous placement and more integrating affordances will lead students to read more of the course materials and navigate the course more easily, thus increasing cognitive presence and satisfaction.

Tools for Providing Feedback
In many online courses, discussion forums are the primary means of fostering constructive and meaningful interactions among faculty and students. An LMS that makes it difficult for faculty to give regular, private, formative feedback on student work posted in the discussion forums creates a disincentive to faculty to do so. While public feedback is easy in virtually any LMS, LMSs vary considerably in the ability to provide private formative feedback, which is needed for students to modify their learning strategies, correct misapprehensions, and master concepts and applications (Nicol & Macfarlane-Dick, 2006; Sadler, 1989). For example, in Blackboard version 8, a faculty must perform many clicks or have two versions of the course open in order to view all posts from a single student on a page and enter both numerical and open-ended feedback. Other LMSs provide a simple one-page interface to do all these tasks. Other feedback tools also vary widely; for example, gradebooks can require many clicks to enter formative and summative feedback, or they can be designed to interface with usable drop-box areas. Tools can provide alerts on the main course page to inform faculty of the number of posts or ungraded work submitted, facilitating feedback. It is hypothesized that an interface that facilitates faculty formative feedback will improve both teaching and cognitive presence.

Communication and Notification Tools
In teaching fully online courses, communication tools must be easy for faculty and students to use. Some communication tools, such as a central Announcement or News tool to guide student work and a basic interface to create discussion postings, are consistent across most LMSs. However, other tools differ widely in their affordances and ease of use. For example, some LMSs can automate notification of due dates on a readily visible calendar, with an interface that is easy for faculty to use. Some allow faculty to set due dates easily and then make exceptions for individual extensions, enabling flexibility in implementation; others do not allow exceptions or modifications. Some LMSs can automate email communication if students fail to enter the course or participate in certain activities, facilitating teaching presence. Some provide tools to show the current online presence of faculty or students, facilitating social presence. It is hypothesized that an LMS with easy automation, flexibility and easy-to-use communication and notification tools will lead to greater teaching presence.

Methodology and Measures
An integrated multi-step study was designed to assess impact of the affordances of the LMS, and resulting structures and tools used by faculty, on faculty and student

perceptions of social presence, teaching presence, cognitive presence and satisfaction (Author, Author, Author & Author, 2010). The study was conducted in four colleges within a large private University in the United States. The university used the Blackboard LMS. An alternative LMS, Desire2Learn (D2L), was obtained and faculty were invited to participate in the study.

D2L had more tools to structure course materials for integration, including at table of contents with contiguous learning resources and tools, checklists, integrated calendars, and "forward" and "back" buttons for navigation. It also had more tools to support automated communication, including automated emails to students when grades were assigned and emails to faculty to alert them when students were out of the course. It also had a less complicated interface to view and provide feedback on student discussion posts.

The course materials, readings, tasks and other elements were copied from Blackboard onto D2L, and standardized across the LMSs. However, if tools such as calendars, automated email notifications or checklists were available, they were recommended for faculty use- although that was not required. Course materials were structured with contiguous elements where allowed by the LMS. Faculty were trained to use the new system by two staff, and consulted regarding the use of tools such as checklists and automated emails- if they chose to have them, support staff set them up. Staff provided ongoing support for both students and faculty. By winter of 2010, 12 fully online courses in a private not-for-profit university were taught in one of two different LMSs: Blackboard 8 and D2L.

Faculty were interviewed after completion of the course using a semi-structured protocol, and asked about how the LMS helped or hindered efficiency and effectiveness of teaching, as well as tool use. Students were asked to complete survey measures of satisfaction with the class and LMS, along with the Community of Inquiry (CoI) survey instrument (Swan, Richardson, Ice, Garrison, Cleveland-Innes & Arbaugh, 2008) measuring social presence, teaching presence and cognitive presence. A version of the survey was developed for faculty, modified after the interviews to include assessment of LMS tool use.

In January of 2011, the university changed its Learning Management System from Blackboard to D2L. In anticipation of this change, the study was expanded in the spring of 2010 to include other classes taught in Blackboard. Over the next three terms another 23 different courses were included in the study, all taught in Blackboard. Over the next two years, most of these courses will be taught by the same faculty in the new D2L LMS which will allow for paired comparisons. Student and faculty perceptions will also be compared to one another. Posting and feedback behaviors will be captured for a subset of courses. At this point, faculty feedback and survey data from unmatched courses are available for comparison.

Subjects

Subjects were students enrolled in fully online courses in one of five different schools in a large private Midwestern university in the United States. They included both graduate and undergraduate students, ranging in age from 19 through 69 with an average age of 35; all but four were 21 or over. The study included 440 students, 324 taking courses in Blackboard and 116 taking courses in D2L; 163 were male and 277 were female. More

than 80% had taken at least one fully online course before the current one, with 60% having taken three or more online courses.

Results
Pilot Study Results

Initial analysis of faculty reaction as expressed in the interviews indicated a consistent, although not uniform, preference for D2L over Blackboard. Faculty found it overall easier to use, to view student work, provide feedback, and communicate with students. Key differences included the ability to see all student discussion posts and assess them, the existence of alerts to notify faculty of work waiting, and the ease of entering grades into the gradebook. Although both systems were found to facilitate teaching as well as hinder it, all but two faculty described more factors that facilitated both efficiency and effectiveness of teaching with D2L than with Blackboard, and indicated that they preferred the former over the latter. On the other hand, many pilot faculty reported that lack of familiarity with D2L reduced the number of tools they used, and placed some barriers to student use as well. When asked to list the tools they used to teach, there was a wide variety, from more than nine tools to two or three.

Initial quantitative analysis of student responses, performed via t-tests of social presence, cognitive presence, teaching presence, and satisfaction with the course and LMS after the first two terms of data collection, found no significant differences between student taking courses in D2L (N = 67) versus Blackboard (N = 60).

Given the interview results showing wide differences in tool use, a subset of classes were indentified in which faculty used many teaching tools, and also a set in which faculty used very few teaching tools. T-tests of student data were conducted comparing courses with the greatest vs. the least tool use (Table 1). These analyses indicated that teaching presence, cognitive presence, and satisfaction with the class and LMS, as well as a question about how much of the online materials students read, were significantly higher for classes with high tool use than low tool use. However, social presence was not affected by faculty's tool use.

Table 1
T-Tests Comparing Courses with High Tool Use and Low Tool Use

	Use of LMS Tools	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
LMS_Read_All	Low Tool Use	57	4.32	.659	-2.344	94	0.021
	High Tool Use	39	4.62	.544			
Teach_Presence	Low Tool Use	58	4.0424	0.77168	-2.480	95	0.015
	High Tool Use	39	4.3886	.49222			
Social_Presence	Low Tool Use	57	3.8967	.62533	.240	94	0.811
	High Tool Use	39	3.8661	.59518			
Cognitive_Presence	Low Tool Use	57	3.9591	.58421	-2.015	94	0.047
	High Tool Use	39	4.1838	.45731			
Satisfaction	Low Tool Use	57	4.0058	1.00887	-2.795	94	0.006
	High Tool Use	39	4.5214	.67014			
LMS_Eval	Low Tool Use	57	4.1360	.71194	-2.187	94	0.031
	High Tool Use	39	4.4231	.49055			

Interim Results

After the study was expanded to include more courses, the data were analyzed again. T-tests again found nearly all non-significant differences in the Community of Inquiry and satisfaction between classes taught in Blackboard vs. D2L; only two individual items were significantly different, and none of the scales were.

However, regression analysis found that after multiple variables including student gender, age, and the number of prior online courses were regressed onto satisfaction with the course, the student's satisfaction with the learning management system had an independent significant effect (Table 2). The formula predicted satisfaction with the course strongly: the adjusted R^2 was .603, which was significant at p<.000 level. Teaching presence and cognitive presence significantly predicted course satisfaction, but social presence did not.

Table 2
Regression Predicting Satisfaction with Online Courses

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		-4.204	.000
Gender	.033	1.074	.283
Age	-.007	-.232	.817
Number completely online courses taken prior to this course	.013	-.400	.689
Teach_Pr_scale	.404	9.753	.000
Soc_Pr_scale	-.023	-.571	.568
Cog_Pr_scale	.384	7.851	.000
Satisfied with LMS	.145	4.247	.000

Discussion and Future Research

This ongoing study found that faculty prefer teaching online courses in an LMS that they perceive to have more tools that support communication, feedback and integrated course content. However, even when provided instruction and support, faculty vary widely in their use of teaching tools to communicate and provide feedback. Initial comparisons across different courses and different instructors did not find a significant difference between the satisfaction or Community of Inquiry experienced by students taking online classes in two different LMSs. However, these comparisons included different faculty and different courses while the effect of instructional style and course design are known to be significant. For example, using an LMS that makes feedback easy will not modify the behavior of faculty who are disinclined to provide regular feedback. However, when faculty are inclined to provide feedback, an LMS that facilitates the process should lead to more feedback.

The study provided evidence that the technology used to teach does affect outcomes. First, faculty use of teaching tools had a significant effect on student satisfaction, teaching presence and cognitive presence, such that faculty who used more tools had more satisfied students who engaged with the concepts and felt the teacher was more

supportive of their learning. In addition, student satisfaction with the tools had a significant effect on satisfaction with the course, independent of other critical factors. This supports the notion that further examination of the technology used to teach an online course is worthwhile, and the technology has a significant effect on student outcomes.

This study will be continued after the new LMS is implemented across the university, and faculty learn how to use it. Data collection is planned to resume in summer of 2011. The next stage of the study will enable direct comparisons of the same faculty teaching the same courses in two different platforms. Controlling for course and instructor will allow a strong assessment of the effect of the LMS affordances on learning outcomes.

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