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A Case Study Using the Community of Inquiry Framework to Analyze Online

Discussions in WordPress and Blackboard in a Graduate Course

By

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Abstract

Online discussions in a graduate level education course were compared using the Community of Inquiry framework and a Classroom Community survey within a mixed methods case study with concurrent triangulation of data sources. Discussion posts were published in two separate software applications: WordPress and Blackboard. Data collected included online discussion metadata, Community of Inquiry coding of online discussion content, survey responses from students, and an interview with the instructor to identify pedagogical decisions made in the design of the course. Content analysis of the discussion archives described differences in posts published to the two platforms, as well as differences in simultaneous indications of Community of Inquiry presences over time. Five new online discussion timeline visualization methods are presented. Key findings include an emphasis on pedagogical design over software selection in facilitating rich online discussions in the context of a graduate level course, although selection of software may provide signals to participants regarding the instructor's expectations. Recommendations for reproducing similar research, identification of areas for future research, and recommendations for practice are provided.

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Chapter 1: Introduction

Overview

As instructors at higher education institutions move more classroom activities online, their selection of software applications has the potential to influence the interactions between students through the technical and pedagogical affordances inherent in these applications. These affordances and constraints are expressed through the design of the software, as well as through the preferences and pedagogical styles employed by instructors in the selection and application of the software. While technically performing similar functional roles in supporting online discussion between members of a class, different online software applications do offer different interfaces and capabilities, which may shape and affect the discussion within the class. Also, instructors may be inclined to use applications differently within the class, as a result of the design decisions made during the development of the software. Many instructors use an institutionally supported learning management system (LMS), such as Blackboard (Blackboard Inc, 2010), Desire2Learn (Desire2Learn Inc, 2012) or Canvas (Instructure Inc, 2012) for all online class activities, while some choose to experiment with other applications, such as WordPress (WordPress.org, 2010), Blogger (Google Inc, 2012), or Elgg (Elgg Foundation, 2012).

While there is anecdotal evidence to suggest that there are differences in online discussions and community interactions conducted in each of these applications, there is scarce empirical data to describe what is different, and what this might mean for teaching and learning. There are aspects of using different online software applications that are

markedly different, from the interface layout and graphic design, to tools available to create and follow discussion, to the locus of control, roles and responsibilities afforded participants. Do these design variations and options impact community activities and behaviours during a formal course? Do the software design variations, coupled with pedagogical decisions related to these designs, influence how learners use the software to engage in online communication and to learn during the course?

Additionally, educational technology can be prone to cycles of hype and fetishism, where new tools and applications are rapidly adopted by individuals who are seen as innovators in the field, with little time for thorough or rigorous investigation of the pedagogical strategies that may be enabled by the affordances of these new tools. This study is important because it attempts to address the impact of pedagogical decisions made by instructors in the context of establishing a classroom community, and to identify ways in which the community interactions may be affected by the pedagogical implementation of different software applications. It is clear that blogging is not a fad, and has become an important writing and publishing component of many online courses, but it is not clear why participants may be inclined to interact through weblogs, or how these interactions may differ from those conducted within a learning management system.

It is expected that the present case study will be useful to instructors who are using online discussions in their courses. A description of pedagogical strategies and the technical affordances of software applications should be useful to inform the development and design of online courses. Further, researchers who are interested in analyzing online discussions in the context of course-related activities may be interested in the methodology and analysis of the online discussion data described in this research.

Purpose of the study

The purpose of this study was to compare online discussion activities and the behaviour of course participants who used two different software applications to engage in class discussions. A range of pedagogical decisions by the instructor influenced the design and enactment of the course. This research was designed to identify and describe ways in which the choice of software application may have influenced the nature of the community interactions and levels of social connectedness demonstrated by participants in the two different software environments.

The setting for this study is an online graduate course at The University of Calgary. Students in this class used the discussion board feature of the Blackboard learning management system, as well as a class blog environment hosted within WordPress websites. The online discussions that occurred during the study period were captured and archived for analysis. A post-course survey of participating students documented their reported sense of community interaction, and a post-course interview with the instructor provided descriptions of the pedagogical and instructional activities that occurred during the course.

Relevance of the study

The 2012 EDUCAUSE Center for Applied Research (ECAR) Study of Undergraduate Students and Information Technology (Dahlstrom, 2012) found that blended learning environments are now a normal part of many students' experiences. A recent shift to large-scale online courses, dubbed "Massively Open Online Courses" or "MOOCs" (McAuley, Stewart, Siemens & Cormier, 2010) may result in more students

participating in online courses, whether formally for credit or informally. These online courses typically eschew learning management systems, and instead implement a distributed publishing model with content posted on individual participants' own websites (Downes, 2012). MOOCs and online courses are also gaining in popularity with traditional institutions, with offerings like MIT's OpenCourseWare initiative (Massachusetts Institute of Technology, 2012), and consortia such as Coursera (Coursera, 2012) offering free access to hundreds of online courses. These new open course models offer non-credit course materials, but institutions are beginning to offer formal and transferrable credits for informal and prior learning (Thomas Edison State College, 2012).

Traditional higher education courses are also being redeveloped in blended or online formats (Johnson, Levine, Smith & Stone, 2010), as institutions attempt to accommodate flexible schedules and the mobility of students as well as incorporating open content to mitigate copyright licensing fees.

As such, if more students are going to encounter online courses as a normal part of their academic program, and participate in more online discussions as a result, then it is important to better understand the effect of software selection and pedagogical decisions on these students' interactions in community, and their levels of social connectedness.

Conceptual framework

This project combines understandings from three separate but related concepts: thought and language, media and design, and discourse and learning. These concepts

interact to describe the activities of a community of learners. Each of these concepts is discussed in the review of literature in chapter two.

The communication medium, or software application, can alter the meaning and interpretation of the message in ways that are both subtle and dramatic. Carpenter & McLuhan (1956) said “each communication channel codifies reality differently and thereby influences, to a surprising degree, the content of the message communicated” (p. 49). If this is the case, it is interesting to explore whether the nature of the specific software application that is used to facilitate online discourse influences the nature of that discourse.

In order to identify ways in which the software application may influence online discussion, the researcher will describe the activities and interactions within the online discussion environment used with each of the targeted software applications. To do this, the Community of Inquiry framework will be employed.

The Community of Inquiry framework, as defined by Garrison, Anderson and Archer (2000), outlines three forms of individual presence or contribution to an educational experience (social, cognitive, and teaching), and sets out methods for analyzing online discussions to assess the contributions of each form of presence. The framework has been used in several studies, and is applicable in various classroom settings, including online discussion forums. As part of a community of inquiry study, the online discussion in a class is recorded, and latent content analysis is applied to codify key segments. Once coded, the discussion fragments are analyzed to determine the various contributions of social, cognitive, and teaching presences. In addition, quantitative survey data will be gathered using the community of inquiry survey

instrument, to collect information about the participant's perception of the classroom discussion experiences.

Rovai's (2002) Classroom Community Survey documents students' reported sense of community interaction and perceived learning. The survey includes items to document students' responses on two scales: connectedness and learning. The items from the Classroom Community Survey will be used along with the Community of Inquiry survey items in the survey instrument used to gather responses from students in order to explore the concepts of connectness and learning.

Context

The research was conducted at the University of Calgary, and included students from a credit course offered in an online format, with all interactions between students and their instructor being conducted through online tools such as email, Elluminate, Blackboard and WordPress. The students who participated in this research were enrolled in a graduate level education course at The University of Calgary. The course that was the focus for this case study was the second of a four-course online certificate program in Educational Technology, and all students had participated in the previous online course together. The course had a single instructor, with 13 students.

Research question

How does pedagogical design interact with selection of technology to influence the nature of a learning community, as expressed through online discourse and social connectedness in higher education?

It is anticipated that pedagogical decisions made by the instructor will combine with technological choices to shape the nature and intensity of online discourse by participants in a course. It is anticipated that interactions made through the open and individually-controlled WordPress publishing environments may be more meaningful and intense than interactions that occur in the closed and institutionally-controlled Blackboard course discussion boards.

A mixed methods case study, with concurrent triangulation methodology, was used for this study. Data was collected through archives of online discussions in Blackboard and WordPress, a student survey combining Community of Inquiry and Classroom Community surveys, and an interview with the instructor. The research methodology will be fully described in chapter three.

Chapter 2: Literature Review

This project draws upon understandings from three inter-related areas of study: thought and language, media and design, and discourse and learning. Figure 2.1 presents the conceptual framework for this research, with key concepts identified in each area, and how they are connected through pedagogy in the context of this research. The primary research focus is on the discourse and learning component of the framework, with analysis of online discussions, community interactions, and documentation of pedagogical design.

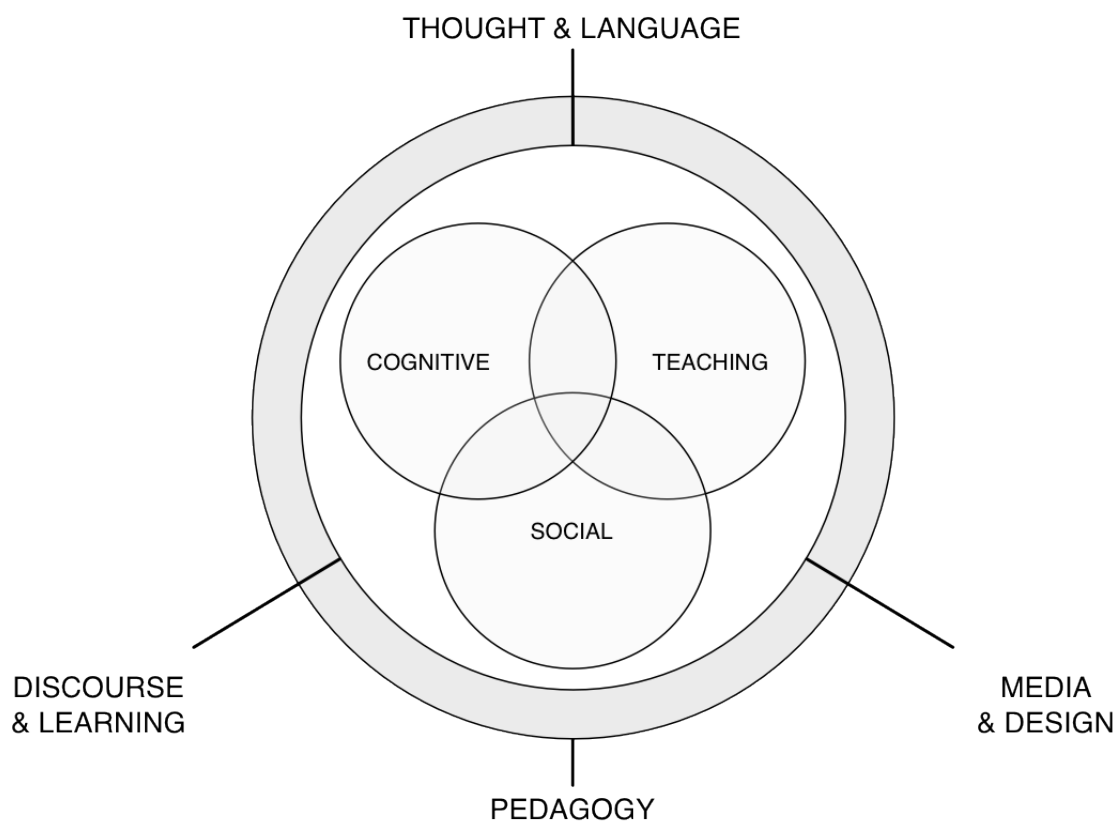


Figure 2.1. Connections between concepts used in this research.

In this framework, pedagogy, through the various decisions and choices made through designing and conducting a course, acts to connect the three fields. These connections can be described through the Community of Inquiry framework (Garrison, Anderson & Archer, 2000), as demonstrated through cognitive, teaching, and social presences demonstrated as participants interact in the context of the course. Within the Community of Inquiry framework, cognitive and teaching presences overlap primarily in the areas of thought and language – how communication is structured by teachers and students alike to convey ideas and share knowledge. Cognitive and social presences overlap primarily in the areas of discourse and learning – how participants interact in the context of a learning environment. Teaching and social presences overlap primarily in the areas of media and design – the intentional selection of technologies and platforms, and the thoughtful crafting of these environments to support the goals of the classroom community.

Thought and Language

By connecting the cognitive and teaching presences in the Community of Inquiry framework, thought and language becomes an interesting context for describing the intentional construction of knowledge as part of a course experience.

Foundational Thinkers

Vygotsky (1962) wrote that language is thought, that our thoughts are shaped by the language we use, and the ways in which we use it. Vygotsky argued that language makes thought possible, and determines not only what we are capable of thinking, but

also how and why. Dewey (1922) described the social role of communication, by stating that in addition to the language used to convey meaning, the social context is equally important in understanding what is meant. Vygotsky's social constructivist approach to learning, combined with Dewey's emphasis on democratic and individualized learning, suggest that the social context of a community is an important aspect of the learning experience.

The social context and sense of community have been shown to be important factors for student interaction and learning (Dawson, 2006; Rovai, 2002). One possible difference between online discussions hosted in an LMS and WordPress might be in the social context shaped by the environment, which might contribute to a difference in student interaction and perceived learning.

Carpenter and McLuhan (1956) described the effect of format used in the conveyance of a message - the medium of transmission - on the perception of the message itself, that people may focus more on particulars rather than relationships, as a result of the language and format used. McLuhan (1967) extended this consideration of the format of conveyance by stating that the medium itself is the message, and that the properties and affordances of the communication medium has as much of an effect as the message in conveying meaning. Postman and Weingartner (1969) built upon McLuhan's work by suggesting that new strategies are required in order to effectively use the tools provided within an environment, and that these strategies must be adapted in response to changes that are not simply additive or linear in nature. Haas (1989) showed that the medium used for writing strongly impacted student's writing process, specifically in the planning and revision stages. For example, writers using pen and paper planned their

work before revising more than those using computers for writing, although computer users re-read their work more than pen and paper users.

Bush (1945) described the effects of limited and ineffective access to information, where research and ideas are lost because they are not readily accessible to those who would benefit from them. He was writing specifically about means of traditional publishing, and how electronic formats, and the interfaces and designs employed by these types of applications, could transform communication and discourse. His descriptions of the “memex” – a fictional device that would allow individuals to access all of their media and communications – and a “codex” would become a customized encyclopedia of knowledge managed by individuals. The concepts have since been implemented as the personal computer, the Internet, and the world wide web. These innovations have produced new literacies, new ways of interacting, and new pedagogies to support the practices of teaching and learning (Garrison, 2000).

Media and Design

Design can incorporate both tangible artifacts such as software and user interfaces, as well as abstract constructs such as the pedagogical decisions made while constructing a course. When combined with media theory, the concrete and abstract design choices strongly shape the ways in which course participants communicate, and the types of interactions that might be supported.

Technology and Pedagogy

The debate over the relative impact of technology vs. pedagogy is not a new one. In the 1980s, Clark (1983) posited that technology did not directly influence learning, while

Kozma (1986) suggested that thoughtful application of technology could create new ways of communication, and increase the effectiveness of educational activities.

Clark (1983) described the impact of technology as being primarily for reducing costs, increasing distribution, and providing equity of access to instruction. Clark elaborated by stating (1994) that “media and their attributes have important influences on the cost or speed of learning but only the use of adequate instructional methods will influence learning” (p. 27).

Kozma (1986) described the role of pedagogy in producing effective educational television programming, as enabling “talented and experienced producers who can push the medium, creating new conventions and symbols that increase its power” (p. 18). He emphasized an interrelation of technology and pedagogical context, stating (1994a) that “media theories and research must reflect both the capabilities of media and the complexities of the social situations within which they are used” and (1994b) “both media and methods influence learning and they frequently do it by influencing each other” (p. 11).

Kozma returned to the topic of pedagogy and technology, and specifically on the shifting nature of control over pedagogy from the teacher to the individual, stating (Kozma, 2000):

“People are in charge of their own learning, whether they are teachers or students, adults or children. It is a shift in mind set: we do not set the objectives for learning, they do. And these objectives emerge, change, and develop over time. Learners are also in charge of arranging - of designing - the context for their learning that works for them” (p. 13).

Watson (2001) extended Clark's position, describing technology as a tool to support change, rather than as a catalyst for it. Maor & Zariski (2003) furthered Clark's proposal that technology is not necessary, and may not be sufficient, to support learning, and that pedagogy and thoughtful design are more important factors to consider. Hastings & Tracey (2004) reinforced Kozma's argument, stating that advances in technology have made it clear that it is not a question of whether or not technology affects learning, but rather how.

Intentional learning, where the teacher is the hub through which all communication passes, is being replaced by knowledge building environments, where students build knowledge and connections in their own individual contexts (Scardamalia & Bereiter, 2006). Recent advancements in technology may more readily support the individual and social construction of knowledge.

The role of pedagogy is central to effective teaching and learning, no matter which technologies are used (Ascough, 2002). The relationship between technology and education means that the selection and implementation of technology is now considered to be a part of pedagogy (Okojie, Olinzock & Okojie-Boulder, 2006).

It seems clear that, especially when considering recent technological advancements, different technologies may offer different affordances for communication and interaction, and as Kozma originally argued, that it is the thoughtful pedagogical application of these technologies that can enable the effective practices of teaching and learning.

The Personal Nature of Electronic Media

Recent trends in electronic media and software have made it possible for individuals to manage and control their own learning environments. Early electronic media and software required institutional resources to operate. Today, individuals – instructors and students – are able to access the software infrastructure to manage and publish their own content on the world wide web. Electronic media are becoming integrated into the “natural” selves of students and teachers (De Kerckhove & Dewdney, 1997, p. 177). Rutherford (2010) found that “highly engaged students may be high users of educationally purposeful social media resources” (p. 710).

Current LMS applications provide an asymmetrical design, often providing more control and power to the teacher than to the learner (Wilson, Liber, Johnson & Beauvoir, 2007). These systems are designed primarily for the management and controlled delivery of course content (Dalsgaard, 2006). At the same time, teachers can be hindered by the physical and designed constraints imposed by institutional systems (Sommer, 1969). Whereas institutional systems are the embodiment of formalized requirements of the enterprise of higher education, there is a growing emphasis on informal learning (Attwell, 2007).

Weblogs (or blogs) are websites authored by individuals, where informal writing is typically posted in reverse chronological order, as opposed to in a traditional print publication layout (Barger, 1999; Blood, 2000). A weblog may provide students with a personal space for learning, without explicitly imposing a communal learning agenda and environment (Efimova & Fiedler, 2004). Weblogs are being successfully integrated into

both formal (Huffaker, 2005; Du & Wagner, 2005) and informal (Downes, 2010; Walker, 2005) learning experiences.

McLaughlin & Lee (2007) wrote that “...many higher education institutions are discovering that new models of teaching and learning are required to meet the needs of a new generation of learners. Today’s students seek greater autonomy, connectivity and socio-experiential learning” (p. 667). If it is true that students are to be able to function with greater autonomy and connectivity, then the design and implementation of the applications used in the context of teaching and learning will enable, or alternatively hinder those capabilities.

Social media applications, such as weblogs, provide the means for students to catalog and organize their own learning artifacts, as well as to reflect on each others’ contributions (Klamma, Chatti, Duval & Hummel, 2007). By using weblogs, students are also building skills that they may use after they finish the course, whereas they would likely never see an institutional LMS again unless they became a professor or corporate trainer themselves (Campbell, 2009).

If language shapes the way we think (Vygotsky, 1962), and the medium shapes the language that is used (McLuhan, 1964), it becomes clear that the selection of medium and software platform may have an effect on the cognitive and social processes of teaching and learning. If different software applications offer different affordances for both teacher and learners, there may very well be measurable differences in the quantity and quality of learner behaviours and activities that occur in the online classroom.

Connection Between Application Design and Interactions

Norman (2002) described the power of the design of tools on their use, and of our interpretation of our selves. “Tools affect more than the ease with which we do things; they can dramatically affect our view of ourselves, society, and the world” (p. 209). The underlying premise of the proposed research project is that the design of the applications used to facilitate online discussion may affect the discussion itself, whether through direct or indirect means. Norman and Draper (1986) also describe the power of software tools: “That is, the system is deemed useful because it offers powerful tools that the user is able to apply constructively and creatively, with understanding” (p. 49). The design of the software interface presented to a user of an application can have an effect on that person’s affect and emotion, which can further effect their ability to successfully use the system (Norman, 2004).

Norman (2011) describes of the importance of social signifiers in indicating perceived affordances of tools and environments. These social signifiers may provide different cues or triggers in response to the design of an online learning environment, and these signifiers may be different in software applications such as Blackboard and WordPress.

Nielsen and Phillips (1993) describe heuristics to measure differences in cost and efficiency when comparing different software applications. Efficiency could be defined in various ways, including learnability, ease of use by students, or speed of reading and processing content (Nielsen, 1989). Squires and Preece (1999) described the importance of a student’s ability to have a sense of ownership of their ideas, and of the learning

environment. This involves both teacher- and learner-centric control of the software as well as the ability to tailor the interface to their own needs and strategies.

Schneiderman and Plaisant (2005) describe a number of factors affecting the universal usability of software interface designs, including variations in physical abilities and workplaces, diverse cognitive and perceptual abilities, personality differences, cultural and international diversity, and users with disabilities. These factors, and others, interact to attenuate a person's experience with a given software interface design, and may effect what activities they are able to effectively conduct through it. The level of interaction between instructor and students largely determines the quality of the educational experience (Kanuka, 2012).

Although explicit measures of software design focus largely on efficiency metrics (Bevan, 2009), Chin, Diehl and Norman (1988) found that subjective measures such as user acceptance of a design are equally important. Cho, Cheng and Lai (2009) found that continued use of an eLearning system was linked with the perceived effectiveness of the user interface, as well as the provision of personalized support for the user. Krejins, Kirschner and Jochems (2002) found that platforms that make social presence more readily known provide a sense of proximity and enhance the community experience for participants. Since different software designs can influence the subjective perception of proximity due to the visibility of participants' actions, as well as acceptance of the application itself, it is important to identify how these influences may be realized in the context of an online discussion as part of a class.

With the theoretical and philosophical work by Vygotsky and McLuhan, combined with the applied work on interface design by Norman and Nielsen, it is appropriate to

study whether the design of an interface effects what activities or actions people perceive to be readily possible or valued, which may further have effects on the activities of teaching and learning. In the context of this study, it is appropriate to investigate whether the choice of online discussion software, coupled with certain pedagogical decisions and designs, impacts how students interact in an online discussion forum.

Blogging Compared to Learning Management Systems

It is important to understand the differences and similarities between weblogs and learning management systems. While both provide mechanisms for participants in a course to post content and respond to others, there are also important distinctions that determine the level of customizability and control over the organization and presentation of content, as well as real and perceived ownership of the website itself.

Simply, a weblog, or blog, is a website managed by an individual or small group, where content is typically published serially as posts and presented in reverse chronological order. Readers often publish responses or comments, which are displayed beneath the post content. The design, layout, and content of the blog website is controlled by the owner of the website, and may be easily and readily changed.

Learning management systems are typically enterprise level software applications, provided by the institution. Modifications to the design and layout of the website usually restricted by policies enforced by the institution. Courses are provisioned with a website within the LMS, where content is typically posted in response to assignments included as part of the course syllabus as determined by the course design implemented by the instructor.

Blogging and learning management system software are designed for different purposes. Hall (2003) describes learning management systems as enterprise-level applications, integrating various institutional administrative systems in an effort to track and quantify resource allocation. Al-Busaidi and Al-Shihi (2012) elaborate, describing the role of the learning management system in administration of educational resources and in providing support for traditional classroom education and distance education.

In contrast, blogging software is typically designed for individuals or small groups, rather than for an entire enterprise-wide operation. While blogging software was originally developed as a platform for personal publishing, it has become adopted as a means of distributing learning content as well (Downes, 2003). O'Donnell (2006) describes blogs as "personal publishing not just in the sense of its expressive or emotional or idiosyncratic tone but also in the sense that it operates at the core of a personal network or set of personal relationships" (p. 8). O'Donnell also describes the unique attributes of weblogs, as they enable the combination of both monologue and dialogue in a single venue that provides both immediacy and a high degree of flexibility, concluding that threaded discussions in a learning management system replicate synchronous face-to-face classroom sessions, while blogging may require participants to adopt different strategies for interaction.

Although different online discussion software may have different affordances for participants, Zydney, deNoyelles and Kyeung-Ju Seo (2012) found that providing a protocol to structure participation in online discussion greatly improved both the rate and quality of participation, without changing the underlying technological platform. It is clear that teaching presence and instructional design are important components of a

course, and that these factors can have strong impacts on student engagement and learning.

Discourse and Learning

Discourse is a fundamentally social activity – the directed interaction between participants in a course through a shared context as they work together to share information and build knowledge. This combination of social and cognitive interaction provides the means for meaningful learning experiences in a course.

Community of Inquiry

The Community of Inquiry framework described by Garrison, Anderson and Archer (2000) outlines three elements they argue to be essential to an educational transaction, namely cognitive presence, social presence, and teaching presence. Analysis of educational discourse using this model involves interpretation of computer-conferencing transcripts, using a set of indicators to signify contributions of each of the three elements within the context of a discussion. For the purposes of this study, a focus on cognitive presence will be used because of its vital role in understanding critical thinking and in representing learning by students (Vaughan & Garrison, 2005). Cognitive presence is defined by Garrison et al (2000) as “the extent to which the participants in any particular configuration of a Community of Inquiry are able to construct meaning through sustained communication” (p. 89). This sustained communication is conducted within the context of an online discussion platform, in classes that implement online- or blended delivery formats. As a result, it is important to understand how the online

discussion platform, and associated pedagogical strategies, may influence the activities of students and class participants.

The Community of Inquiry framework is interesting in the context of this study, because it has been widely used in a range of various fields and disciplines (Shea & Bidgerano, 2009). There is a level of validity to the framework, and to the strategies employed through its application (Akyol, Garrison & Ozden, 2009; Garrison, 2007). Since the framework was first published in 1999, it has been used by hundreds of researchers (Garrison, Anderson & Archer, 2010). Xin (2012) describes a limitation of the framework, as coding and content analysis do not capture some of the fidelity of human communication, by abstracting the messages into single categories of presence indications. While this may be true, it may be possible to mitigate this by simply coding multiple presences per unit, rather than selecting a single atomic representation. While this multiple coding approach may increase the fidelity of describing an online post, as opposed to selecting a single presence that is determined to be primarily indicated, it will not capture aspects of the interactions that do not fit within the coding template employed by the researcher.

Ice, Gibson, Boston and Becher (2011) used the Community of Inquiry framework to compare two courses with different rates of student disenrollment. They found that almost all of the variance in responses to the Community of Inquiry survey was accounted for by a subset of four survey items (“The instructor clearly communicated course topics”, “I felt motivated to explore content related questions”, “The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking” and “Reflection on course content and discussions helped me

understand fundamental concepts in this class”) although the differences in responses in low and high disenrollment courses overall were small but still statistically significant, with all students indicating a moderate to high level of satisfaction.

Ke (2010) studied adult learners in an online course context, and found that the instructional design of an online course is essential for student success, and connected the instructional design to the experience of an instructor and the design of the software interface. The study also examined the role of the instructor grading online discussions, and found that the assignment of grades was perceived by students as an indication of teaching presence. Community of Inquiry presences were also examined, and relations between the social, cognitive and teaching presences were described.

Gorsky, Caspi, Antonovsky, Blau and Mansur (2010) compared online discussions in 100 courses, 50 in the humanities and 50 in the sciences, and found that all three Community of Inquiry presence indications were more prevalent in posts published by students in the science courses than in the humanities. They found that the higher prevalence of presence indications in the science courses may be a result of more open communication by the instructors in those courses, rather than of the nature of the discipline. In contrast, Arbough, Bangert, and Cleveland-Innes (2010) used the Community of Inquiry survey to compare students in online courses across disciplines at two institutions, and found that students in science and technical (what they describe as “hard” applied discipline) courses rated the CoI presence dimensions higher than students in business or management (described as “soft” applied discipline) courses. They attribute the difference to varying emphasis on knowledge acquisition and integration in the different fields of study, with students in “hard” applied disciplines favouring linear

acquisition and master of factual knowledge while students in “soft” applied disciplines favouring formative and iterative construction of knowledge.

Kanuka and Garrison (2004) describe the challenge of online learning on the teaching presence component of the community of inquiry model:

While it is clearly possible to create and sustain a teaching presence in an online environment, the nature of Internet communication technologies presents unique challenges to the development of an effective teaching presence (p. 24).

This difficulty may be mitigated by a shift in roles within a course, where students contribute some of the teaching presence, and the instructor participates more directly in the community. Teaching presence was found to have a central role in fostering an engaged online community (Garrison, Cleveland-Innes & Fung, 2010).

Similar challenges are found in fostering effective social and cognitive presences (Garrison & Cleveland-Innes, 2005; Campbell & Cleveland-Innes, 2005). These challenges result from the affordances and limitations of the online learning platform used for a course, where the software interface and properties of the software itself seem to interact to mediate interaction between participants in a class. Learning communities can have a delayed effect. Gabelnick, MacGregor, Matthews and Smith (1990) found that students report that it takes several weeks to build their online communication skills and to see the value in this form of community learning.

Akyol and Garrison (2008) describe the fluid nature of a Community of Inquiry over the duration of a course, and observe that the prevalence of the social, cognitive and teaching presences can change during the progression of the course. This research

explores the progression of Community of Inquiry presence indications over time, through the application of various timeline visualizations of the online discussion.

The Community of Inquiry framework is an important and relevant model for framing the present research, as it can be used to document, analyze and describe the various social, cognitive and teaching presences indicated by participants as they interact as members of an active community. These indications are demonstrated through discourse, and specifically through online discussion in all software applications used as part of the course. The abstracted software platform independence of the Community of Inquiry framework and coding template is essential when comparing online discussion hosted in two different software environments.

The validity of the Community of Inquiry framework has been tested recently by Swan, Shea, Richardson, Ice, Garrison and Cleveland-Innes (2008), who concluded that the three elements of the model are distinct but overlapping, as described by the model itself. The Community of Inquiry supplementary survey was also tested by Swan, who found the instrument to be statistically valid. In their study, Swan et al used the Community of Inquiry Survey Instrument to gather responses from 287 students at the Master and Doctoral levels, participating in courses in a variety of disciplines, distributed across four separate institutions. Students participated in online discussions within the context of their enrolled courses. Responses from the students surveyed were scored and analyzed using a confirmatory factor analysis, indicating that the three elements described by the Community of Inquiry model were present, and were distinct but overlapping. Swan (et al. 2008) found that “an online community of inquiry emerges out of social, cognitive and teaching presence” (p. 8).

The Community of Inquiry framework relies on content analysis to identify interactions between members of a community. Content analysis is the systematic quantification of symbols within messages communicated between individuals (Krippendorff, 1980). In order to provide useful data, it is essential to have a coding scheme with sufficient detail to allow messages to be effectively identified and coded (Garrison, Cleveland-Innes, Koole & Kappelman, 2006).

Hesse-Biber and Leavy (2011) describe content analysis as being an inherently mixed-mode methodology, combining aspects of both quantitative and qualitative research. As a result, the present research has some components of quantitative data: metrics of activity patterns, word concordance, surveys, and server logs - as well as qualitative data: latent content analysis, social network analysis, and interviews.

Social Connectedness and Learning

Dewey (1922) and Vygotsky (1962) describe learning as being a strongly social experience. Social constructivism frames knowledge as a subjective process, which is built from an individual's social context through experiences, connections and interactions. This social construction of knowledge may be enabled or enhanced by recent advancements in technology, and the thoughtful pedagogical application of these technologies in a classroom community context (Scardamalia & Bereiter, 2006; Hastings & Tracey, 2004).

Classroom Community

Similar to the Community of Inquiry framework, Rovai (2002) constructed the Classroom Community Scale instrument as a means of measuring and describing the

sense of social connectedness within a class, as well as students' reported learning experiences. Ke (2006) found a strong positive correlation between reported sense of social connectedness and grades, using the Classroom Community Scale. Not all forms of interaction produce the same sense of social connectedness, but it is possible to foster a sense of connectedness in an online class similar to that found in a face to face one (Lord & Lomicka, 2008).

The sense of community reported by participants in a course was identified by Top (2011) as the main predictor for explaining their perceptions of learning. The use of online discussions in a blended learning course has been shown to promote a strong sense of community among participating students (Rovai & Jordan, 2004). This sense of community is similar but distinct from the community of inquiry model's description of social presence, and may be used to further define the social context as described by the students in a class. Shea, Pickett and Pelz (2003) found that the instructional design and organization of a course during the planning stage, when combined with the Community of Inquiry teaching presence as demonstrated by instructors and students during the course, are important factors in creating a meaningful learning experience.

If a learner's social context and interactions shape the knowledge that they build as part of an educational experience, and if these interactions can be further shaped by the affordances of the software that enables the interactions as well as pedagogical decisions within a classroom community, then it is important to better understand the connections between these concepts in order to inform the design of effective online learning experiences.

The Classroom Community Scale may be useful to include as part of this research, as a way to describe students' reported sense of community and learning from outside the context of the Community of Inquiry framework. By documenting an additional perspective on community within a class community, a more robust description of the social connectedness between participants may be provided.

The next chapter will describe the research methodology that was implemented in this research study.

Chapter 3: Methodology

Using a mixed methods case study approach, this research builds upon what is known about community interaction and community of inquiry in online courses by studying the online discussions between graduate students and the course instructor. There is one primary research question that frames this study: How does pedagogical design interact with selection of technology to influence the nature of a learning community, as expressed through online discourse and social connectedness in higher education?

In this chapter, the research design, instruments and procedures are presented, including descriptions of data anonymizing, the coding protocol, student survey, and instructor interview.

Research Design

This case study was designed to use a mixed methods research approach to data collection and analysis. A case study is an examination of a bounded system that can include historical, qualitative and quantitative data (Merriam, 2002). Case studies are important in the field of education because quantitative measurements of online activities may not be directly comparable between contexts, but the provision of many robust case study descriptions may help to strengthen the shared understanding of the field (Flyvbjerg, 2006). Case studies are also useful because of the researcher's closeness to the subject, and in the richness data and descriptions gathered as part of a research study (Flyvbjerg, 2001)

In this research, the bounded system is the online graduate course, including students, instructors and guests, and the online environments used by these participants during the period of observation (Creswell, 2003).

Because a case study is a complex research strategy employing multiple methods of data collection (Marshall and Rossman, 2011), the researcher must accommodate means of connecting or triangulating the various types of data.

A concurrent triangulation strategy (Creswell, 2003) was employed, using data gathered through a quantitative survey, metadata from online discussion archives, qualitative content analysis of the online discussion archives, and an interview with the instructor. This design allowed data gathering to occur within a single semester, with diverse data types intended to describe both the perceived and demonstrated activities and attributes of the online community and discussions conducted through the course. The study drew upon the qualitative methods of the Community of Inquiry model (Garrison et al, 2000) and the researcher applied this coding to discussion posts to identify social, cognitive, and teaching presences. Interview data was also gathered, to identify narrative or messaging provided by the instructor to students. Quantitative data was gathered using a survey composed of items from both the Community of Inquiry survey instrument (Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson & Swan, 2008), and the Classroom Community survey (Rovai, 2002).

Research and Learning Context

This research study examined the participation of graduate students and an instructor in an online graduate-level course offered by the Faculty of Education at the

University of Calgary, during the Fall 2011 semester. The primary activities of the course took place between September and December 2011; however, some related online activities occurred as early as June 2011, and as late as January, 2012. These online activities included posting and responding to posts in online discussions in Blackboard and WordPress, as well as synchronous classroom sessions hosted in Elluminate. All content and interactions included in the online discussion archives were analyzed as part of the research. This particular course was part of an online certificate in a graduate program, which comprises four interrelated graduate courses in a particular specialization area.

Participants

The targeted participants for this study were a convenience sample of students enrolled in a graduate level course and their instructor.

Of the 13 students enrolled in the course, 8 provided consent to participate in the online discussion analysis and survey portions of this study. There was one instructor in the course, and 2 instructors who were involved in the online discussions through interactions with the students in a previous course. Consent was provided by the two instructors from the previous course for their discussion posts to be included in the archives to be analysed.

The course was offered in a fully online format, with 4 synchronous classroom sessions conducted using Elluminate, and online discussions using both Blackboard and WordPress. Asynchronous interaction between students and their instructor, as well as among students, was conducted through email, online discussion posts in Blackboard,

and published posts and comments on WordPress sites hosted on UCalgaryBlogs.ca. Course information, including syllabus, schedule, and assignment details were provided via the Blackboard website.

As a graduate level educational technology course, the instructor reported that all participating students had prior experience with using Blackboard, which is the standard learning management system offered by the University of Calgary. Most of the students had some prior experience using WordPress to publish content, as they had used it in a previous course in their program of studies.

Pedagogical Design by Instructor

In conversation with the instructor after the course had started, it was discovered that the online discussions were conducted for different pedagogical activities, and with different requirements for assessment and grades. The Blackboard discussion boards were used primarily for sharing information about the course activities, and to facilitate provision of information by the instructor. These discussion posts were not required by the instructor, and student contributions were not graded. In contrast, the WordPress websites were used for publishing formal assignments as part of the course, and for providing peer feedback. Students were required to post content, and were provided with a rubric to describe expectations of participation made by the instructor. Students were graded for their original posts on the WordPress websites, as well as for their interaction with other students in the peer feedback discussions.

This course design as implemented creates an additional confounding variable, as student interactions would be shaped not only by the pedagogical activities and blog

versus LMS technology selections, but also by differences in assessment and grades applied to the two discussion platforms. As a result of the confounding variables, it will be challenging to identify specific triggers that may have shaped the online discourse. Thus, the emphasis will be on describing in detail the various contexts as part of the case study, along with making descriptive comparisons using the CoI and Classroom Community scales, to provide insights and make knowledge claims about participant interactions and behavior in the two different discussion platforms.

Ethics Procedure

Ethics approval was granted by The University of Calgary, and all participants in the research provided their declaration of informed consent via an online consent form. Because the content of the online discussions could be sensitive and personal in nature, the ethics application outlined that content from consenting students would be processed to ensure complete anonymity and confidentiality, and that non-consenting students' content would not be used in any way.

Students in the course were contacted by email by the researcher, and provided with information about the study as well as a link to a web page with full information about the research. The web page also provided a link to an online consent form, where students could indicate their consent to participate in the research.

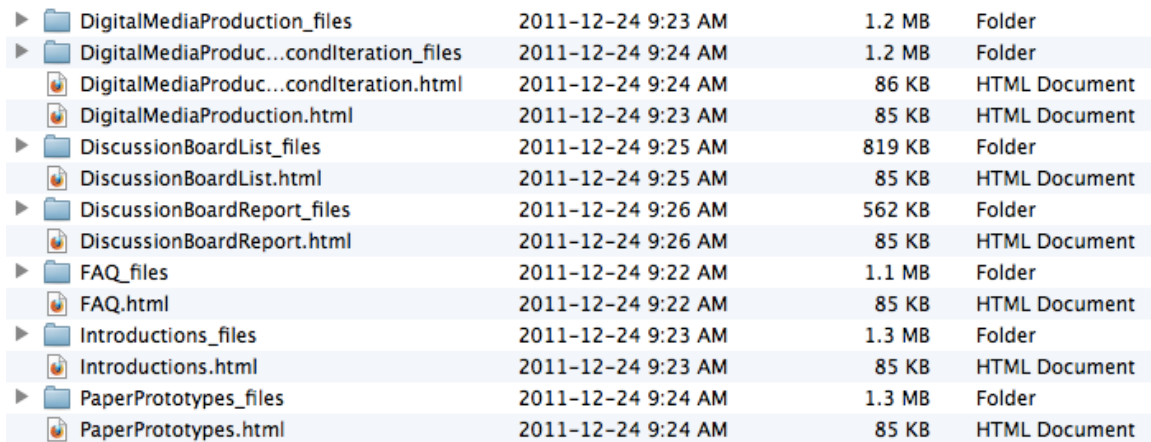
Special considerations were made to ensure that all collected data was fully anonymous. This includes the online discussions, surveys, and interview. Surveys were completed through the online service Survey Monkey, which was configured to not track any personally identifiable information. Online discussions were exported from the

appropriate software applications into HTML and processed before exporting the data further into PDF files in order to prevent inadvertent or accidental access to the source code for the online discussion archive web pages, which may contain hidden personally identifiable information such as usernames and identification numbers. Raw online discussion archives were retained only until the successful conversion of the fully anonymized data into the final PDF files was verified by the researcher.

Instruments and Procedures Used in Data Collection

Online Discussion Archives

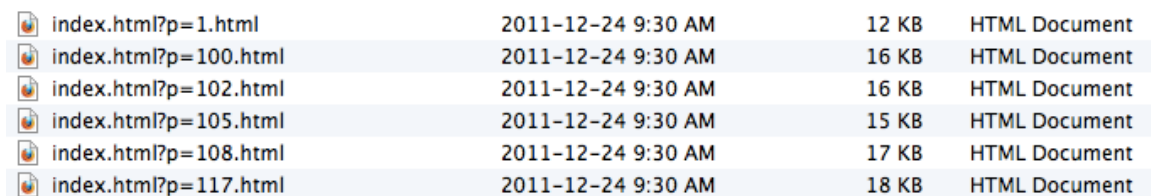
All online discussions were archived after the end of the Fall 2011 semester. For the Blackboard discussions, all posts in a discussion were displayed using the “Collect Posts” feature of Blackboard, and then the frame containing the entire discussion was saved as an archive using the “Save Page As... Webpage, Complete” feature of the Google Chrome web browser (Google Inc, 2011). The use of a web browser to archive these discussions was necessary, as the researcher needed to be logged into Blackboard in order to see the discussions. This process produced 5 separate archives for the Blackboard discussions, one for each discussion, as shown in Figure 3.1.



▶ DigitalMediaProduction_files	2011-12-24 9:23 AM	1.2 MB	Folder
▶ DigitalMediaProduc...condlteration_files	2011-12-24 9:24 AM	1.2 MB	Folder
▶ DigitalMediaProduc...condlteration.html	2011-12-24 9:24 AM	86 KB	HTML Document
▶ DigitalMediaProduction.html	2011-12-24 9:23 AM	85 KB	HTML Document
▶ DiscussionBoardList_files	2011-12-24 9:25 AM	819 KB	Folder
▶ DiscussionBoardList.html	2011-12-24 9:25 AM	85 KB	HTML Document
▶ DiscussionBoardReport_files	2011-12-24 9:26 AM	562 KB	Folder
▶ DiscussionBoardReport.html	2011-12-24 9:26 AM	85 KB	HTML Document
▶ FAQ_files	2011-12-24 9:22 AM	1.1 MB	Folder
▶ FAQ.html	2011-12-24 9:22 AM	85 KB	HTML Document
▶ Introductions_files	2011-12-24 9:23 AM	1.3 MB	Folder
▶ Introductions.html	2011-12-24 9:23 AM	85 KB	HTML Document
▶ PaperPrototypes_files	2011-12-24 9:24 AM	1.3 MB	Folder
▶ PaperPrototypes.html	2011-12-24 9:24 AM	85 KB	HTML Document

Figure 3.1. Website archives for the Blackboard discussions.

For the students' WordPress sites, all content was archived using the HTTrack Website Copier software program (Roche, 2011), as each website was published individually by each student so that access was possible without having to log in. This process produced full static HTML archives of the entire blog website for each student, resulting in 8 separate archives for the WordPress discussions, one for each student blog website. The individual posts were stored as separate files within these archives, as shown in Figure 3.2.



index.html?p=1.html	2011-12-24 9:30 AM	12 KB	HTML Document
index.html?p=100.html	2011-12-24 9:30 AM	16 KB	HTML Document
index.html?p=102.html	2011-12-24 9:30 AM	16 KB	HTML Document
index.html?p=105.html	2011-12-24 9:30 AM	15 KB	HTML Document
index.html?p=108.html	2011-12-24 9:30 AM	17 KB	HTML Document
index.html?p=117.html	2011-12-24 9:30 AM	18 KB	HTML Document

Figure 3.2. Screenshot of a MacOSX Finder window listing 6 archived blog posts for a student's WordPress website.

The raw archives that were created for both Blackboard and WordPress websites included much information about the students' identities, and these archives were retained only until the process of anonymizing of the data was complete.

Anonymization of Online Discussion Data

In order to ensure that all content was stripped of information that could potentially identify the person who posted it, the raw archives were processed using both automatic and manual processes. The application BBEdit 10 (Barebones Software, 2011) was used, as it is capable of rapidly searching and replacing strings of text in multiple files.

Before anonymizing, each student was assigned a label, which would be used to replace any text that referred to that student, including usernames used by the discussion software and user-provided text strings within posts in the discussions. "John Doe" may be assigned a label of "Student 1", and any reference to "John Doe", their username "jdoe", or casual references to "John" would be replaced with the label "Student 1". All 8 participating students were assigned labels, from "Student 1" through "Student 8". The 5 students that did not provide consent were all assigned the label "Student 0". The instructor was provided the label "Instructor", and two instructors from other courses in the certificate program were provided the labels "Guest 1" and "Guest 2".

To automate the anonymization process as much as possible, the "Multi-File Search..." feature in BBEdit 10 was used to replace the identifying information. Software-provided usernames such as "jdoe" and full student names such as "John Doe" were replaced in all files within the archives using this technique. After the batch processing was complete, each file that was to be used for coding was manually edited

using BBEdit, in order to find instances of names that did not match the automated searches. At this time, any avatar photos added by the participants were removed as well. Any photographs or images that could be used to identify the participants were also removed, including several images added to an Introductions discussion. These images were replaced with a simple string of text to indicate that a photo had been posted by the participant.

Any discussion posts, comments, or responses published by “Student 0” were processed to retain the metadata about the item, including position in the discussion and time of posting, but the content was deleted and replaced with the string “CONTENT REDACTED BECAUSE CONSENT WAS NOT PROVIDED”. This process met the requirements of removing non-consenting participant contributions, while retaining the system-provided information that described the flow of the online discussion (Figure 3.3).

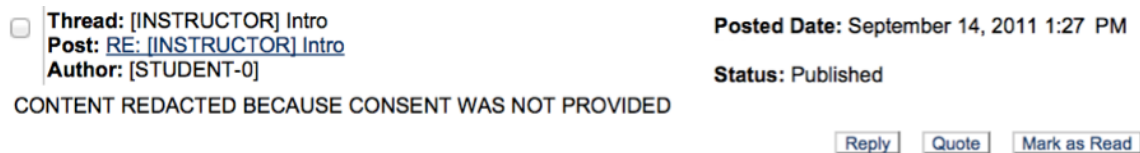


Figure 3.3. Sample of a non-consenting participant's Blackboard anonymized discussion post, with metadata retained and content redacted.

Once all identifying information had been removed from the files, all discussions were opened in a web browser, and printed as Portable Document Format (PDF) files. This was done to ensure that any identifying information remaining in the source code for the HTML archives would be unavailable during the coding process. The individual PDF

files for each post from a student's blog were then collected into a single PDF file that contained all of the posts and comments published on a student's WordPress website.

The fully anonymized PDF files (Figure 3.4) were used for analysis from this point forward, and the raw HTML archives were archived and deleted in accordance with the ethics protocol for this study. The Blackboard discussion forums were archived in 5 PDF files, with a total of 42 pages of content for data analysis. The WordPress student blog websites were archived in 8 PDF files, with a total of 161 pages of content for data analysis.

▼	Blackboard Discussion Board	833 KB	Folder
	02-FAQ.pdf	151 KB	Portable Document Format (PDF)
	04-Digital Media...First Iteration.pdf	170 KB	Portable Document Format (PDF)
	05-Introductions.pdf	156 KB	Portable Document Format (PDF)
	06-Digital Media...entation (LT2).pdf	157 KB	Portable Document Format (PDF)
	07-Paper Prototypes.pdf	200 KB	Portable Document Format (PDF)
▼	WordPress Blogs	5.3 MB	Folder
	Student-1.pdf	559 KB	Portable Document Format (PDF)
	Student-2.pdf	745 KB	Portable Document Format (PDF)
	Student-3.pdf	246 KB	Portable Document Format (PDF)
	Student-4.pdf	764 KB	Portable Document Format (PDF)
	Student-5.pdf	985 KB	Portable Document Format (PDF)
	Student-6.pdf	878 KB	Portable Document Format (PDF)
	Student-7.pdf	782 KB	Portable Document Format (PDF)
	Student-8.pdf	319 KB	Portable Document Format (PDF)

Figure 3.4. Final PDF files produced by anonymizing process.

Metadata Analysis

The metadata portion of the online discussions is generated automatically by the software that publishes the posts. Metadata includes items such as the date and time of a post, the identity of the person who posts content, a basic description of the content itself, and the relationship between a piece of posted content and others within the discussion.

These data can be used to describe activity patterns within a discussion. Figure 3.5 provides a sample of the metadata that was used, describing part of a discussion in Blackboard. Metadata fields include:

- ID: a number used as a unique identifier when referring to a post
- Platform: the name of the software that manages the discussion (either Blackboard or WordPress)
- Discussion: the name of the root or originating post for the discussion thread
- Thread: a representation of the position of a post within a discussion thread
- Person: the anonymized name of the individual that posted an item to the discussion
- Date: the calendar date on which the item was posted
- Day of course: a number representing the number of days since the first course activity when the item was posted
- Word count: the number of words in the body of the discussion post
- Images: the number of embedded images in the discussion post
- Links: the number of embedded links to web pages in the discussion post
- Attachments: the number of files uploaded and attached to the discussion post

	A	B	C	D	E	F	G	H	I	J	K	
1		Id	Platform	Discussion	Thread	Person	Date	Day of course	Wordcount	Images	Links	Attachments
2		1	Blackboard	FAQ	1.1	Instructor						
3		2	Blackboard	FAQ	1.1.1	Instructor	2011-09-13	74	62			1
4		3	Blackboard	FAQ	1.1.1.1	Student-0	2011-09-22	83	0			
5		4	Blackboard	FAQ	1.1.1.1.1	Instructor	2011-09-22	83	39			
6		5	Blackboard	FAQ	1.1.1.1.1.1	Student-0	2011-09-22	83	0			
7		6	Blackboard	FAQ	1.1.1.1.1.1.1	Instructor	2011-09-23	84	106			
8		7	Blackboard	FAQ	1.1.1.1.1.1.1.1	Student-0	2011-09-23	84	0			
9		8	Blackboard	FAQ	1.1.2	Instructor	2011-09-13	74	56			
10		9	Blackboard	FAQ	1.1.3	Instructor	2011-09-13	74	104			
11		10	Blackboard	FAQ	1.1.4	Instructor	2011-09-26	87	158			1
12		11	Blackboard	FAQ	1.1.4.1	Instructor	2011-09-26	87	1			1
13		12	Blackboard	FAQ	1.1.4.2	Instructor	2011-09-26	87	34		1	
14		13	Blackboard	FAQ	1.1.5	Instructor	2011-09-29	90	126			
15		14	Blackboard	FAQ	1.1.6	Student-6	2011-09-29	90	92			
16		15	Blackboard	FAQ	1.1.6.1	Instructor	2011-09-29	90	103			2
17		16	Blackboard	FAQ	1.1.6.1.1	Student-6	2011-09-29	90	76			
18		17	Blackboard	FAQ	1.1.6.1.1.1	Instructor	2011-09-30	91	116			
19		18	Blackboard	FAQ	1.1.6.2	Student-5	2011-10-07	98	67			
20		19	Blackboard	FAQ	1.1.6.2.1	Instructor	2011-10-08	99	100		2	
21		20	Blackboard	FAQ	1.1.7	Student-4	2011-10-06	97	92		1	

Figure 3.5. Metadata for part of one thread in an online discussion.

These metadata fields will be used to generate timelines of the online discussions, and will also be used as the basis for organizing the coded data produced through content analysis of the online discussion posts.

Content Analysis

In addition to the software-generated metadata, the content of the online discussion posts was analyzed using a coding protocol based on the description of the Community of Inquiry coding protocol template published by Garrison, et al (2000). To facilitate this analysis, the researcher coded each post according to the coding protocol.

Coding Protocol

Discussion posts and responses were coded using a coding protocol adapted from Garrison, et al (2000). Each item was coded to indicate all appropriate coding values as

listed in the coding template (Table 3.1). An item may indicate several different presences, or indicate the same type of presence in different ways. Posts in the online discussions were coded at the 3rd level of the coding template (eg, C1A, C1B, etc...), to document all indications of presence identified in the post rather than a single primarily indicated presence, in order to mitigate against a loss of fidelity of the message (Xin, 2012). These indications were then aggregated to give sum totals of Cognitive, Social and Teaching presences for the entire discussion thread.

Table 3.1. *Coding Template, Based on Community of Inquiry Coding Template (Garrison et al, 2000)*

Community of Inquiry Presence	Category	Indicator
C: Cognitive Presence	C1: Triggering Event	C1A: Recognize the problem
		C1B: Sense of puzzlement
	C2: Exploration	C2A: Information exchange
		C2B: Discussion of ambiguities
	C3: Integration	C3A: Connecting ideas
		C3B: Creating solutions
S: Social Presence	S1: Emotional Expression	S1A: Emoticons
		S1B: Autobiographical narratives
	S2: Open Communication	S2A: Risk-free expression
		S2B: Acknowledging others
		S2C: Being encouraging
	S3: Group Cohesion	S3A: Encouraging collaboration
		S3B: Helping
		S3C: Supporting

T: Teaching Presence	T1: Instructional Management	T1A: Structuring content
		T1B: Setting discussion topics
		T1C: Establishing discussion groups
	T2: Building understanding	T2A: Sharing personal meaning and values
		T2B: Expressing agreement
		T2C: Seeking consensus
	T3: Direct Instruction	T3A: Focusing and pacing discussion
		T3B: Answering questions
		T3C: Diagnosing misconceptions
		T3D: Summarizing learning outcomes or issues

All discussion board posts, blog posts and blog responses were archived as static HTML files, and all posts and responses were made anonymous – participant’s names were replaced with generated names to ensure the participants’ identity was not known during coding. Generated names included “Student 1” through “Student 8” for consenting participants, “Instructor,” “Guest 1” and “Guest 2”. All items posted by non-consenting students were attributed to “Student 0” and the content of their posts were discarded and not coded, leaving only the metadata about their posts.

To facilitate coding, a branching-tree diagram (Figure 3.6) was created to represent each discussion, and coding values were entered directly on those diagrams. The branching-tree diagrams were useful in this research, as they explicitly abstract the structure of the discussion from the content, and facilitate documentation of the coding values in the context of that organizational structure.

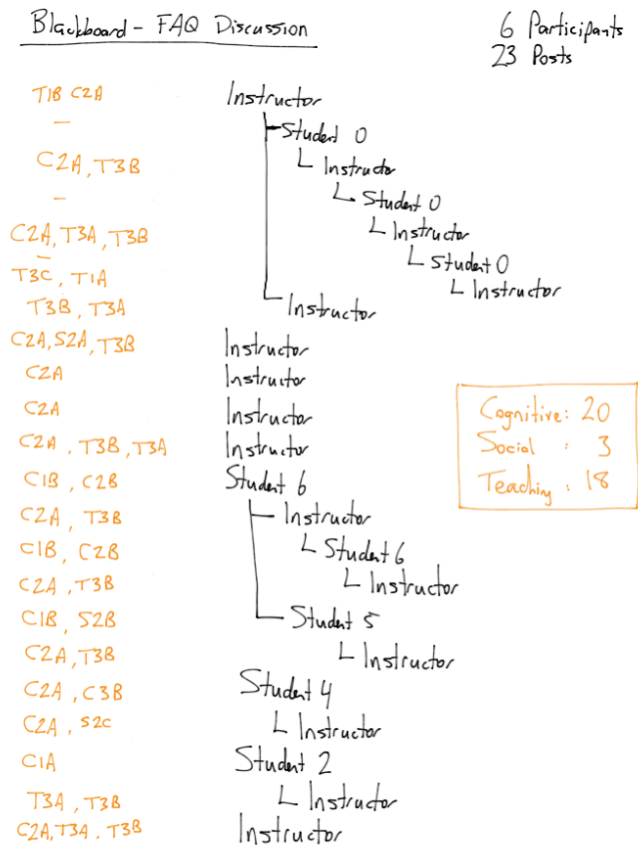


Figure 3.6. Sample branching-tree diagram used for coding a discussion with the coding template.

Once the discussion posts were coded, the data was stored in the same spreadsheet as the discussion metadata, as shown in Figure 3.7. By storing the coded data together with the discussion metadata, it was possible to generate timelines representing the Community of Inquiry presences in each discussion, through the duration of the course.

	A	B	C	D	E	L	M	N
1		Id Platform	Discussion	Thread	Person	Cognitive	Teaching	Social
2		1 Blackboard	FAQ	1.1	Instructor			
3		2 Blackboard	FAQ	1.1.1	Instructor	C2A	T1B	
4		3 Blackboard	FAQ	1.1.1.1	Student-0			
5		4 Blackboard	FAQ	1.1.1.1.1	Instructor	C2A		
6		5 Blackboard	FAQ	1.1.1.1.1.1	Student-0			
7		6 Blackboard	FAQ	1.1.1.1.1.1.1	Instructor	C2A	T1A	
8		7 Blackboard	FAQ	1.1.1.1.1.1.1.1	Student-0			
9		8 Blackboard	FAQ	1.1.2	Instructor		T1A	
10		9 Blackboard	FAQ	1.1.3	Instructor		T1A,T3B	
11		10 Blackboard	FAQ	1.1.4	Instructor	C2A	T1A,T3B	
12		11 Blackboard	FAQ	1.1.4.1	Instructor	C2A		
13		12 Blackboard	FAQ	1.1.4.2	Instructor	C2A	T1A	
14		13 Blackboard	FAQ	1.1.5	Instructor	C2A	T3B	
15		14 Blackboard	FAQ	1.1.6	Student-6	C1B,C2A		
16		15 Blackboard	FAQ	1.1.6.1	Instructor	C2A	T3B	S2B
17		16 Blackboard	FAQ	1.1.6.1.1	Student-6	C1B		S2B
18		17 Blackboard	FAQ	1.1.6.1.1.1	Instructor	C2A	T3B	
19		18 Blackboard	FAQ	1.1.6.2	Student-5	C1B		S2B
20		19 Blackboard	FAQ	1.1.6.2.1	Instructor	C2A	T3B	
21		20 Blackboard	FAQ	1.1.7	Student-4	C2A		

Figure 3.7. Coded data stored in the spreadsheet.

Unit of Analysis

Discussions were coded at the message level, meaning an entire entry into a discussion. So, whether an entry was an initial post or a response, it was coded as a single unit. The message unit provides a consistent unit of analysis (Rourke, Anderson, Garrison & Archer, 1999; Rourke, Anderson, Garrison & Archer, 2001), at a level of granularity that enables consistent coding. Each post may contain several different indicators as described by the coding template, or multiple instances of the same indicators. All text within a message unit representing a participant's post, comment or response was coded using the template, and then all unique coding values identified in that message were assigned to the message as a whole. Although the selection of the message as the unit of analysis is subjective, and offers a low level of granularity of coding (de Wever, Schellens, Valcke and van Keer, 2006), the researcher utilized message level coding to maintain consistency with other Community of Inquiry research, as well as to enable timely and effective coding of all discussion data by a single coder.

Reliability and Replicability of Coding Scheme

Inter-rater reliability is important in coding online discussions, as it describes the consistency and objectivity of coding by different coders, and also indicates the quality of the coding template (Rourke et al, 1999).

All online discussions were coded by the researcher. The consistency of coding using the template was validated with assistance from two graduate student peers, who coded two sample discussions each. The coding by the graduate student research assistants was conducted in order to measure and establish the consistency of coding by the researcher. The coding process can be highly subjective, and the comparison of coding for a sample of discussion posts was used to determine the level of replicability in the researcher's application of the coding template.

A subset of discussion posts (one post with responses taken from the Blackboard discussion, one post with responses from a WordPress blog website) were coded by the researcher and two graduate student assistants. Through this process, it was discovered that the coding applied to the discussion posts and responses were highly consistent. The percentage of agreement (PA) was calculated according to Holsti's (1969) formula:

$$PA_o = \frac{2A}{n1 + n2}$$

Where A is the number of agreements between all coders, and n1 through n3 are the number of items coded by each coder. Possible values for the calculated PA will range from 0 to 1.0, where 0 indicates no agreement, and 1.0 indicates perfect agreement between the coders (Neuendorf, 2002). In the formula, the "A" refers to the number of

agreements between coders, while “n1” and “n2” refer to the number of coding values recorded by each individual coder.

A “simple agreement” Percentage of Agreement (PA) was calculated, comparing exact matches in the coding values recorded by the researcher and each of the two graduate research assistants (Table 3.2). A more comprehensive application of Cohen’s kappa (Cohen, 1960) that would accommodate for agreement or disagreement by chance was not used, as this approach to establishing inter-rater reliability was being used only to test the consistency of the researcher’s rating, and not to measure inter-rater reliability of multiple researchers coding entire discussions.

Table 3.2. Calculated Percentage of Simple Agreement Values for Coded Online Discussion Posts

Online Discussion	PA Value Researcher vs. Assistant 1	PA Value Researcher vs. Assistant 2
Blackboard	0.875	0.848
WordPress	0.722	0.727

Lombard, Snyder-Duch and Camponella Bracken (2004) describe Percentage of Agreement values above 0.70 being acceptable for exploratory studies, and values above 0.80 being acceptable in most situations. Smith (2000) recommends percentage of agreement above 0.85. The “simple agreement” PA values were near the low end of the acceptable range, so a second set of inter-rater reliability calculations was performed.

A second set of Percentage of Agreement values were calculated, using a “range agreement” method – where the numbers of presences indicated were compared, rather than the specific coded values. This provides some flexibility, as coders may be agreeing,

but deciding to use slightly different coding values to represent their interpretation of a message. This range agreement method more closely approximates the level of data coding that is used in this research, where the specific coded values are abstracted to a simple number representing the number of indicated Community of Inquiry presences rather than maintaining specific coding values. For the range agreement PA value calculations, the coded values entered by each researcher or assistant were converted into a matrix of values. If an assistant entered codes such as “S2A, S3A, S2B”, the matrix would hold a value of “3” for that message, under the “Social” column. This was repeated for all coded messages that were used for measuring the reliability of the coding template. The resulting matrix is presented in Table 3.3:

Table 3.3. Sum of Coded Community of Inquiry Presences, As Recorded By Researcher (R), and Research Assistants (RA1, RA2)

id	platform	R-C	R-S	R-T	RA1-C	RA1-S	RA1-T	RA2-C	RA2-S	RA2-T
1	Blackboard	2	3	0	2	2	0	2	3	0
2	Blackboard	0	3	2	0	2	1	0	1	2
3	Blackboard	0	2	0	1	2	0	1	2	0
4	Blackboard	0	0	0	0	0	0	0	0	0
5	Blackboard	0	2	0	0	2	0	0	2	0
6	Blackboard	0	0	0	0	0	0	0	0	0
7	Blackboard	1	0	0	1	0	0	1	0	0
8	Blackboard	0	2	0	0	2	0	0	2	0
9	Blackboard	0	0	0	0	0	0	0	0	0
10	WordPress	4	2	2	4	3	1	4	2	1
11	WordPress	1	4	0	1	3	1	1	3	0
12	WordPress	3	2	0	2	2	1	0	3	1

A second matrix was produced, containing the number of coding values in agreement for each range:

Table 3.4. *Range Agreement Coding Matrix for Researcher (R) and Research Assistants (RA1, RA2)*

id	platform	R/RA1-C	R/RA1-S	R/RA1-T	R/RA2-C	R/RA2-S	R/RA2-T
1	Blackboard	2	2	0	2	3	0
2	Blackboard	0	2	1	0	1	2
3	Blackboard	0	2	0	0	2	0
4	Blackboard	0	0	0	0	0	0
5	Blackboard	0	2	0	0	2	0
6	Blackboard	0	0	0	0	0	0
7	Blackboard	1	0	0	1	0	0
8	Blackboard	0	2	0	0	2	0
9	Blackboard	0	0	0	0	0	0
10	WordPress	4	2	1	4	2	1
11	WordPress	1	3	0	1	3	0
12	WordPress	2	2	0	0	2	0

The Percentage of Agreement values were calculated using the same formula as the simple agreement PA values:

$$PA_r = \frac{2(14)}{(17 + 15)} = 0.875$$

The number 14 in the numerator is the sum of all values in the R/RA1 portion of the table, for the Blackboard posts. This represents the number of coded values that are made in agreement by both Researcher and Research Assistant 1. The denominator values

17 and 15 are the total number of coded values recorded by the Research and Research Assistant 1 for the Blackboard posts.

Table 3.5. *Range-based Percentage of Agreement Values*

Online Discussion	PA Value Researcher vs. Assistant 1	PA Value Researcher vs. Assistant 2	Mean PA Value
Blackboard	0.875	0.909	0.892
WordPress	0.833	0.788	0.815

The calculated mean PA value for the sample Blackboard post and responses was 0.892, and the mean PA value for the WordPress post and responses was 0.815. These two percentage of agreement scores are above the recommended 0.8 threshold (Lombard et al, 2004), and indicate that the coding template was consistently and reliably applied, and that the coding values will be useful for analysis (Krippendorff, 1980). Further, this level of measured inter-rater reliability provides confidence in the consistency of coding content using the coding protocol by the researcher.

Survey

A post-course survey was created by combining the 34 items Community of Inquiry survey instrument (Arbaugh et al, 2008) and the 20 items Classroom Community Survey (Rovai, 2002) The combined survey of 54 items used in this research is presented in Appendix A.

Community of Inquiry Survey Instrument

The Community of Inquiry survey is a 34-item instrument (Arbaugh et al, 2008), with items designed to document responses by participants in a community, to describe

the teaching, social, and cognitive presences they experienced through their participation. The survey has been validated (Swan, et al, 2008) and shown to provide a reliable measurement of the relative presences described by the Community of Inquiry model.

Classroom Community Survey

Rovai's (2002) Classroom Community survey is a 20-item instrument, designed to measure a participant's sense of community in a learning environment. Specifically, it has been shown to provide data describing both perceived community connectedness and reported levels of learning.

Combined Community of Inquiry and Classroom Community Survey

In the initial research design, the intent was to use the survey to identify any differences in perceived community interaction and community of inquiry presences between two sections of a course. As a result of modifying the research to use a single section in one course, the survey was not used to describe differences between communities, but rather to describe the sense of community indicated by participants within the course.

The researcher used an online survey tool to create and administer the survey. The survey was conducted online, using the SurveyMonkey (SurveyMonkey, 2011) online survey management service. Consenting students were emailed a link to the survey at the end of the course, as well as a follow up email as an additional reminder to complete the survey. Of the 8 consenting students, 5 completed the survey. The survey data was analyzed using descriptive statistics.

Interview

The instructor for the course was interviewed in order to document how each online discussion environment was used in the context of the course. The 20-minute interview was recorded, and transcribed for use in the research. The resulting transcript of 6 pages was analyzed to identify differences in intended pedagogical application of each online discussion platform, as well as observations made by the instructor during the course.

The interview was loosely structured around the following questions:

1. What was the level of prior experience reported by students for Blackboard?
 - a. How many of the students had used Blackboard before this course?
 - b. What was your prior experience with Blackboard?
2. What was the level of prior experience reported by students for WordPress?
 - a. How many of the students had used WordPress before this course?
 - b. What was your prior experience with WordPress?
3. What was the Blackboard discussion board used for, pedagogically?
 - a. Why was the instructor so active in Blackboard?
4. What were the WordPress sites used for, pedagogically?
 - a. Why was the instructor relatively less active in WordPress?
5. There were 2 other instructors from another course who were active in the students' WordPress sites. Did that affect your interactions with the students in your course?
6. Did you observe anything as an instructor that was different in WordPress or Blackboard discussions?

7. Was it more difficult to follow students' contributions and responses in WordPress as compared with Blackboard?

Summary of Methodology

In order to address the research questions, several types of data were gathered as part of this research, namely:

1. Online discussion data
 - a. System-generated metadata describing online discussion activity
 - b. Coded data describing Community of Inquiry presences indicated by online discussion messages
2. Survey data, using a combined Community of Inquiry and Classroom Community survey instrument
3. Interview with the instructor of the course

Through the analysis of each of these different forms of data, and the triangulation of these different data sources, the research aims to describe patterns of interaction between participants, to document the perceived sense of community and learning described by participants, and to describe the instructor's use of the different online discussion applications and pedagogies in the context of the course.

In chapter 4, the analysis of data is presented.

Chapter 4: Analysis of Data

This chapter presents an analysis of data collected in this case study. The chapter is divided into 5 sections: 1) metadata analysis, 2) content analysis, 3) survey responses, 4) instructor interview, and 5) summary of findings. The first section is an examination of system-generated metadata describing the online discussion posts. The second section is a description of content analysis, applying a modified Community of Inquiry coding template to describe the indicators of various presences in the online discussions. Section three presents an analysis of the responses to the combined Community of Inquiry and Classroom Community survey instrument. The fourth section provides an analysis of data gathered during an interview with the instructor that documents the different contexts of the online discussions. The fifth and final section summarizes the various sources of data, and triangulates the different forms of analysis to provide a more complete description of the online discussions and the community of the class.

Metadata Analysis

Online discussions are composed of both the content posted by participants – the messages themselves, along with salutations, links and attachments – as well as the system-generated metadata describing the posts (Figure 4.1). This metadata includes the name of the person who publishes a post, the time and date the post is published, and the relationship between a post and others within a thread (Figure 4.2). Post metadata can also include calculated items, such as word count, number of links, and the number of embedded media or attached files. Analysis of this metadata can provide a description of activity patterns within a discussion over time.

Thread: [STUDENT-6]'s Digital Media Presentation
Post: [STUDENT-6]'s Digital Media Presentation
Author: [STUDENT-6]

Posted Date: September 30, 2011 11:15 AM
Status: Published

Figure 4.1. Sample of system-generated metadata for an online discussion post in Blackboard.

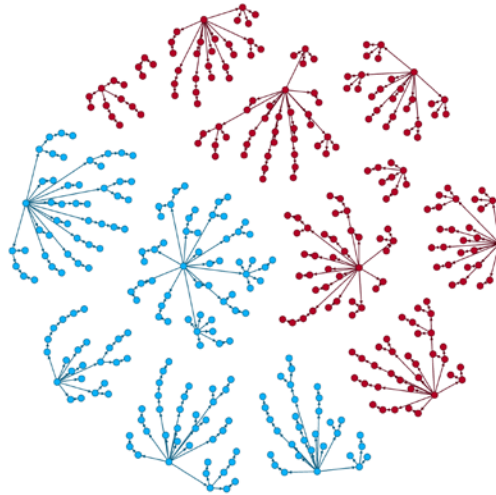


Figure 4.2. Sample diagram of posts and responses, built from metadata in the online discussions - Blackboard discussions (blue) and WordPress posts and responses (red).

Timeline of Discussion Posts

By documenting and analyzing the timeline of a discussion thread, it is possible to get a sense of the intensity and duration of a discussion over time. An approximation of intensity through a timeline may be used to describe the level of ongoing engagement by participants in an online discussion. Brief discussions will occur rapidly, while long engagements may extend over several days or weeks. For the purposes of this study, the choice was made to analyze the data by plotting online discussion activity in each platform over the duration of the course (which was 88 days from September 12 through December 9, 2011, and over the duration of online activity which occurred for 164 days

from July 4 through December 15, 2011) by plotting metadata fields on a timeline. This decision was justified because substantial portions of the online discourse occurred prior to the official start date for the course. It was determined that in order to fully document the online discussion and interactions between participants using the two discussion platforms, and to describe and compare the affordances of the online discussion environments, all available online discussion data must be included in the analysis.

In order to facilitate date-based calculations, all dates were measured against July 1, 2011 as “day 0” of course activity. The first online post was published on July 4, 2011, which is indicated as “day 3”. The last online post was published on December 15, 2011, which is indicated as “day 167”. The course officially started on September 12, 2011, which is indicated as “day 73”, and the course officially ended on December 9, 2011, indicated as “day 161”.

Based on the timeline analysis, it was determined that although both of the online discussions contained a similar numbers of posts and responses (189 for Blackboard, 207 for WordPress), the timelines were markedly different (Figure 4.3). The WordPress discussions appeared to be of lower intensity, with fewer posts per day (with a maximum of 10 posts and responses in a single day), but of longer duration, spanning the entire 164 days of online discussion activity. In comparison, Blackboard discussions appeared to be of higher intensity (with a maximum of 20 posts and responses in a single day), and the timeline was more compressed, spanning only 110 days.

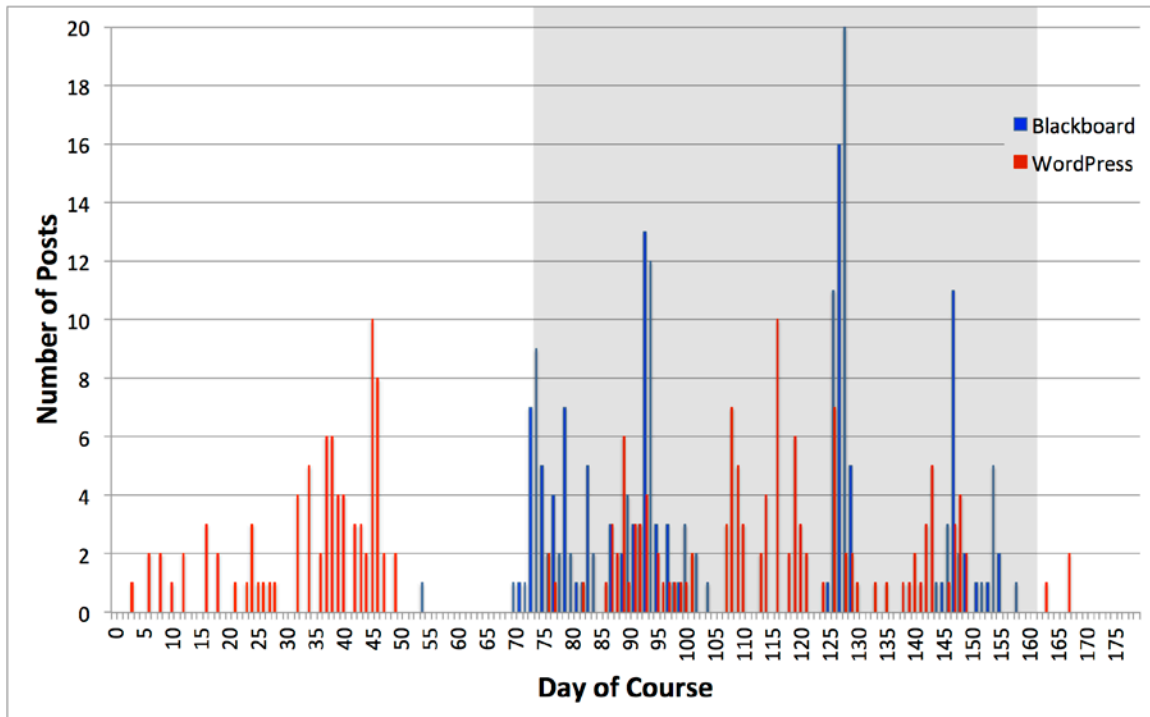


Figure 4.3. Timeline of posting activity by day of course, for WordPress and Blackboard discussions (official course period indicated in grey).

Given that the course officially started on “day 73”, almost all of the activity in the Blackboard discussion boards occurred after this date, except for some activity by the instructor to set up the discussion boards prior to the start of the course. The students’ WordPress websites contained many posts from before the beginning of this course. This is a result of the nature of the WordPress websites’ configuration as being owned or managed by individual students rather than the institution or educational program. The students were using their WordPress websites in other courses in the certificate program, and as a result, their WordPress websites contained posts and responses from a previous course. These websites also included content contributed by the instructors from the previous course. In contrast, the Blackboard online course was created and configured to contain only content directly related to the course that was used in this research. There

was no content from previous courses, and no participants who were not registered in the course.

The mean activity levels were similar, with Blackboard discussions having slightly more posting intensity during the 110 days the Blackboard threads were active (1.72 mean posts and responses per day), compared with WordPress having 1.25 mean posts and responses per day during the 164 days the WordPress sites were active. By comparing just that metric, it is difficult to get a sense of the level of meaningful intensity, rather than simple post frequency.

While the discussion intensities as measured in mean posts per day were similar for both Blackboard and WordPress, other aspects of the metadata gathered for the discussions may provide insight into other potential differences between the discussions in the two platforms.

Activity Patterns

By examining additional metadata parameters, such as word count and person publishing a post, a more inclusive activity pattern emerges. The WordPress discussions had much longer posts, with significantly higher word counts (Figure 4.4), even though the posting frequency was slightly lower than on the Blackboard discussion threads. This suggests that the content of the posts may be different between the two discussion platforms, and subsequent content analysis of the discussion posts may identify and describe any differences.

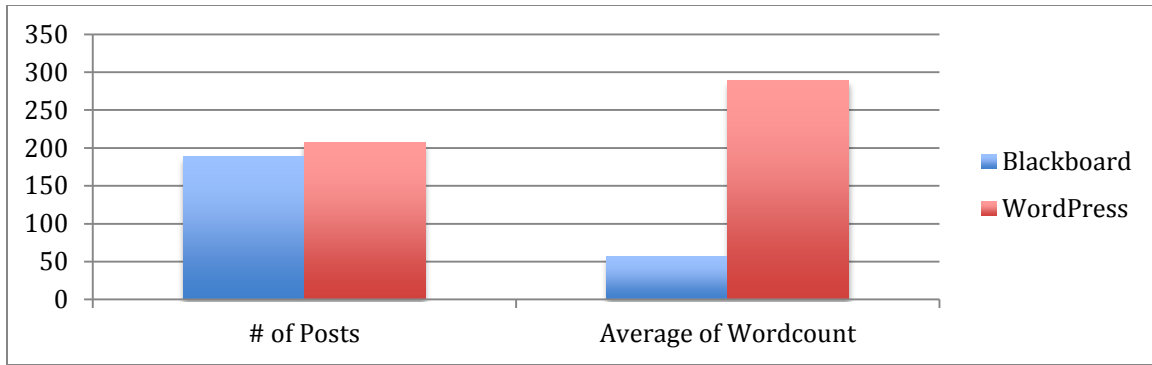


Figure 4.4. Number of posts and average word count for Blackboard and WordPress online discussions.

For this study, a visual representation of three variables was developed in order to extend the analysis. The metadata for a discussion can be broken into three components – the individual, the date, and the size (as measured by word count) of the post. By mapping time on the x-axis, word count (size of post) on the y-axis, and plotting individual posts, a description of an entire discussion becomes visible for both the WordPress (Figure 4.5) and Blackboard (Figure 4.6) discussions. Both figures have been plotted with the same vertical and horizontal axes and scales, to facilitate comparison and identification of patterns. Additionally, posts can be connected to their responses with lines, describing the flow of a discussion through the course, and between the participants. Longer posts have higher word counts, and are thereby indicated higher up the y-axis. Gaps in activity become clear, as well as concentrations of sizeable contributions.

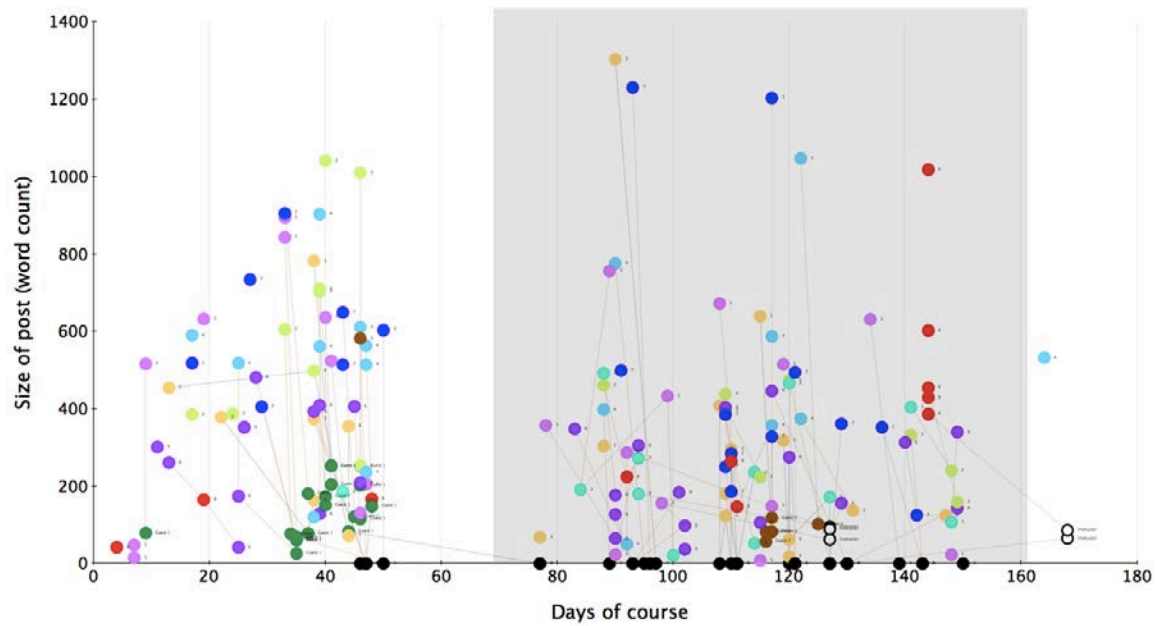


Figure 4.5. Online discussion activity in WordPress (official course period indicated in grey).

Each colour represents an individual participant. From Figure 4.5, one can discern that the instructor (white circles) had a minimal presence in the WordPress sites, while students were active in publishing longer posts and responses to each others' work. The solid black circles represent "Student 0" – the 5 students who did not provide consent. Their posts were redacted from analysis, but the anonymized and aggregated metadata was retained to maintain the activity pattern of the online discussions.

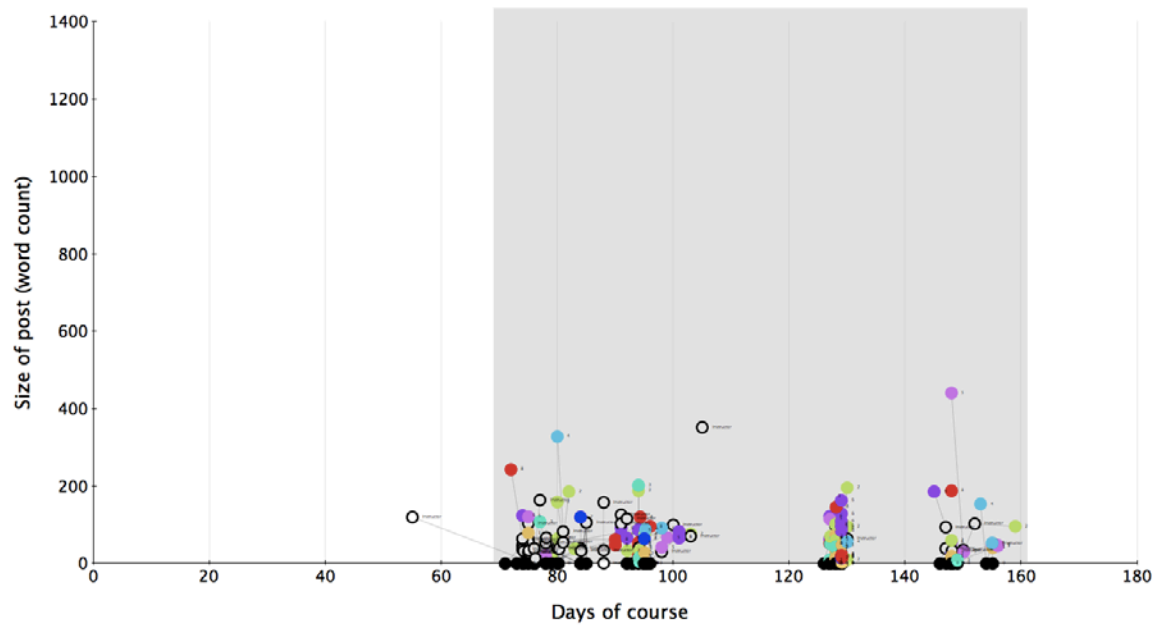


Figure 4.6. Online discussion activity in Blackboard (official course period indicated in grey).

The instructor (white circle) participated much more actively in the Blackboard discussion threads than in the WordPress discussions, posting 8 times more in Blackboard than in WordPress (Table 4.1). In addition, many of the student interactions in the Blackboard discussion threads were providing responses directly to content posted by the instructor.

Table 4.1. *Online Discussion Posts By Each Participant In the Course, In Both Blackboard and Wordpress*

Participant	Blackboard (posts)	Blackboard (word count)	WordPress (posts)	WordPress (word count)
Instructor	40	2855	5	397
Student 1	9	343	21	6846
Student 2	19	1590	17	8039
Student 3	13	686	14	3302

Student 4	8	911	16	8617
Student 5	11	1076	23	9035
Student 6	18	1767	27	6680
Student 7	4	223	19	10025
Student 8	18	1239	11	3898
Student 0	49 ¹	n/a	30	n/a
Guest 1	0	0	19	2587
Guest 2	0	0	5	441

Figure 4.7 shows that the Instructor was the most active individual contributor of content to the Blackboard discussion board, both in terms of number of posts and total word count, but was the least active individual contributor of content to the WordPress discussions.

One student (Student 7) was one of the least active participants in the Blackboard discussions, but posted the highest word count of all participants in the WordPress discussions.

¹ “Student 0” is an anonymous aggregate of 5 students who did not provide consent to content analysis of their discussion posts. As a result, any metadata describing contributions by “Student 0” is artificially exaggerated, and no data about the content itself is available.

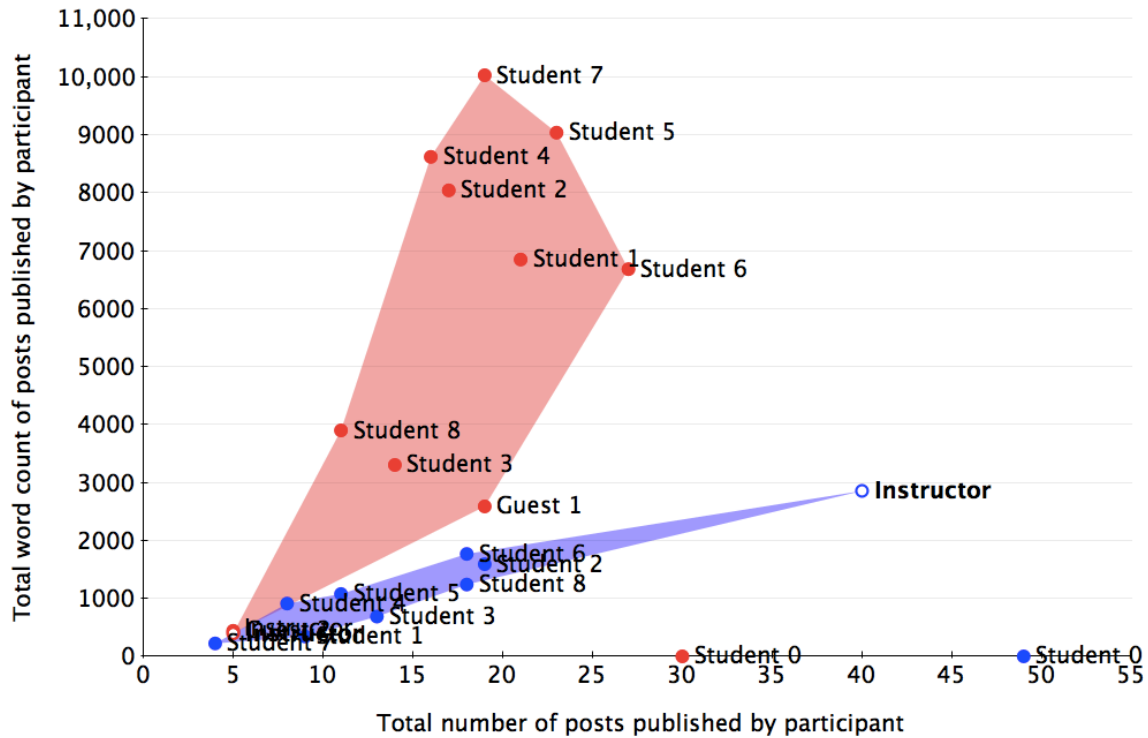


Figure 4.7. Total number of posts vs. total word count of posts published by participants. Blackboard activity is shown in blue, and WordPress activity is shown in red.

While the discussion posting intensity as measured by mean posts per day was similar for both discussion platforms, the other metadata parameters describe some interesting differences between the two discussions.

1. Number of posts published by participants, as well as mean posts per day, were similar in both WordPress and Blackboard discussions, suggesting the overall intensity of the discussions was similar.
2. WordPress discussions had much longer posts, with 5442 mean total word count (minimum 397, maximum 10025) of participants' posts, compared to 1187 mean total word count (minimum 223, maximum 2855) of participants' posts in Blackboard. Participants posted 4.6 times as many words in the WordPress

discussions as they did in the Blackboard discussions. Some of the increased total word count of posts published by students to their WordPress websites is a result of their use of the website for other courses. If only posts from the official course dates are considered for both Blackboard and WordPress online discussions, the results are consistent, but less marked (Table 4.2 and Figure 4.8). In this date-restricted subset of the data, the mean total word count of posts published by students using WordPress during the course was 3073.9 words (minimum 246, maximum 5697), while the mean total word count of posts published by students using Blackboard during the course was 1147.4 words (minimum 223, maximum 2735).

3. The instructor was the most active participant in the Blackboard discussions, and the least active participant in the WordPress discussions, both in terms of number of posts, and in the word count of posted content.

Table 4.2. Mean, Max and Min Total Word Counts of Students' Posts to Blackboard and WordPress Discussions

Platform	Mean word count	Max word count	Min word count
Blackboard (all)	1187.8	2855	223
Blackboard (course)	1147.4	2735	223
WordPress (all)	5442.5	10025	397
WordPress (course)	3073.9	5697	246

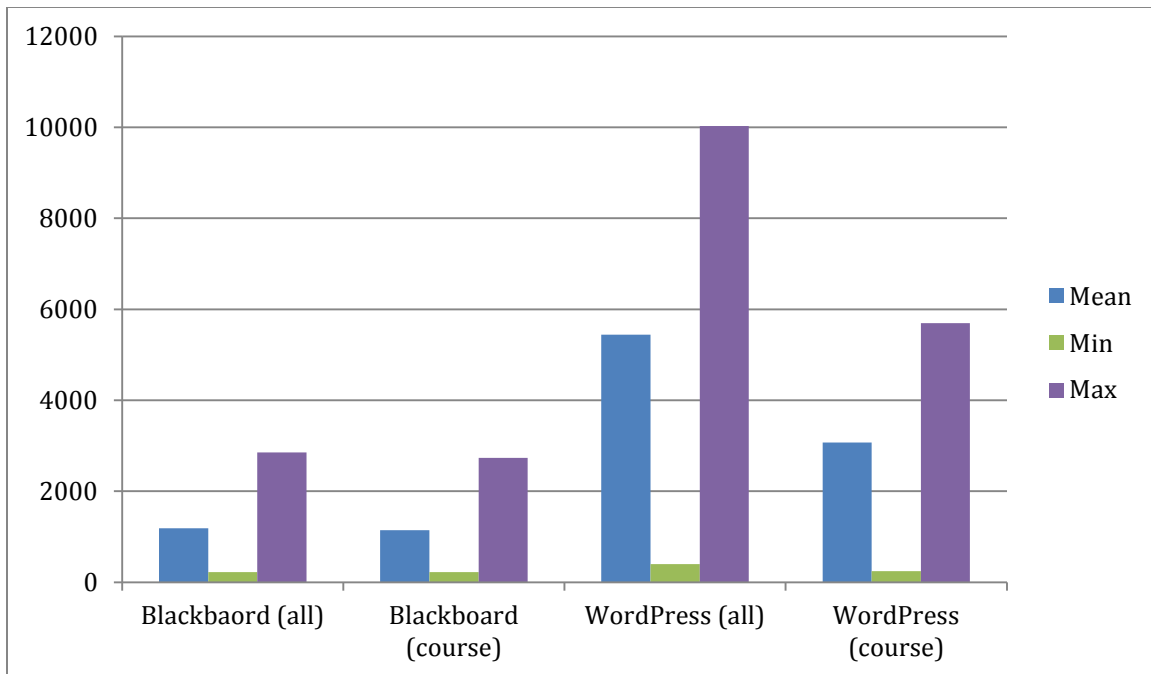


Figure 4.8. Mean, max and min total word counts of students' posts to Blackboard and WordPress discussions.

These differences are interesting because they begin to describe measurable effects of pedagogy and activity on the discussions produced through interaction between the instructor and course participants. To examine these differences more closely, content analysis was applied through a Community of Inquiry coding template, to document and describe the relative prevalence of the three Community of Inquiry presences throughout the discussions in the course.

Connections Between Individuals

Another potential use for the online discussion metadata is in the generation of a map or diagram to describe the pattern of connections between individuals. If “Student 1” responds to a post by “Student 2”, they have demonstrated a connection between the two

individuals. By documenting the connections demonstrated by participants throughout the various online discussion threads, it is possible to describe the overall connection pattern. If an individual only responds to posts from a small subset of students, then the number of connections that individual has will be low. If the individual responds to a large subset, or even the entire set of participants, then that person's number of connections will be high.

In the WordPress online discussions, study participants responded to posts by a mean 6.83 other individuals (Figure 4.9, left), with a maximum responding to 11 other individuals, and a minimum of 3. In the Blackboard online discussions, individuals responded to posts by an average 6.0 other individuals (Figure 4.9, right), with a maximum responding to 9 other individuals, and a minimum of 2. This slight increase in connections between individuals on WordPress may suggest that the community interactions between participants were broader in the WordPress discussions, with participants interacting more with each other than they did in the Blackboard discussions. When combined with the difference in activity and contribution by the instructor in each discussion platform, the student participants appear to be more connected with each other in the WordPress discussions than they are in Blackboard. It is unclear what may have caused these differences – whether these were as a result of the technology, or of the pedagogy and activities assigned to be conducted in each platform. It is possible that the additional two guest instructor participants in the WordPress discussions could account for the differences, as they were absent from the Blackboard discussions.

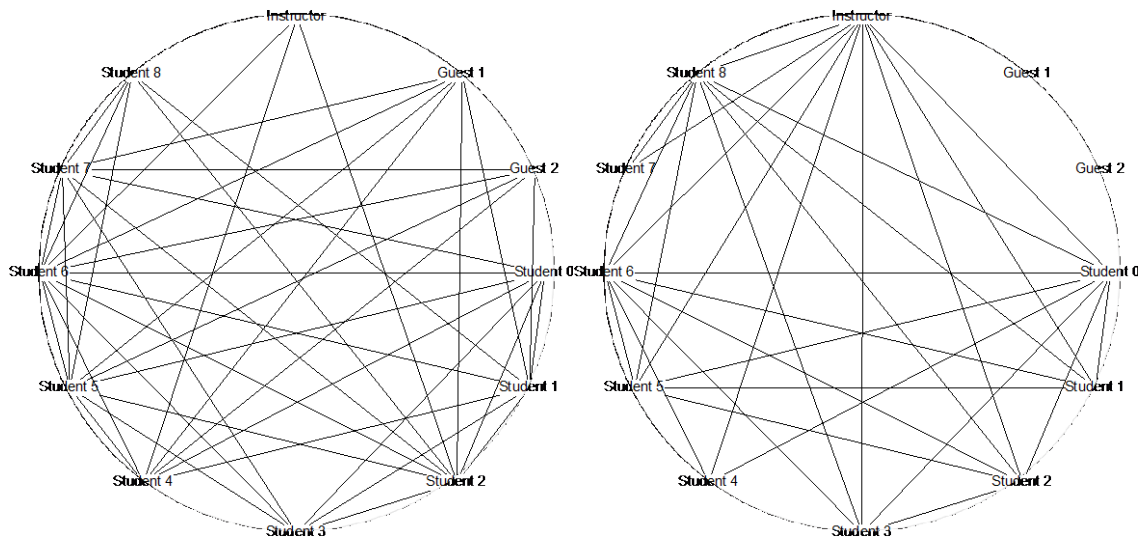


Figure 4.9. Connections between individuals in WordPress (left) and Blackboard (right) online discussions.

Summary of Metadata Activity

Discussion posts occurred throughout the duration of the course activities, and the total number of posts as well as mean posts per day were similar for both discussion platforms. In order to extend the analysis, the metadata was analyzed by time, activity and level of interaction for both WordPress and Blackboard discussions.

It was found that participants published longer posts in the WordPress discussions than they did in Blackboard, and interacted with more of the other participants in WordPress than in Blackboard. When plotted on a timeline, the contributions to the WordPress websites occurred for a longer period of time, both before and after the official start and end dates of the course, as a result of the students' ability to use their website in other courses in the certificate program.

Additional network and social graph analysis of the discussion metadata could be applied, to generate an understanding of community interaction and connectedness. This

analysis was outside the scope of this research project because the primary framework for analysis in this research was the Community of Inquiry presences. A future study or follow-up analysis of the data could be used to provide some additional insights into activity patterns within the course.

Content Analysis

The Community of Inquiry model provided the basis for a modified coding framework that was used to conduct a content analysis of online discussion posts. This analysis produced an additional set of interpretive metadata parameters, representing the cognitive, social, and teaching presences detected in each post. As posts were coded using the Community of Inquiry modified coding template, the frequency of each type of coded presence were counted, giving an overall aggregate description of a discussion as a whole (Table 4.3).

It should be noted that only a subset of the online discussions was available for analysis, as only 8 of the 13 students provided consent to participate in the research project. As a result, any analysis will only be applicable to the participating students, and cannot be generalized to describe the community that developed in the course as a whole.

On the WordPress websites of the 8 students who provided consent to participate in this research, the discussions had a total of 207 posts from all participants. After coding the posts, it was determined that the WordPress posts had a combined 339 instances of cognitive presences (mean 1.638), 195 instances of teaching presences (mean 0.942), and 334 instances of social presences (mean 1.614). Blackboard discussions had a total of 189 posts, including content posted by all students enrolled in the course, with 69 instances of

cognitive presences (mean 0.366), 26 instances of teaching presences (mean 0.138), and 245 instances of social presences (mean 1.296). If the original research design had been employed, where two separate groups of students each used different online discussion software and their content and interactions were analyzed separately, the mean and significant difference values would have been used to compare relative strengths of cognitive, teaching and social presences in each group. Variation in these values could then be used to identify differences in community interaction that may have resulted from selection of software. Unfortunately, in the modified research design that was employed, there was only a single group of students using both online discussion applications simultaneously, so the mean and significant difference values are merely descriptive rather than comparative.

Table 4.3. *Community of Inquiry Coding Summary for Blackboard and WordPress Online Discussions*

Platform	# of Posts	Cognitive Presence	Teaching Presence	Social Presence
Blackboard	189	total: 69 mean: 0.366 SD: 0.545	total: 26 mean: 0.138 SD: 0.375	total: 245 mean: 1.296 SD: 1.253
WordPress	207	total: 339 mean: 1.638 SD: 1.500	total: 195 mean: 0.942 SD: 0.728	total: 334 mean: 1.614 SD: 1.180

Both online discussions had similar levels of social presences, but teaching and cognitive presences were higher in the WordPress discussions than in the Blackboard discussion threads (Figure 4.10).

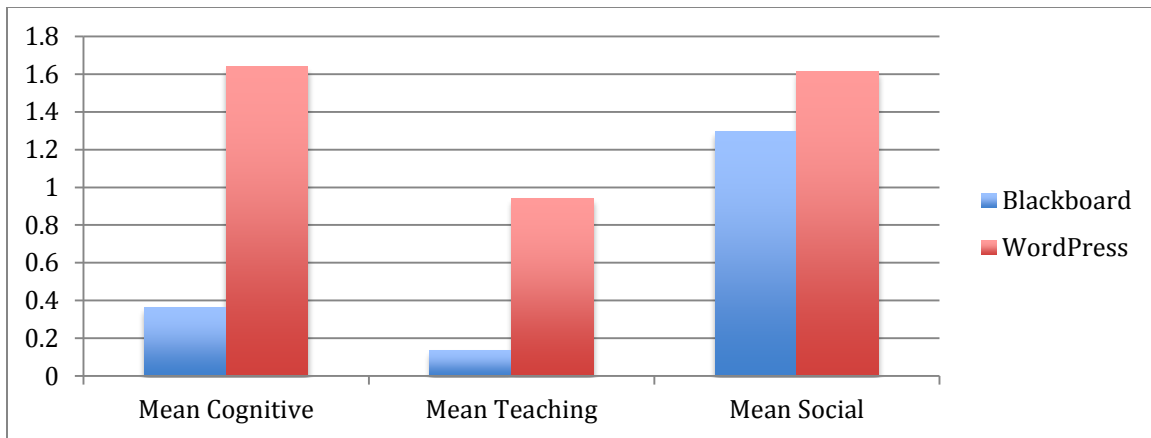


Figure 4.10. Comparison of aggregated Community of Inquiry coded values for Blackboard and WordPress online discussions.

Although the instructor was the least active participant in the discussions hosted in WordPress, the WordPress posts demonstrated a greater number of Community of Inquiry teaching presence indicators. The students themselves were providing feedback as comments posted to the WordPress website posts, demonstrating teaching presence themselves, without recorded intervention by the instructor.

Akyol and Garrison (2008) presented a method of describing changes in Community of Inquiry presences over the duration of a course, using aggregate values in three separate three-week periods. Following similar methodology, the coded data for the online discussions is presented in Figure 4.11 (Blackboard) and Figure 4.12 (WordPress).

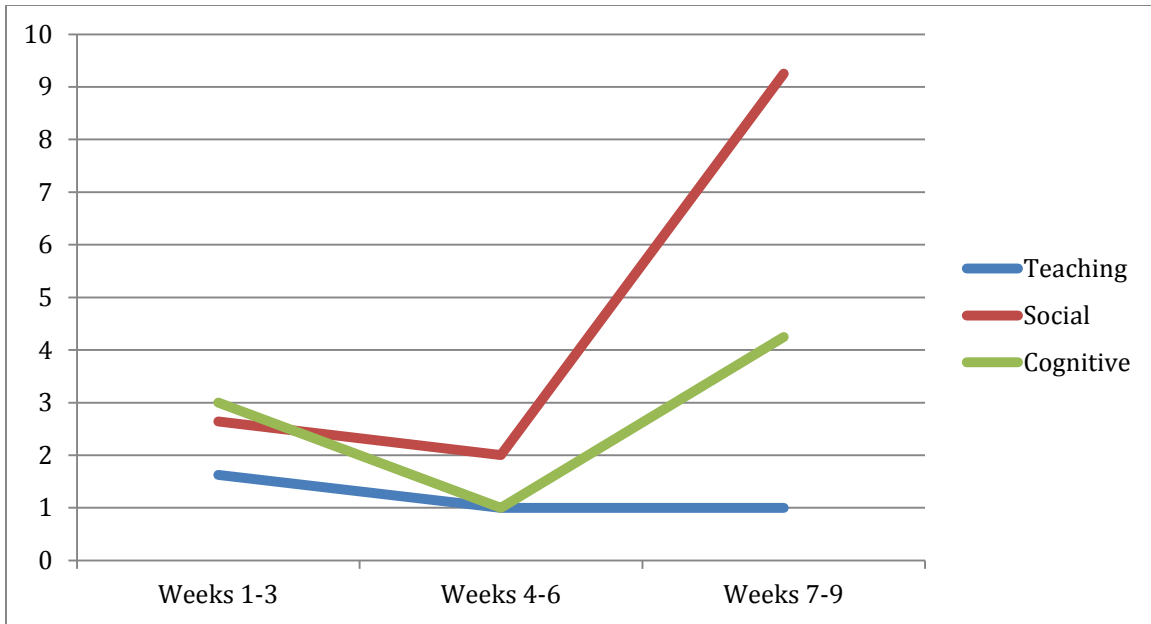


Figure 4.11. Mean Community of Inquiry presences per post in Blackboard discussions, by week of course.

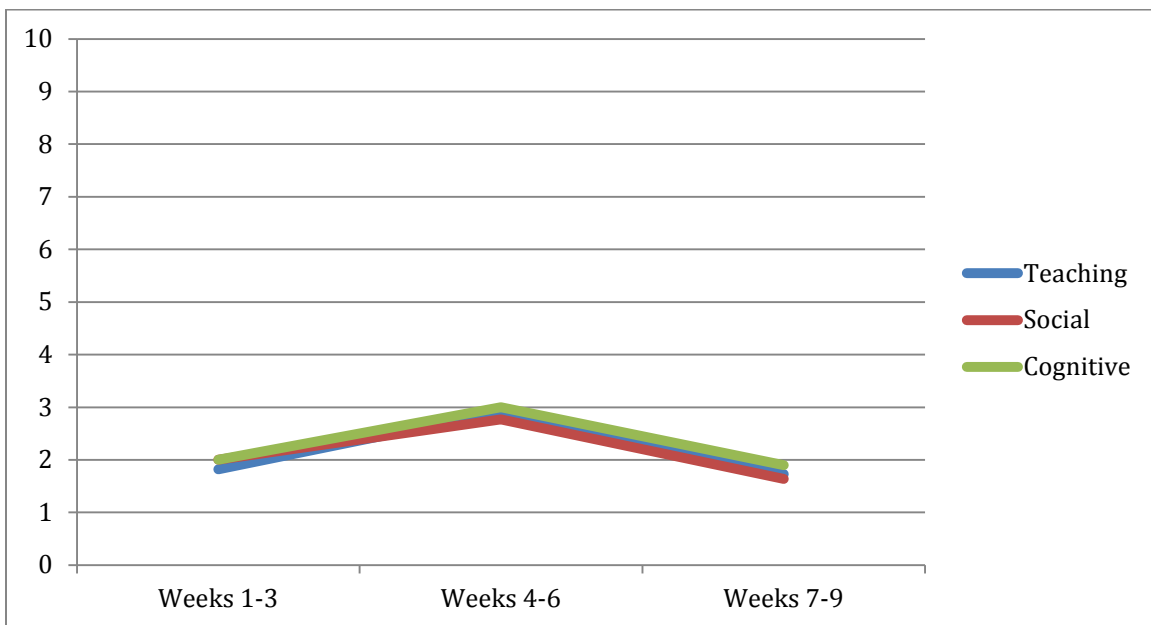


Figure 4.12. Mean Community of Inquiry presences per post in WordPress discussions, by week of course.

This form of visualization provides a way of describing trends at a coarse or high level, but does not reflect the fluid and constantly changing nature of discourse in a learning community. When combined with other post metadata, such as the date of posting, it is possible to produce a timeline that describes changes in the three Community of Inquiry presences over the duration of an online discussion. In exploring the coded discussion data, it became clear that a more fluid timeline presentation of the data was possible, and the researcher devised two new timeline visualizations: Community of Inquiry presence indications by day of course, and number of simultaneous presences by day of course.

The WordPress discussion posts, when mapped for the duration of the students' interaction, showing prevalence of the cognitive, social, and teaching presences (Figure 4.13) shows that multiple presences were detected throughout almost the entire discussion, and that cognitive and social presences were often strongly visible simultaneously.

The same visualization of the Blackboard discussion threads (Figure 4.14) shows a marked difference in Community of Inquiry presence patterns. Social presence is strong, but there is little teaching presence shown, and simultaneous spikes of cognitive and social presences were less prevalent.

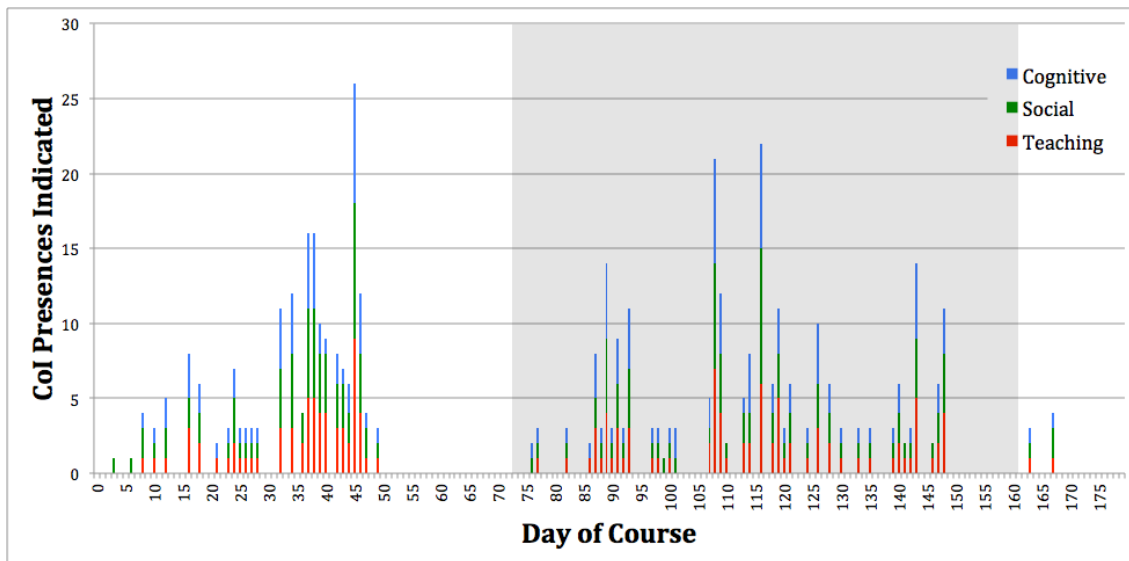


Figure 4.13. Community of Inquiry presence indications in WordPress discussion posts by day of course (official course period indicated in grey).

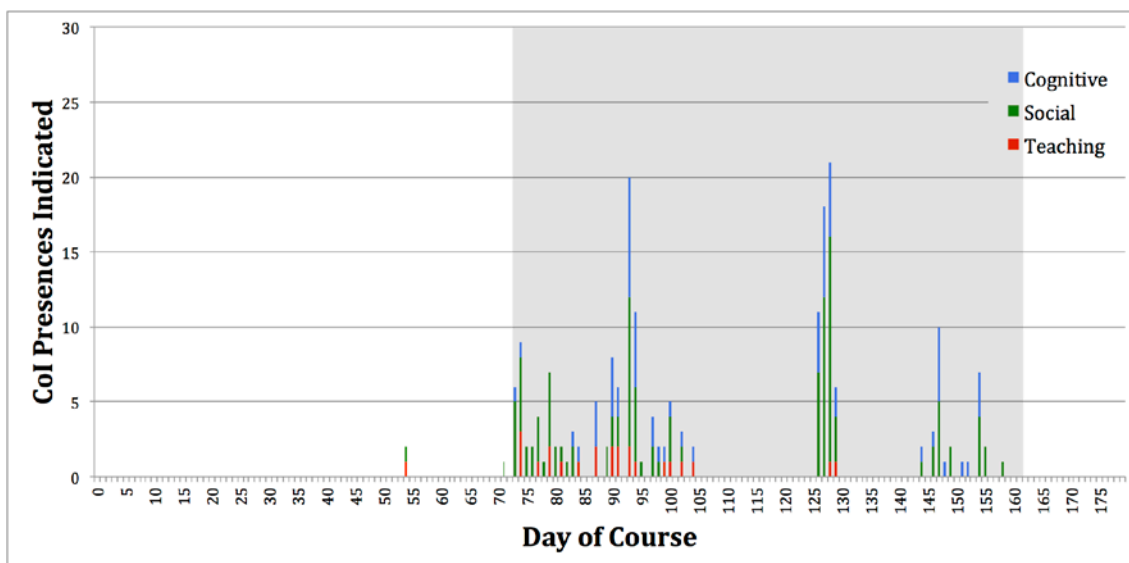


Figure 4.14. Community of Inquiry presence indications in Blackboard discussion posts, by day of course.

The WordPress discussions appear to show multiple simultaneous presences, whereas the Blackboard discussions show more of a single-presence pattern. If the coded

metadata is reduced to a more abstract representation of the number of simultaneous presences shown in a single post, it is possible to describe the level of multiple presences described in a discussion (Figure 4.15). With this form of discussion visualization, it can be demonstrated that the WordPress discussions commonly included all three forms of community of inquiry presence (cognitive, social and teaching), or 2 of the 3 simultaneously demonstrated in a single post. In comparison, the Blackboard discussion posts rarely showed all three Community of Inquiry presences, and most commonly showed only 1 or 2 presences. The higher degree of multiple simultaneous presences may mitigate what Garrison (et al, 2000) describe as a “leanness” in online text-based communication, when compared to the comparatively “richer” interactions with more non-verbal and paralinguistic cues available. This may suggest that participants are able to incorporate a richer set of interactions while gaining the advantage of increased time for reflection as they are engaged in an asynchronous text-based discussion.

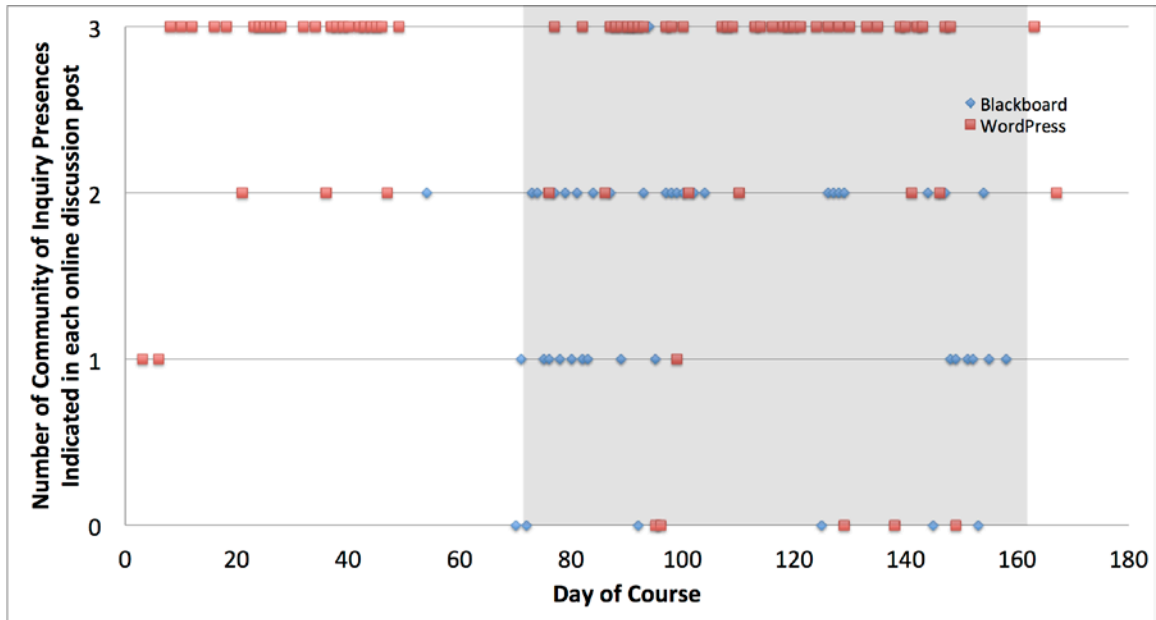


Figure 4.15. Number of simultaneous presences shown across all posts per day in WordPress vs. Blackboard (official course period indicated in grey).

Survey Responses

The online survey presented participants with 54 items from two survey instruments, the Community of Inquiry survey (Arbaugh et al, 2008) of 34 items, and the Classroom Community survey (Rovai, 2002) of 20 items. Students completed the survey online.

The survey was designed using two web pages. Page one contained the items from the Community of Inquiry survey instrument (Arbaugh et al, 2008), and page two contained the items from the Classroom Community Survey (Rovai, 2002). Of the 8 students who provided consent, only 5 completed the survey. While the data from the online survey is not representative of the class as a whole, it does provide data from 38% of students enrolled in the class. Additionally, since the researcher was only able to use a single section of one course, the survey was not used to describe differences in

community between the WordPress and Blackboard users, as all students in the course were actively using both online discussion platforms.

The survey responses can be used to document and describe the reported sense of community interaction of the participants in this course as a whole, rather than as originally intended to document differences between WordPress-using and Blackboard-using students.

All survey questions were presented as ordinal Likert scales, with options ranging from 1 (Strongly Disagree), through 5 (Strongly Agree). Although a 5-point Likert scale has been shown to skew responses (Garland, 1991), the effect may be minimal as increased precision in the measurement instrument does not significantly increase or decrease the quality of response data (Matell & Jacoby, 1971). The researcher elected to stay with the 5-point scale used in the original Community of Inquiry and Classroom Community surveys, in order to maintain consistency with other studies using the instruments.

Community of Inquiry Survey Items

The Community of Inquiry Survey items (Table 4.4) are organized into three groupings, one for each of the presences described by the Community of Inquiry model (Arbaugh et al, 2008). Items 1-13 measure indicators of Teaching Presence, items 14-22 measure indicators of Social Presence, and items 23-34 measure indicators of Cognitive Presence.

Table 4.4. *Responses For 34 Items of the Community of Inquiry Survey Instrument, Grouped by Presence and Sorted by Mean Value*

Item	Question	Mean	SD
Teaching Presence Items			
9	The instructor encouraged course participants to explore new concepts in this course.	4.80	0.45
4	The instructor clearly communicated important due dates/time frames for learning activities.	4.60	0.55
3	The instructor provided clear instructions on how to participate in course learning activities.	4.40	0.55
6	The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	4.20	0.84
13	The instructor provided feedback in a timely fashion.	4.20	1.30
8	The instructor helped keep the course participants on task in a way that helped me to learn.	4.00	1.00
11	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	4.00	1.00
1	The instructor clearly communicated important course topics.	4.00	1.22
2	The instructor clearly communicated important course goals.	3.80	1.10
12	The instructor provided feedback that helped me understand my strengths and weaknesses.	3.80	1.10
10	Instructor actions reinforced the development of a sense of community among course participants.	3.80	1.30
7	The instructor helped to keep course participants engaged and participating in productive dialogue.	3.60	1.52
5	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	3.20	0.84
Social Presence Items			
18	I felt comfortable participating in the course discussions.	4.20	0.45
21	I felt that my point of view was acknowledged by other course participants.	4.20	0.45
17	I felt comfortable conversing through the online medium.	4.00	0.00

19	I felt comfortable interacting with other course participants.	3.80	0.45
14	Getting to know other course participants gave me a sense of belonging in the course.	3.80	1.30
15	I was able to form distinct impressions of some course participants.	3.80	1.30
20	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	3.60	0.89
16	Online or web-based communication is an excellent medium for social interaction.	3.40	0.89
22	Online discussions help me to develop a sense of collaboration.	3.20	0.84
Cognitive Presence Items			
26	I utilized a variety of information sources to explore problems posed in this course.	4.60	0.55
34	I can apply the knowledge created in this course to my work or other non-class related activities.	4.60	0.89
28	Online discussions were valuable in helping me appreciate different perspectives.	4.40	0.55
30	Learning activities helped me construct explanations/solutions.	4.40	0.55
31	Reflection on course content and discussions helped me understand fundamental concepts in this class.	4.40	0.55
32	I can describe ways to test and apply the knowledge created in this course.	4.20	0.45
33	I have developed solutions to course problems that can be applied in practice.	4.00	0.00
24	Course activities piqued my curiosity.	4.00	1.22
25	I felt motivated to explore content related questions.	3.80	1.10
23	Problems posed increased my interest in course issues.	3.80	1.64
27	Brainstorming and finding relevant information helped me resolve content related questions.	3.60	1.14
29	Combining new information helped me answer questions raised in course activities.	3.60	1.34

It is worth noting that six of the Community of Inquiry survey Teaching Presence items indicated strong agreement by all participants (mean ≥ 4.0 and SD ≤ 1.0). These items were:

1. The instructor engaged course participants to explore new concepts in this course (mean 4.80, SD 0.45)
2. The instructor clearly communicated important due dates/time frames for learning activities (mean 4.60, SD 0.55)
3. The instructor provided clear instructions on how to participate in course learning activities (mean 4.40, SD 0.55)
4. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking (mean 4.20, SD 0.84)
5. The instructor helped keep the course participants on task in a way that helped me to learn (mean 4.00, SD 1.00)
6. The instructor helped to focus discussion on relevant issues in a way that helped me to learn (mean 4.00, SD 1.00)

These items indicate that the instructor was providing clear communication with students regarding course expectations, which may have helped to elicit strong participation by students in the class community. Further, the items regarding instructor direction of discussion suggest that teaching presence was contributed by the instructor outside the online discussion software, as the instructor was not active in the WordPress discussions.

The Social Presence section of the Community of Inquiry survey yielded three items with strong agreement (mean ≥ 4.0 and SD ≤ 1.0). These items were:

1. I felt comfortable participating in course discussions (mean 4.20, SD 0.45)
2. I felt that my point of view was acknowledged by other course participants (mean 4.20, SD 0.45)
3. I felt comfortable conversing through the online medium (mean 4.00, SD, 0.00)

The responses to these items indicate a strong agreement by students that they were able to comfortably use the online discussion software, and that they felt comfortable interacting with course participants and were acknowledged by others in doing so. These factors may explain why the online discussions produced the high level of activity that was observed through this research.

Responses to items the Cognitive Presence section of the Community of Inquiry survey suggest that students believed they were able to directly apply what they were learning, that they were able to appreciate different perspectives and reflect on what they were learning, but that they did not feel strongly motivated to explore the concepts further. The items with strong agreement (mean ≥ 4.0 and SD ≤ 1.0) were:

1. I utilized a variety of information sources to explore problems posed in this course (mean 4.60, SD 0.55)
2. I can apply the knowledge created in this course to my work or other non-class related activities (mean 4.60, SD 0.89)
3. Online discussions were valuable in helping me appreciate different perspectives (mean 4.40, SD 0.55)

4. Learning activities helped me construct explanations/solutions (mean 4.40, SD 0.55)
5. Reflection on course content and discussions helped me understand fundamental concepts in this class (mean 4.40, SD 0.55)
6. I can describe ways to test and apply the knowledge created in this course (mean 4.20, SD 0.45)
7. I have developed solutions to course problems that can be applied in practice (mean 4.00, SD 0.00)

Mean responses for the 34 items from the Community of Inquiry survey ranged from 4.80 for item 9 (The instructor encouraged course participants to explore new concepts in this course) to 3.20 for items 5 (The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn) and 22 (Online discussions help me to develop a sense of collaboration). Standard deviations were highest for item 23 (S.D. = 1.64), and lowest for item 33 (S.D. = 0.00). Mean responses for each of the three sections of the Community of Inquiry survey instrument are presented in Table 4.5.

Table 4.5. *Mean Responses For Community of Inquiry Survey, by Section of Survey*

CoI Survey Section	Mean Response	Standard Deviation
Teaching Presence	4.03	1.01
Social Presence	3.78	0.82
Cognitive Presence	4.12	0.92

The CoI survey responses show that participants in this single study group consistently reported that they agreed that each of the three Community of Inquiry presences were observed during their online discussion activities.

Classroom Community Survey Items

Mean responses for the 20 items from the Classroom Community survey (Rovai, 2002) (Table 4.6) ranged from 4.40 for items 2 (*I feel that I am encouraged to ask questions*) and 16 (*I feel that I am given ample opportunities to learn*) to 1.60 for item 4 (*I feel that it is hard to get help when I have a question*). Standard deviations were highest for item 12 (*I feel that this course results in only modest learning*) (S.D. = 1.52), and lowest for item 17 (*I feel uncertain about others in this course*) (S.D. = 0.00).

Table 4.6. Responses For the 20 Classroom Community Survey Items In the Combined Survey Instrument, Grouped By Subscale and Sorted By Mean Value

Item	Question	Mean	SD
Connectedness Subscale			
1	I feel that students in this course care about each other.	4.00	0.71
11	I trust others in this course.	3.80	0.84
19	I feel confident that others will support me.	3.80	0.45
13	I feel that I can rely on others in this course.	3.60	0.89
3	I feel connected to others in this course.	3.40	1.34
7	I feel that this course is like a family.	2.80	1.30
15	I feel that members of this course depend on me.	2.80	1.30
9	I feel isolated in this course.	2.60	1.34
5	I do not feel a spirit of community.	2.20	1.10
17	I feel uncertain about others in this course.	2.00	0.00
Learning Subscale			
2	I feel that I am encouraged to ask questions.	4.40	0.55
16	I feel that I am given ample opportunities to learn.	4.40	0.55
6	I feel that I receive timely feedback.	4.00	1.22
12	I feel that this course results in only modest learning.	2.40	1.52
8	I feel uneasy exposing gaps in my understanding.	2.20	0.45
10	I feel reluctant to speak openly.	2.20	0.84
18	I feel that my educational needs are not being met.	2.00	1.22
14	I feel that other students do not help me learn.	1.80	0.84
4	I feel that it is hard to get help when I have a question.	1.60	0.55
20	I feel that this course does not promote a desire to learn.	1.60	0.55

It is worth noting that the Connectedness subscale had one item that was strongly agreed upon by all students (mean ≥ 4.0 and SD ≤ 1.0):

1. I feel that students in this course care about each other (mean 4.00, SD 0.71)

Additionally, there was one item with strong disagreement reported by all students (mean ≤ 2.0 and SD ≤ 1.0):

1. I feel uncertain about others in this course (mean 2.00, SD 0.00)

These responses suggest that there was a strong and unanimous sense of community support within the class, at least among the subset who responded to the survey.

For the Learning subscale, two items resulted in strong agreement by all students (mean ≥ 4.0 and SD ≤ 1.0):

1. I feel that I am encouraged to ask questions (mean 4.40, SD 0.55)
2. I feel that I am given ample opportunities to learn (mean 4.40, SD 0.55)

Additionally, three items resulted in strong disagreement by all students (mean ≤ 2.0 and SD ≤ 1.0):

1. I feel that other students do not help me learn (mean 1.80, SD 0.84)
2. I feel that it is hard to get help when I have a question (mean 1.60, SD 0.55)
3. I feel that this course does not promote a desire to learn (mean 1.60, SD 0.55)

These responses suggest that students felt encouraged to participate by asking questions, and that they were able to get acceptable responses to their questions. It is likely that students were including all aspects of course interaction in their responses, and

not limiting their responses to descriptions of the online discussion components of the course.

The values for Classroom Community Survey subscales are presented in table 4.7, below. To calculate the “connectedness subscale” from the survey responses, raw values for all responses to odd-numbered Classroom Community Survey items were added, then divided by the number of respondents (5). The “learning subscale” was calculated by adding raw values for all responses to even-numbered survey items, then dividing by the number of respondents (5). The overall “classroom community scale” was calculated by adding raw values for response to all survey items, then dividing by the number of respondents (5).

Table 4.7. *Calculated Classroom Community Survey Subscale Values*

Subscale	Mean	S.D.
Connectedness Subscale	31	3.16
Learning Subscale	26.6	2.73
Classroom Community Scale	57.6	2.06

The Classroom Community survey subscale values are similar to those reported by Rovai and Jordan (2004) for students in an online course. These values suggest that participants reported only moderate responses for both connectedness and learning. The responses indicate that participants reported a stronger sense of connection with each other, and a slightly lower sense of reported learning in the online course.

In a future study, it may be interesting and useful to describe the reported senses of connectedness and learning by participants in two different study groups, and to use the

survey data to further describe differences resulting from the selection, and pedagogical application of, the two different online discussion software platforms.

Comparing Community of Inquiry and Classroom Community

The Community of Inquiry and Classroom Community survey instruments both address similar descriptions of a community in the context of a course. The Community of Inquiry survey has a subsection that addresses the “teaching” presence, with items asking students to describe their interactions with their instructor. From examining the coded discussion data, almost all of the “teaching” presence indications in the WordPress discussions were contributed by students, rather than by an instructor. With this in mind, the more general “learning” subscale in the Classroom Community survey may provide a more compatible means for students to describe their interactions. By examining both “teaching” and “cognitive” presences in the Community of Inquiry survey, an approximation of the “learning” Classroom Community subscale is achieved, however, the focus on instructor interaction is still problematic in describing the interactions observed in this case study.

The Community of Inquiry “teaching presence” items do provide a more thorough description of student’s perceptions of the instructor’s pedagogical decisions, as well as their perceived classroom management and student activity directions. These are descriptions that could not be captured by the Classroom Community survey, so an instrument combining both surveys was useful in more thoroughly describing this community.

The Community of Inquiry “social presence” items are consistent with the Classroom Community “connectedness” subscale. Both instruments provided similar descriptions of the sense of social cohesion, with students reporting a strong perception of support for safe and open communication within the community. Similarly, the Community of Inquiry “cognitive presence” items provided similar descriptions as were provided by the Classroom Community “learning” subscale. The Classroom Community survey items emphasized the actions of the individual student who completed the survey – items such as “I feel that I am encouraged to ask questions” and “I feel that I am given ample opportunities to learn.” In contrast, the Community of Inquiry items emphasized the mechanical processes, such as “I utilized a variety of information sources to explore problems posed in this course,” or constructive processes, such as “Learning activities helped me construct explanations/solutions.”

The two instruments were originally selected to attempt to provide an additional source of data outside of the Community of Inquiry framework, to triangulate findings and to provide a robust description of the community and its interactions. After processing the combined survey data, it became apparent that this triangulation was useful, as the overlap between the two survey instruments is not complete. There are unique areas in each survey, with Community of Inquiry including additional data on interactions with the instructor, and with Classroom Community including data on individual perceptions in addition to the perceptions of the instructor and community as a whole.

Interview with Instructor

The interview was structured around a series of open-ended questions outlined in Chapter 3. The interview was transcribed, and the text was used to identify relevant pedagogical or technological decisions made by the instructor, as well as descriptions of the instructor's interpretation of the interactions between students in the course. The interview provided some insight into how the course was conducted and why different levels of activity and presence may have been expected.

Instructor's description of WordPress and Blackboard use

When describing the use of Blackboard, the instructor stated that the Blackboard discussion board was used as a common class resource, allowing participants to post content to a single place to share it with the entire class. This discussion area was used primarily for administrative resources, including information about assignments and links to students' digital media creations. It was a private discussion, visible only to the participants in the course. In addition, contributions to the Blackboard discussion board were not directly graded, and no directions regarding the expected number or length of posts were provided by the instructor. The instructor described the Blackboard discussion board as "industrial" – indicating that it was an institutionally-provided application without flexibility for customization by participants.

In contrast, the instructor described the WordPress sites as belonging to the individual students. The sites were highly customizable, which may have helped to provide a sense of individual ownership. The WordPress sites were publicly visible, and were used by students in a number of contexts in addition to this course – including

contributions for other courses, ongoing personal feedback and reflection, and integration with documentation of professional development and learning for the purposes of workplace promotion. The WordPress contributions were also directly graded by the instructor (comprising 25% of the student's grade for this course), and guidelines for the expectations on number of posts as well as criteria to describe the quality of the posts were provided to students in an online rubric. Students were also expected to comment on other students' WordPress sites, with additional criteria describing expectations of "substantive" comments provided by the instructor.

Pedagogical decisions

The instructor described their use of Blackboard and WordPress as technically similar, but that having different platforms available made it possible for them to isolate different pedagogical activities, and to leverage the sense of space to enable the students to interact differently depending on the online software that was being used. The Blackboard course was described as an "institutional" tool, a place for information dissemination and retrieval. The WordPress websites were described as "individual" tools to support student reflection and critique, and the instructor made an active effort to minimize their interactions with students on their WordPress websites.

Student contributions to their WordPress websites were graded by the instructor, where contributions to the Blackboard discussion board were not graded. The instructor reported that this graded requirement resulted in students putting much more effort into their WordPress blog posts than they did for items posted to Blackboard. The instructor

elaborated, describing his/her perception that a combination of student-owned WordPress websites and requirements for posting in order to earn grades for the course was responsible for the longer blog posts and responses by students. The use of the WordPress websites as part of the formal assessment by the instructor, and the exclusion of Blackboard discussions from grading, was not apparent through the direct examination of the online discussion data. There were no declarations of grading expectations directly within the discussions, and these expectations were only described separately in the course syllabus and through interaction with the instructor.

Triangulation of Data Sources

The different data sources collected through this research (discussion metadata, Community of Inquiry coding data, instructor interview, student survey) each describe different aspects of the online discussion activities in the course. Discussion metadata provided timelines of the online discussions, as well as basic descriptions of the types of content posted by participants. Community of Inquiry coding data provided additional descriptions of the types of interactions that students were having, whether indicating cognitive, social, or teaching presences (or some combination of the three). The student survey provided a general description of the sense of community reported by participating students, with several of the Community of Inquiry items describing student's perceptions of the teaching, social and cognitive presences within the course, and Classroom Community items describing student's perceptions of learning and connectedness. Additionally, the Community of Inquiry items documented student's perceptions of their interactions with the instructor throughout the course. By combining findings from the two different survey instruments, a more robust and complete

description of the community and its perceived interactions is provided. The instructor interview provided descriptions of the pedagogical context for the discussions in each of the online applications, and this information proved to be critical in understanding why students may have been more likely to post substantial content to their WordPress websites in contrast with the course's Blackboard discussion forums.

Through the interview with the instructor, two main differences between the online discussion platforms were identified, in addition to the technical differences in the software itself. Contributions to the WordPress websites were graded by the instructor, in response to predefined assignment parameters, whereas the Blackboard discussion posts were not graded. The WordPress websites were managed by the individual students, with each student creating, configuring, customizing, and publishing posts to their own website. The Blackboard discussions were communal, occurring within the institutionally-provided online environment provided for the course, with no customization or management needed from students.

The use of the WordPress websites for formal course assignments, with grades assigned by the instructor, likely accounts for much, if not most (or all) of the higher mean word count for posts to WordPress when compared with Blackboard. The use of WordPress for formal assignments does not explain the higher mean observed simultaneous Community of Inquiry presences, however. It would have been expected that responses that were posted strictly to meet the criteria provided by the instructor might have been restricted to the cognitive presence domain, but the WordPress responses showed strong simultaneous indications of all three Community of Inquiry

presences, whereas Blackboard responses typically showed only a single Community of Inquiry presence each.

Summary of Key Themes

This chapter presents an analysis of data collected in this study. Multiple sources of evidence were used, including a survey of students, metadata gathered from online discussions, content analyses of these discussions, and an interview with the instructor, to generate the key themes and trends. The data analysis revealed the following key trends:

1. Students posted to Blackboard and WordPress discussions with similar frequency.
2. Students posted longer items to WordPress discussions, as measured by word count, than they did to Blackboard.
3. Individual students responded to a larger number of peers in WordPress than they did in Blackboard.
4. Contributions to WordPress discussions demonstrated a higher number of Community of Inquiry indicators than discussions posted to Blackboard for all CoI presences: cognitive, teaching and social.
5. Contributions to WordPress discussions demonstrated more simultaneous indicators of CoI presences than Blackboard discussion contributions, suggesting a more natural or well-rounded interaction between participants.
6. WordPress contributions were directly graded by the instructor, with criteria describing expectations of students' posts and responses. There were no similar

criteria or grading for Blackboard contributions or responses. It is likely that these factors account for much of the observed difference between Blackboard and WordPress contributions.

Major findings that emerged from the analysis of data, recommendations for instructional design and teaching, as well as case study research practice, and the significance of this research are discussed in Chapter 5.

Chapter 5: Discussion, Recommendations and Conclusions

Introduction

The purpose of this chapter is to provide a summary of key findings from this research, outline limitations of this study, make recommendations for reproducing this type of research, make recommendations for development of tools to support research and analysis, and to discuss implications of this study for the practice of teaching online.

Key findings

Differences in the online discussions carried out in Blackboard and WordPress likely resulted from a combination of four instructional and learning strategies identified in this research:

1. Different pedagogical activities conducted in the two online discussion platforms
2. Assignment of grades for only one portion of online discussion
3. Individual control over the layout, design and presentation of the students'

WordPress websites vs. institutional control in the Blackboard course website

4. Inclusion of online discussion posts from beyond of the course in the students'

WordPress websites

Of these differences, only one is directly related to the choice of software (WordPress or Blackboard) that is used to facilitate online discussion. The majority of differences that were identified are related to pedagogical and instructional decisions made by the instructor in the course.

This chapter will describe each of the four differences outlined above, present and discuss Community of Inquiry timeline diagrams, describe several limitations of this study, provide recommendations for practice and for development of tools to support similar research, and present conclusions based on the findings of this study.

Pedagogical activities

Online discussions in Blackboard were restricted to posting information about course assignments and sharing links to resources, while the WordPress posts were used in the context of assignments for reflecting on and documenting learning. The WordPress assignments had specific requirements for contribution by students, with expectations for substantive and meaningful posts, and these same expectations were not made of posts published to the Blackboard discussions. It is likely that these different pedagogical activities, and the associated expectation by the instructor of student participation, resulted in substantially different types of content being posted to the two online discussion environments. Additionally, the difference between the online posts are more likely to be attributed to the pedagogical activities associated with each environment, rather than to the software that hosted each online discussion environment.

Assignment of grades

The instructor did not assign grades to posts published to the Blackboard discussions, but did assign grades to the WordPress posts and responses, with student participation in the WordPress discussions making up 25% of their grade in the course. The instructor described the contributions of students to the WordPress discussions as being directly motivated by the assignment of grades to that activity, while contributions

to the Blackboard discussions had no such motivation. The instructor's expectations appeared to influence the nature and length of posts published to each environment, moreso than the affordances of the software used to host each online discussion environment.

Control over website

Students had no control over the layout or structure of the Blackboard discussion environment, and could not modify the presentation of that discussion environment. In contrast, each student had a high degree of control over the layout and presentation of their WordPress website. Students selected different themes, modified the "banner" images on their website, and created their own navigational structures within the website. The instructor had no control over the design and structure of the students' WordPress websites, aside from providing simple guidance and feedback to students. During the interview, the instructor mentioned that students described the WordPress websites as "theirs," as opposed to belonging to the institution, and that they spent additional time refining the WordPress websites and the content posted there, beyond what was strictly required by pedagogical expectations and assignment of grades by the instructor.

Additionally, students told the instructor that they were planning to use their WordPress websites outside of the context of the course and certificate program, with several students stating they intended to use their website as part of a professional development program with their employer.

Inclusion of discussion outside of the course

The WordPress websites were used by students throughout the duration of a 4-course graduate certificate program. The course involved with this study was the second course in the four course program. As a result, students had posts from a previous course already published to their WordPress websites, and were receiving responses from the two instructors for that course as well as from the instructor in the course used in this study. In contrast, the Blackboard course environment contained only content from participants directly enrolled in the single course, and only content posted as part of that course. The inclusion of content and participants from outside of the direct context of a single course may make the website more relevant to the student, and facilitate cross-curricular and extra-curricular connections.

Community of Inquiry timelines

During the content analysis of the online discussion archives, it was observed that the patterns of Community of Inquiry presence indicators were not constant, and that presences were displayed both more strongly, and in different compositions, throughout the duration of the course. The Community of Inquiry timeline diagrams were created as ways to visualize these changes over time. It should be noted that the timeline diagrams, although useful in demonstrating these changes in patterns, only provide a subjective description of the Community of Inquiry presences over time. More objective ways of describing these changes are necessary, in order to facilitate comparison between online discussions in different portions of a course, discussions using different online environments, or discussions that occur in different courses.

The Community of Inquiry timeline diagrams indicate periods of stronger cognitive and social presences, which were typical toward the beginning of the course activities. It was observed during analysis that as the course progressed, there was evidence of multiple simultaneous presences more commonly demonstrated by participants. This is best described in the simultaneous presences timeline (Figure 4.13), which shows that posts in the WordPress portion of the online discussions typically demonstrated simultaneous indications of 2 or 3 of the Community of Inquiry presences, while posts in the Blackboard portion of the online discussions typically demonstrated only 1 or 2 simultaneous Community of Inquiry presences. Additionally, this timeline description also made it possible to observe that the Blackboard discussion posts changed over time, with two simultaneous presences commonly indicated at the beginning of the course period, but only 1 presence more commonly indicated near the end of the course period. WordPress posts consistently indicated 2 or 3 simultaneous presences throughout the duration of the online discussion activities.

These timeline diagrams provide insights into the dynamic nature of interactions and Community of Inquiry presence indications over the duration of a course. This is important, in order to avoid oversimplification of coded discussion data with aggregate and composite scores for the entire online discussions, which do not have the ability to capture or describe these more subtle changes over time. Further research on the implications of these timeline diagrams, as well as the development of software to facilitate effective and efficient generation of the diagrams, is warranted. The implementation of visualization of these interaction timelines into online discussion software would provide valuable information to both instructors and students, as a form

of learning analytics and a mechanism for feedback on interactions in the online discussions.

Online discussion visualization

Through the analysis of data collected, the researcher created five new techniques for visualizing the online discussion metadata and Community of Inquiry coding data.

These are:

1. Combined timeline of posting activity metadata (Figure 4.3). This method displays the number of posts published each day in both online discussion platforms, for each day of online discussion activity.
2. Online discussion activity metadata (Figures 4.5, 4.6). This method displays each post published by a participant in an online discussion application, indicating the length of the post (in number of words), the day it was posted, as well as the individual who published the post. Additionally, lines connect posts and responses, making it possible to describe timelines of interaction over multiple threads and between multiple participants.
3. Comparison of participant's total posts and wordcounts (Figure 4.7). This method displays both the total number of posts published by a participant in each software application, and the total number of words contained in those posts. In this research, the visualization made clear distinction between the longer WordPress posts and shorter Blackboard posts. The visualization also made it clear that the instructor was the most active participant in the Blackboard discussions, but the least active participant in WordPress.

4. Community of Inquiry presence indication timeline (Figures 4.13, 4.14).

This method aggregates the Community of Inquiry coding values for each day of online discussion activity, displaying relative contributions of cognitive, social and teaching presences over the duration of the discussions.

5. Community of Inquiry simultaneous presence indications (Figure 4.15).

This method displays the total number of presences (cognitive, teaching and social) for online discussion posts in both software applications. The visualization indicates that WordPress posts typically contained indications of all three Community of Inquiry presences simultaneously, where Blackboard posts typically contained either 1 or 2 of the presences.

Although these new visualizations provide useful ways of describing and presenting online discussion metadata and Community of Inquiry coding data, their generation is currently a labour intensive process, and they are available only after the online discussion activity has ceased. It may be possible to use this method to provide summative feedback to the participants. It would be useful if tools could be developed to facilitate rapid generation of these kinds of visualizations, ideally as a way to provide formative feedback during the online discussion activities. If participants were able to have access to these visualizations during their course activities, they could provide useful and interesting feedback to help shape further interactions and contributions to the online discussions.

Limitations of this study

There were several key limitations resulting from the design and application of this research. These limitations included difficulty in recruiting participating instructors, modification of the research design to accommodate a single graduate-level course, and a small sample size of participants. All of these factors make it problematic to extrapolate the findings of this study to other contexts, and result in the data being used primarily to support a case study description of online discussion activity and community interaction within the context of the course examined during this research project.

The original design for the study involved studying the nature of a learning community developed in a single course taught to two different groups of students by one instructor, with two separate simultaneous sections of approximately 15-20 graduate students each. One section would use Blackboard, while the other used WordPress for their online discussions. By examining two simultaneous sections in the same course, it was anticipated that the researcher could identify any differences in community presence associated with the platform used for online discussion, while minimizing other contextual variables such as time of year, course content, course activities, and instructor context.

However, the original research design was modified because it proved to be very difficult to implement. Several candidate instructors were identified as potential participants, as they had experience in using both Blackboard and WordPress for online discussions in graduate-level courses. After nearly one year of attempts to recruit participating instructors, none of these candidate instructors would agree to return to

using Blackboard for their course-based online discussions. As a result, a modified design was implemented.

The original research design was modified to respond to the recruitment challenge. In this modified design, a single online course taught by one instructor was identified, and students in one section of this course would use both Blackboard and WordPress for their online discussions as part of their participation in the course. Unfortunately, this single-course single-section design rendered it difficult to use the combined survey instrument to identify potential differences between Blackboard-using and WordPress-using students, as the same students were using both discussion platforms within the same course. The survey can be used to describe the Community of Inquiry presences and classroom community indicators of the course as a whole, but cannot be used to describe differences between online communities using Blackboard versus WordPress.

Difficulty in recruiting participating instructors

The process of identifying candidate instructors, and of attempting to recruit them to participate in this research, took over a year. There were several potential candidates initially identified by the researcher, as they had experience teaching with both Blackboard and WordPress. The intent was to reduce the effect of software novelty, by finding instructors who were familiar and fluent in both online discussion applications. However, none of these instructors who had adopted WordPress in their courses would agree to return to the use of Blackboard with their students.

The only timely solution to the problem of recruiting suitable instructors was to modify the research design, to accommodate the participating instructor's course.

Single graduate-level course section

The use of a small graduate-level course, with a single section of approximately a dozen students planned to be enrolled, meant that the original plan of comparing separate groups of WordPress- and Blackboard-using student communities had to be changed to a case study. All of the students were in a single study group, and would all be using both WordPress and Blackboard. While this adjustment was necessary in order to allow the researcher to collect data in a timely manner, it meant there could be no comparison between the community interactions in each of the two software applications, as they were not separate.

However, the small single community of students enabled a richer and deeper exploration of the data as part of the case study analysis. The combined Community of Inquiry and Classroom Community survey was used as an instrument to document the sense of community and learning reported by students, and provided supplementary descriptions of their interactions in addition to the coded discussion data.

Low sample size

The course that was involved in this research had 12 students enrolled, and of those, 8 provided consent for their online discussion posts to be used. Although that is a 67% participation rate, the original class size wasn't large enough for the participating sample size to be as large as anticipated. For the survey, only 5 of the consenting students participated, which is 38% of the class as a whole. Again, this is a common participation rate, but the small class size resulted in a survey response sample that is likely too small to provide sufficient data to meaningfully describe the study group.

Small sample size may have been mitigated by selecting potential participating courses by the demographics of the enrolled students – number of students, experience levels with the software – rather than attempting to select courses initially through identifying instructors with prior experience with both software applications.

The low sample size did provide a benefit to the researcher, however, as the coding and data processing were highly labour intensive and manual processes. If a larger study group had been available, the researcher would have needed significantly more time to process the data, or would have required assistants to process the data in a timely manner. The small size of the community enabled the researcher to more thoroughly explore the coding data, which directly benefited the research through the development of new visualization methods to describe the data.

Different assignment expectations in each online discussion platform

The online discussions in Blackboard were not graded by the instructor, and were used solely for supporting dissemination of information about the course and to share information with students. The content posted to the student's WordPress websites was graded by the instructor, and the assignments for that content involved reflection and documentation by students, rather than simple information dissemination. These different expectations would have resulted in different priorities by students, who were likely to have allocated more time and effort to write their WordPress posts because of the assignment of grades.

Gaps in the data

The original research proposal did not include a pre-survey that could have collected information from the participating students prior to the start of the course. This information could have been useful, especially if data on prior experience with each of the software applications was collected. As such, this data was gathered indirectly through the instructor interview, which provided only a high level and anecdotal description of some of the student's spontaneously reported prior experience.

Recommendations

Through the planning and implementation of this research, and analysis of the data, several recommendations for reproducing and improving the research design were identified, as well as areas for future research and practice.

Recommendations for reproducing this study

Several adjustments to the research design and implementation would make this research more readily reproducible, and could make the findings more usable in other contexts:

1. Use two sections of the same course for the online discussions, with one section using Blackboard and the other using WordPress. This would make the survey data more useful in describing differences in community between both groups, as well.
2. Have the participating instructor(s) apply the same assignment expectations to both sections and to both of the online discussion platforms (i.e., use the same assignments, grades, and rubrics for both groups' online discussions).

3. Conduct a pre-survey to gather information about participant's prior experience with online discussions in general, and specifically their prior use of the online discussion platform used in their section of the course (either WordPress or Blackboard).
4. Use a course with higher enrolment, with each section having approximately 15-20 students, and attempt to solicit a higher percentage of students to participate in the online surveys in order to increase the sample size.

Areas for future research

Through conducting this research, the researcher identified a number of topics that require future research. The first, being the investigation of potentially interesting topics that were exposed through the creation of timeline-based visualizations for this research: simultaneous Community of Inquiry presences, and understanding the changes in observed Community of Inquiry presences throughout the duration of a course. The second, being the development of better tools to facilitate collection, processing, and visualization of online discussion data.

Investigation of Community of Inquiry timelines

The “simultaneous Community of Inquiry” diagram (Figure 4.15) was created in order to display possible patterns involving multiple Community of Inquiry presences in messages posted to the online discussion board. It is suspected that the number of simultaneous presences may be correlated to the quality or depth of online interactions, as more presences may indicate a higher fidelity of personal connection, and fewer presences may indicate a more directed, abstract or surface interaction. This possible

correlation would need to be reproduced in other research projects, and the connection between the number of simultaneous Community of Inquiry presences and the quality and fidelity of the interactions would need to be examined. The figure used in the analysis of the data in this study provides a subjective description of simultaneous presences. A more objective measure of simultaneous Community of Inquiry presence indications over time would be useful in comparing online discussions in different portions of a course, or between different courses and contexts.

The Community of Inquiry Presences Timeline diagram (Figures 4.13 and 4.14) was created in an attempt to identify patterns or changes in types of presences indicated by students in their online discussion posts, as the course progressed. The current design of the diagram leaves the patterns of presences open to interpretation, and a way of tabulating presence indications in the timeline, and of comparing both within the same timeline and against the timeline from other online discussions, would be useful in describing the patterns of online discussion presences.

Development of tools

During the collection and analysis of data for this research, the researcher struggled to find software tools and techniques to enable more efficient manipulation and visualization of the data. While some useful tools, such as Gephi (Figure 4.2; Bastian, Heymann & Jacomy., 2009) and OmniGraphSketcher (Omni Group, 2012) were identified and used in this research, much of the data processing was performed in highly labour-intensive methods using BBEdit (Barebones Software, 2011) and Microsoft Excel (Microsoft, 2011) as a data storage and manipulation environment. Much of the effort in preparing the data for analysis was in the manual normalization of online discussion

metadata into a single Excel worksheet (Figures 3.5 and 3.7) to enable consistent processing and manipulation.

While there are tools that support the analysis of a single online discussion platform, such as bFree (University of North Carolina, 2012) and SNAPP (Dawson et al., 2011) (both of which support extracting discussion data from Blackboard), a suitable utility for analyzing both Blackboard and WordPress discussions was not found by the researcher.

Some of the tools that would be useful in conducting similar research projects include:

1. A tool to normalize online discussion archives and metadata captured or exported from different host applications (namely Blackboard and WordPress, but including discussion archives from other applications would be useful in subsequent research)
2. Tools to visualize metadata-described activity patterns in a timeline
3. Tools to support efficient coding of online discussion posts made in different software applications (namely Blackboard and WordPress)
4. Tools to visualize coded data for online discussions
 - a. Timeline of Community of Inquiry presence indications
 - b. Timeline of Simultaneous Community of Inquiry presences

Recommendations for Practice

Although the findings of this research cannot be generalized outside the context of the graduate level education course that was involved in the study, some of the

differences that were identified in the two online discussion platforms might be useful to inform the practice of teaching online:

1. Provide clear expectations of participants' contributions and interactions in an online discussion, including descriptions of the relevance of these activities to course-related assessment and grades. This may be an intuitive or common sense recommendation, but making expectations explicit may have an impact on students' effort and activity in an online discussion.
2. Allow participants to have control over their contributions, including the layout, design, and presentation of the website they use. Additionally, allow them to use their website(s) outside the context of a single course. The ability to connect activities within a course to additional contexts such as workplace learning was reported by students to be a strong contributor to their efforts in developing their WordPress websites. In this case study, the WordPress discussions produced higher levels of Community of Inquiry presence indications, as well as longer posts and responses by students. Some of these differences were attributed by the instructor to the personalized nature of the WordPress websites, and their use outside the strict context of a single course.

Conclusion

The research question posed by the researcher was:

“How does pedagogical design interact with selection of technology to influence the nature of a learning community, as expressed through online discourse and social connectedness in higher education?”

The purpose of this study was to examine the online discussions engaged in by participants in an online graduate course, and to apply the Community of Inquiry and Classroom Community frameworks to document and describe the interactions within the online discussions in order to identify any differences between discussions hosted in the Blackboard learning management system and in WordPress websites.

The main focus of this study was in the metadata and content analysis of the online discussions, using a Community of Inquiry coding template to document indications of cognitive, social, and teaching presences in the online discussion posts. These analyses described more indications of cognitive and teaching presences in the WordPress discussion posts than in the Blackboard discussions posts. Additionally, participants published posts to their WordPress websites with much higher word counts, and over a time period that included participants from other courses. Posts published to the Blackboard discussions had lower word counts, were restricted to participants directly enrolled in the course, and to the time period of the course itself.

Both WordPress and Blackboard performed similar technical functions in supporting online discussion by participants in the course, but were used differently, from how they were presented to students and the course expectations the instructor placed on use. The software platform was used as an indicator of ownership or responsibility, and a way of demarcating pedagogical expectations of the instructor for participation by students in the course. As such, the specific software that was used may not have had as much of an impact on the online discussion as the context and pedagogical expectations of students' participation.

Indicators of cognitive presence were much more prevalent in the WordPress discussions than in the Blackboard discussions. This was likely to have been largely a result of the grading requirements defined by the instructor for the WordPress discussions, as well as a product of the pedagogical activities and expectations of participation conducted in the WordPress discussions, and of affordances of the software itself.

Given the recent growth of interest in online courses, this study suggests that pedagogical decisions may have a stronger effect on the interactions between students than the simple choice of technology would. By providing clear expectations of participation, and by describing the value of participation through assignment of grades, student interaction is shifted toward more in-depth posts and responses, with stronger indications of cognitive and teaching presences. This may have an impact on the design of online courses, including the Massively Open Online Courses (MOOCs) that are based on distributed publishing by participants. Without strong pedagogical decisions and clear communication of expectations, participants may not be as fully engaged with the course community, even if they are in full control of the software they use to publish their content for use in the course.

Many questions remain that may be addressed in future research of this kind. With a stronger division of participants into the two online discussion platforms, the effect of software choice on online discussion may be better described. What are the effects of software selection on the online discussion and properties of a classroom community? What do the Community of Inquiry timeline diagrams mean, when describing online discussion posts throughout the duration of a course? How can online discussions be

documented and analyzed more efficiently, so that this kind of study can be more readily applied to online discussions in other courses? What are the implications on lifelong learning and interaction outside the context of a course, where pedagogical design may be weaker, or absent?

The findings of this study, while limited in scope to a case study of a single course, suggest some implications for learning. Participants in an online discussion make decisions on how much effort they will devote to posting content, and these decisions appear to be more strongly informed by the pedagogical and instructional context of the course than by the functionality of the software environment that hosts the discussion. This seems intuitive in hindsight, but proponents of student-controlled software as a panacea for increasing student engagement may be at risk of overlooking this key factor.

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Appendix A: Student Survey Protocol

Questionnaire for Online Discussion and Community Research Project

The questionnaire will be prepared using a 5 point Likert-type scale, with options provided as follows:

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

1. The instructor clearly communicated important course topics.
2. The instructor clearly communicated important course goals.
3. The instructor provided clear instructions on how to participate in course learning activities.
4. The instructor clearly communicated important due dates/time frames for learning activities.
5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
7. The instructor helped to keep course participants engaged and participating in productive dialogue.
8. The instructor helped keep the course participants on task in a way that helped me to learn.
9. The instructor encouraged course participants to explore new concepts in this course.

10. Instructor actions reinforced the development of a sense of community among course participants.
11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
12. The instructor provided feedback that helped me understand my strengths and weaknesses.
13. The instructor provided feedback in a timely fashion.
14. Getting to know other course participants gave me a sense of belonging in the course.
15. I was able to form distinct impressions of some course participants.
16. Online or web-based communication is an excellent medium for social interaction.
17. I felt comfortable conversing through the online medium.
18. I felt comfortable participating in the course discussions.
19. I felt comfortable interacting with other course participants.
20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
21. I felt that my point of view was acknowledged by other course participants.
22. Online discussions help me to develop a sense of collaboration.
23. Problems posed increased my interest in course issues.
24. Course activities piqued my curiosity.
25. I felt motivated to explore content related questions.

26. I utilized a variety of information sources to explore problems posed in this course.
27. Brainstorming and finding relevant information helped me resolve content related questions.
28. Online discussions were valuable in helping me appreciate different perspectives.
29. Combining new information helped me answer questions raised in course activities.
30. Learning activities helped me construct explanations/solutions.
31. Reflection on course content and discussions helped me understand fundamental concepts in this class.
32. I can describe ways to test and apply the knowledge created in this course.
33. I have developed solutions to course problems that can be applied in practice.
34. I can apply the knowledge created in this course to my work or other non-class related activities.
35. I feel that students in this course care about each other
36. I feel that I am encouraged to ask questions
37. I feel connected to others in this course
38. I feel that it is hard to get help when I have a question
39. I do not feel a spirit of community
40. I feel that I receive timely feedback
41. I feel that this course is like a family
42. I feel uneasy exposing gaps in my understanding
43. I feel isolated in this course

- 44. I feel reluctant to speak openly
- 45. I trust others in this course
- 46. I feel that this course results in only modest learning
- 47. I feel that I can rely on others in this course
- 48. I feel that other students do not help me learn
- 49. I feel that members of this course depend on me
- 50. I feel that I am given ample opportunities to learn
- 51. I feel uncertain about others in this course
- 52. I feel that my educational needs are not being met
- 53. I feel confident that others will support me
- 54. I feel that this course does not promote a desire to learn