THE LEARNING MANAGEMENT SYSTEM AS A BRUNER AMPLIFIER:

DEFINING A MODEL OF FACULTY ENGAGEMENTS

WITH AN ONLINE TECHNOLOGY

by

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ABSTRACT

The purpose of this study was to determine if reasonable and reliable models of faculty engagements with an LMS could be constructed, and to determine how attitudes and perceptions of the technology might be reflected in those engagements. The study grew from a desire to understand which LMS components faculty found most and least helpful, how faculty used those components to teach and communicate, and why they used them. A model was developed to aid in understanding how faculty engage with LMS.

In order to construct the model, several multiple data sources were used that provided information on tool usage, course design, and attitudes toward/perceptions of an LMS. The model chosen was based upon Jerome Bruner's (1965) amplification systems, which he introduced at the Seventy-Third Annual Convention of the American Psychological Association. The model, once constructed, demonstrated how the system amplified the process of teaching, how the instructor was trained to use the system and how the instructor "plugged into" the system.

The findings revealed that a usable model of faculty engagement with the technology was possible. It was determined from the model that study participants taught online according to more traditional approaches, that they were trained in a variety of ways to use the system, that they tended to use file manipulation and asynchronous communication tools more than others and that content delivery, course administration and steady, albeit not constant, contact with the students was considered important. Further research is necessary in order to model faculty and

student interactions within courses, and in order to help modify or construct a good working theory of teaching and learning online, via an LMS.

DEDICATION

This dissertation is dedicated to all who helped and guided me through the long and trying process of creating this manuscript.

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CHAPTER 1

INTRODUCTION

> The profound impact that technological innovations are having in all aspects of education focuses attention on assessing relationships between changing modes and practices of instruction and their outcomes. The emergence of new technologies does not change the goals of education. The new technologies change the process of communication within an educational setting to accomplish those goals. Research… is needed to examine how changes in means of communicating content impacts the goals of those engaged in a communication activity.
>
> —Allen et al., 2004, p. 402

Since the advent of the Internet as an educational platform, interest in using the platform's strengths to benefit learning has grown steadily. Sadly, evaluating the uses of the platform to teach and learn has not kept up with the increase in online course development or technology advancements (Hutchins, 2003). Distance education "is not… one-dimensional" (Allen et al., 2004, p. 402). As such, evaluating education online ought not to be one-dimensional. For instance, Allen et al. demonstrated that in studies on instructional immediacy, the type of communication channel impacted the perception of immediacy between teacher and learner. Yet, studies in distance education often focused on one communication medium at a time (Blignaut & Trollip, 2003; Woods, 2002). The context of online communication was dependent on the type of technology being used. As the New Media Consortium suggested in its 2007 white paper, the "flavor" of communications via instant messaging was very different from the same conversation by phone, email, virtual reality, or discussion boards. As a result,

knowing the channel of a communication should have been as important as the communication itself to develop or enhance a model of distance education activity.

Much of the past research was conducted within time slices of a course, capturing snapshots of activity rather than studying in-progress activity, and therefore not necessarily demonstrating process flow, which can change over time (Lindland, Sindre, & Solvberg, 1994). Situations evolve. Plans change. What was considered ideal at one moment might have proven to be inadequate 2 weeks later. For this reason, viewing how engagements changed over time may have been as revealing as analyzing the engagements. Thus, any model of distance learning activity should not only consider multiple communication avenues, but also allow for formative, in addition to summative, data collection and analysis.

Further, the investigator found that methods of communicating and learning have changed. Rather than infrequent exchanges of "lots of ideas" with individuals involved in problem-solving tasks, we saw short, more frequent bursts of limited information combined with groups tackling issues (The New Media Consortium, 2007, p. 2). The Internet made it possible for people separated by physical and temporal distance to "be close." People no longer had to wait long intervals to learn about each other's affairs; they could get rapid updates on each other's status, as with Twitter or other social networking applications. As a result, we began to see a phenomenon that Clive Thompson referred to as *social proprioception*, which is a "sense of connectedness" and an "awareness of others without direct communication" (as cited in The New Media Consortium, 2007, p. 3). Any model of distance learning activity should account for evolving methods of communications and sense of community. Especially useful would be acquiring knowledge of which aspects of communication remain constant as technology changes, and what implications arise from aspects of communication that evolve over time.

Finally, behavioral patterns in faculty engagements with technology were increasingly of interest (Coates, 2005). Past studies often consisted of overviews of technology access and cognition, but behavioral patterns might help reveal intentions, strengths, weaknesses and understandings (or misunderstandings) not only of content and communications, but of the technology and channels used. There is no way to see inside the heads of research subjects, but there is a way to glean information from the subjects' actions. Coates stated that student behaviors online and offline, for instance, might reveal engagement styles and thus might be used to "enhance the campus-based experience" (p. 68). Another reason to consider studying engagement behaviors came from a 1994 paper by Klemettinen, Mannila, Ronkainen, Toivonen, and Verkamo. Within the large data sets in an online course management system, association rules might be discovered between different interactions and behaviors. Such rules, if they existed, would be beneficial in model building.

Learning Management Systems (LMS), such as Blackboard, Angel, Sakai and Moodle, have become widely used by academic institutions, and by businesses, across America (Carnevale, 2005; Morris, Xu, & Finnegan, 2005). As a result, it had become necessary to study the impact that LMS had on student success (Skylar et al., 2005). The focus of most research related to LMS, to date, has been placed largely on student usage (Hutchins, 2003). There has not been as much emphasis placed on studying faculty uses of LMS (Harrington, Staffo, & Wright, 2006). In this study, the investigator looked at LMS tools that faculty use (focusing on *how* they used the tools), how faculty designed courses to facilitate engagement, and how perceptions and attitudes matched use, in order to develop a model of faculty engagements with a course management system.

There is no question that faculty continue to play a vital role in student learning, despite the increase in alternative course delivery methods (Umbach & Wawrzynski, 2005), but the literature seems to suggest there is some question as to what that role is (Hutchins, 2003; Morris et al., 2005; Umbach & Wawrzynski, 2005). If faculty members are increasingly using LMS to foster student learning, it compels us to better understand how faculty use LMS to facilitate learning.

Statement of the Problem

As the literature review demonstrates, there is a shortage of research on faculty engagements with an LMS. It is not enough to consider research done on instruction *sans* technology, for the use of technology adds an additional layer of complexity to the teaching and learning relationship (Bickle & Carroll, 2003). A rapid increase in course offerings online was expected (Bickle & Carroll, 2003), so it was important to comprehend what faculty intended to accomplish with the technology and how to better evaluate such offerings (Harrington et al., 2006). Further, Jerome Bruner stated that, for all the research applied to the question, we have no better understanding of how learning is accomplished now than we did at his address to the American Psychological Association in 1965 (Bruner, 2004).

In order to construct a good understanding of faculty engagements with a learning management system, the investigator believed that it was necessary to model all pertinent interactions. The model had to be logical, it had to be adequately descriptive, and it had to be easy to use and understand. Therefore, this study was designed to address the problem of finding at least one way to model faculty engagements.

Statement of Purpose

The purpose of this study was to determine if reasonable and reliable models of faculty engagements with an LMS could be constructed, and to determine how attitudes and perceptions of the technology might be reflected in those engagements. The study grew from a desire to understand which LMS components faculty found most and least helpful, how faculty used those components to teach and communicate, and why they used them.

Significance of the Study

There has been an increasing effort to move course content online (Kraemer, 2003; Morgan, 2003; Morris et al., 2006). As of 2006, Roach reported that 3,700 institutions were using WebCT or Blackboard. As resources diminish, institutions of higher learning are strongly considering more online options to deliver courses (Sneller, 2004). Further, academia sees a growing demographic of students who need additional distance options for obtaining an education (Bickle & Carroll, 2003). Because we were seeing an expansion in online offerings, there is an increasing need for more insight into such delivery methods (Harrington et al., 2006).

Theoretical Framework

The theoretical framework for this study was Moore's theory of transactional distance (Moore, 2007; Chen & Willits, 1998). Moore identified the primary components of distance education as dialogue, structure, and learner autonomy (Moore, 2007; Chen & Willits, 1998). He further described the psychological distance between the instructor and learners (and between learners) as "transactional distance" (Moore, 2007). Granted, there were valid criticisms to Moore's theory (Gorsky & Caspi, 2005). However, in chapter 2, the investigator discusses the theory in greater detail, discusses the primary criticisms, and demonstrates a method for

overcoming them. This investigation intends to show that an extended transactional distance theory may provide a way to evaluate faculty-student interactions via technology.

To better understand how faculty members seek to close the transactional gap, the investigator endeavored to construct a model of faculty engagements with a learning management system. Understanding how faculty intend to use the technology is expected to shed light on how faculty plan to aid students with transfer of knowledge. The model developed was based on Bruner's concept of amplification systems, which he presented at the Seventy-Third Annual Convention of the American Psychological Association in 1965. In his presentation "The Growth of Mind," Bruner stated that societies provide amplification systems through which humans develop "powers of mind" (p. 1009) and expand their capabilities when "equipped with appropriate skills" (p. 1009). He believed that culture provides three specific kinds of amplifiers to society's members: enactive, iconic, and symbolic (Bruner, 1965). Although it is clear that LMS can be thought of as enactive amplifiers because they amplify the action of teaching, they could also be iconic (text, images, and diagrams are not only available to the students at any time, they can be dynamically delivered and do not have to be at all static) and symbolic (design elements and software components can provide assistance to thinking skills, even when not specifically designed for that purpose). This complicates the study of faculty engagements with an LMS. We can see a pencil, a hammer, a plow, or a spear, but unlike physical tools, LMS can not be seen. LMS are presented through web browsers, delivered from web servers. As a Bruner amplifier, faculty engagements with an LMS would have to be modeled before an understanding of the nature of an LMS as a amplification system might be acquired. The investigator will illustrate the issues involved with constructing such a model and demonstrate at least one way in which these issues may be addressed.

Research Questions

Based on the literature review, the investigator formed a series of questions pertaining to faculty engagement with an LMS. The answers to these questions would form the basis of a model of faculty engagements with an LMS. Although Bruner's amplifier was an abstract idea and one typically applied to the learner, the investigator believed this idea was useful as a conceptual foundation and that a fairly detailed model for such an amplifier could be generated based on that foundation. In order to construct the model, the investigator planed to conduct a mixed-method study. The following are the questions the investigator wanted to answer:

RQ 1. Which tools do faculty members use and how do they use them? Might a reason be inferred, from a given plan of action, for this use?

RQ 2. Which tools do faculty tend to avoid? Might a reason be inferred, from a given plan of action, for this avoidance?

RQ 3. How does course design affect the communication process?

RQ 4. How flexible does course structure become across a term?

RQ 5. How does faculty's use of LMS technology and services influence faculty-student interactions?

RQ 6. How might one describe an LMS as a Bruner amplifier, given faculty engagement with the system?

Method

In order to create a minimal component usage map, which is described in chapter 3, the investigator proposed to use an Arrow-May method developed by the investigator. The Arrow-May method, also described in chapter 3, is a technique based on social decision theories devised by two prominent 20th century economists, Kenneth Arrow and Kenneth May. The significance

of the method is that it allows researchers to strengthen claims made about categorical data. Such an attribute makes the technique useful in studies using simple surveys, literature review analyses, archival research, and other approaches where more intensive surveys and interviews are not always possible. The component usage map is also significant, in that it is a method for graphically demonstrating typical technology uses in departments, schools, or divisions and across an entire organization. For organizations making significant cost outlays on technology packages and system integrations, the component usage map may demonstrate where investments are best used and least used, and it might indicate areas where technology training is most needed. The Blignaut-Trollip method described in chapter 3 might provide a useful technique for categorizing and studying communication within classes. The investigator suggests that this method might prove useful in determining how much communication in a course is actually dialogue, as defined by Moore (2007). Finally, the model construction of faculty engagement is useful in finding underlying intentions and plans of action that are expected to shape dialogue, as well as unintended consequences of those decisions.

Assumptions of the Study

The assumption that each faculty member has a pedagogical basis for course design and development was made in this study, and it was assumed that such bases may be fairly determined from studying course designs and tool usage. Even if an educational viewpoint is informal, a reason for tool use, course design, and planned communications existed. It was assumed that faculty request training or help, if needed. It was assumed that a complete plan of action for facilitating engagements may be found within each course, from syllabi, assignments and assessments instructions, discussion board instructions, and so on. Again, if an instructor

desires a specific performance from students, instructions should be provided. For whatever duration faculty members engaged the LMS, their interactions were assumed to be purposeful.

Limitations of the Study

Due to the small number of participants relative to the total body of faculty teaching online, questions might be reasonably asked about the validity of the study. Despite the fact that the sample data resulted in fairly uniform outcomes, it is possible that a different or larger sample might have provided a different result set. Although the investigator believed that the previously described assumption on pedagogy was reasonable, the investigator could not assure that every faculty member had a well-conceived plan. Nor could the investigator assume that any weakness in plan or action resulted from poor attitude toward the technology, lack of training, lack of FTE (a percentage of full-time employment) to develop a course online, and so forth. The investigator conceded that these issues ought to be considered more deeply for future research.

Operational Definition of Terms

For the purpose of this study, the following terms have been defined:

Amplification system: An external construct provided to individuals by their culture that assists in the development of the power of mind and extends the individual's normal abilities, when members of the culture are equipped with appropriate skills with which to link (Bruner, 1965).

ANOVA: Analysis of variance is a statistical method used to test differences in the means between two or more groups.

Asynchronous communication: Communication distributed over time (Carr-Chellman & Duchastel, 2001).

Browser: Graphical client software used to access the Internet.

Classroom flip: A reversal of the usual process of lecture by day and homework by night, in which the lecture is often taped and viewed by students as homework, and applications of the concepts taught is conducted during the class. It is based on the work of Karl Fisch (Pink, 2011).

Course structure: The level of rigidity or flexibility toward student learning within a course (Moore, 2007).

Cultural scripting: Emulation and imitation of observed behavior (Helterbran, 2006).

Component usage map: A diagram (generally in the form of a digraph) that illustrates which components of a given software system are used, based on a predefined set of criteria.

Digraph: A special diagram composed of points, called nodes or vertices, and arrows, called arcs or edges, that connect them. Digraph is a contraction of "directed graph," which means the edges from node to node are directional (Berge, 1985, p. 1).

Dialogue: Any interaction that promotes learning. Note that this does not only include communication, but may also include interaction with content (Moore, 2007).

Distance learning: Also called distance education, is any instructional delivery method not enacted in a traditional classroom, but lately used to describe Internet-based, asynchronous formats.

Instructional immediacy: Behaviors that enhance psychological closeness between teachers and students (Hutchins, 2003). Also referred to in the literature as instructor presence. Instructional immediacy is related to the issue of transactional distance.

Internet: A decentralized network of computers interconnected by a set of common communication protocols, of which the Hypertext Transfer Protocol (HTTP) is prevalent. This network is used primarily as an information conduit.

Learning Management System (LMS):

> LMS is the framework that handles all aspects of the learning process. An LMS is the infrastructure that delivers and manages instructional content, identifies and assesses individual and organizational learning or training goals, tracks the progress toward meeting those goals, and collects and presents data for supervising the learning process of an organization as a whole (Szabo & Flesher, 2002). (Watson & Watson, 2007, p. 30)

Minimal component usage map: A representative component usage map that reflects typical technology utilization patterns across an organization, or parts of the organization.

Online Course: "An online course is one that is primarily internet based (or intranet based within an organization)" (Carr-Chellman & Duchastel, 2001, p. 230).

Pedagogy: The set of theories that govern the practice of good teaching (Govindasamy, 2002).

Server: Server software runs on a remote machine (in this case denoting any machine that is not local) and generally is used to serve data or control some task set on the remote machine. Any server that is accessed by a web client generally communicates via the web server.

Student autonomy: The level of self-direction a student requires to learn within a course (Moore, 2007).

Synchronous communication: Communication that is live and real-time (Carr-Chellman & Duchastel, 2001).

Teaching presence: The actions engaged "during the design and organization of a course, facilitation of the discourse… and during direct instruction taking place in a course" (Blignaut & Trollip, 2003, p. 152).

Transactional distance: Pedagogical distance between the teacher and learner. Three variables influence this distance: program structure, dialogue, and student autonomy (Moore, 2007).

Web Application: Any computer software that is designed specifically for the Internet. Web applications are typically broken down into two categories: server and client. Server software runs on a remote computer and helps to serve data and information across the Internet upon request. Client software runs on a local computer and is used to request data and information.

Web Server: A web server is web application software on a remote machine that is used to control the flow of data and information requested by client software.

Summary

This dissertation is divided into five chapters: introduction, literature review and rationales for conducting the study, methodology, results and analysis of the data, and conclusions and recommendations for future study. Chapter 1 provides a basic introduction into the importance of researching distance education, especially from a faculty perspective, an introduction to Bruner's amplification systems, and an outline of the intended course of action by the investigator. Chapter 2 contains the literature review, a more detailed explanation of Moore's theory of transactional distance, a detailed rationale for conducting the study, a definition of Bruner's amplifiers, and a rationale for modeling faculty engagements with an LMS. Issues regarding modeling engagement are discussed, and means to addressing these issues are outlined.

Chapter 3 describes the methodology used in the study, including how the participants were selected, what data was collected, and how it was analyzed. Further included in this chapter is a description of an Arrow-May procedure (Arrow, 1963; May, 1952) that strengthens inferences based on categorical data. This procedure was used to define the minimal component usage map.

Chapter 4 describes the results of the study, contains the analysis of the data, and defines a minimal component usage map. Data are analyzed on course design and faculty perceptions of and attitudes toward an LMS. Chapter 5 contains a description of the Bruner model, constructed from the findings in chapter 4, conclusions, and a discussion, including potential implications. This chapter also discusses the importance of this work for the field of study and contains future plans for study based on this work. The investigator is not at all convinced that this is the only meaningful approach to the problem of studying faculty engagements with a learning management system, but is totally convinced that the results and analyses provide a useful heuristic for future study and that a study of the institution as a whole would be meaningful and beneficial.

CHAPTER 2

REVIEW OF THE LITERATURE

Moore was one of the first, in 1972, to begin defining the processes of distance education (Moore, 2007; Chen & Willits, 1998). Moore saw distance education as a universe of teacher-learner relationships, and in that universe, distance was not one of time and space, but of pedagogical distance between the teacher and the learner. He postulated that there were three primary variables that influenced student success in distance education: programmatic structure, dialogue, and student autonomy. Structure referred to the level of rigidity or flexibility in a course toward serving the learning needs of the students. Dialogue referred to positive interactions (Moore, 2007). This was an important distinction, for there were many interactions in a course, but to Moore, if an interaction did not improve student learning, it was not positive and hence could not be considered dialogue. Student autonomy was the amount of self-direction a student required in a course, in order to successfully complete it (Moore, 2007).

Drawing from Dewey (as cited in Moore, 2007), who first discussed education in terms of transactions, Moore saw education as interacting behaviors between teachers and learners with the explicit goal of closing the transactional gap (Moore, 2007). He hypothesized that the greater the rigidity in the structure of a course, the less dialogue there would be and the more autonomy the student would require to be successful in the course (Moore, 2007; Chen & Willits, 1998). A large number of papers have been published in peer-reviewed journals that are based on

transactional distance theory (TDT), and Moore's theory began to be seen as one of the first truly empirical foundations for research in distance education (Chen, 2001; Gorsky & Caspi, 2005).

Of interest to the investigator was the way Moore defined engagement. To wit, Moore (2007) defined three types of interactions: learner-instructor, learner-learner, and learner-content. Moore was interested in which interactions from the three categories classify as dialogue. Hillman, Wills, and Gunawardena added a fourth to account for new technology: learner-interface (as cited in Chen, 2001). Using these as the basis of an overall definition of engagement, the four categories could become central to any model of online teaching and learning.

It should be noted that Moore's theory was not without its detractors. Gorsky and Caspi (2005), in particular, performed a critical analysis on Moore's theory and came to the conclusion that research based on TDT had not been sufficiently empirically grounded, that some research had improperly operationalized variables, and resulted in a "tautology." For instance, citing works by Chen, Gorsky and Caspi (2005) claimed that TDT was only partially supported by empirical research. Chen (2001) used factor analysis to show that only dialogue seemingly had any impact on transactional distance, negating structure and student autonomy. Further, citing 1994 research by Saba and Shearer, Gorsky and Caspi (2005) demonstrated that researchers sometimes operationally defined Moore's variables in ways that were radically different from Moore's original intent. For example, Saba and Shearer used a variable of total contacts as "dialog," whereas Moore (2007) explicitly stated that only interactions that positively led to learning fit the criterion. Thus, the criticism became that what was tested was sometimes not TDT (Gorsky & Caspi, 2005). Finally, Gorsky and Caspi claimed that even if the empirical

support and variable operationalization were not issues, the very wording of Moore's theory resulted in a tautology.

Gorsky and Caspi (2005) reduced Moore's relationship among his three variables to "(a)s… dialogue increases, transactional distance decreases" (p. 8). They then took Moore's wording on dialogue and understanding to equate the two terms. They did likewise with transactional distance and misunderstanding. From this, they reduced Moore's theory to the statement, "As understanding increases, misunderstanding decreases" (p. 8), which is a tautology. However, if we consider Blignaut and Trollip's (2003) taxonomy of asynchronous communications (covered in chapter 3) and modified Moore's concept of dialogue to include affective (encouraging), corrective, informational, and Socratic (leading) types of communications, we might not only reduce the ambiguity surrounding the issue of understanding, but we might operationalize dialogue in a way that made it quantifiable. Additionally, results that the investigator found in a review of course design (detailed in chapter 3) might lead to a better conceptualization of structure than can be currently found in Moore's theory. Finally, studying planned communications within courses might lead to a better understanding of learner autonomy. For example, if communication takes precedence over content, or if content is customizable for individual learning needs, then high levels of dialogue are likely, and autonomy might not be an issue.

The Need for Research from the Faculty Perspective

Research on course management systems from the faculty perspective is lacking (Hutchins, 2003). However, the lack of information from this solitary perspective was but one compelling argument for further study. In 1965, Bruner said that we didn't really understand much about the transfer function in learning, of how we "get the most from… potential by use of

a culture's resources" (p. 1009). Carr-Chellman and Duchastel (2001) stated that there was still a lack of consensus on what constitutes learning. This investigator believes that this study might help elucidate how educators intend to perform the transfer function when combined with the use of an LMS. Online technologies add " to the complex relationships of teaching and learning" (Bickle & Carroll, 2003). As such, it is not enough to view online interactions without knowing these relationships and understanding the impact of these additional complexities. The investigator believes that modeling faculty engagement with an LMS is one way to understand these complex relationships.

As stated previously, there has been an increasing effort to move course content online (Kraemer, 2003; Morgan, 2003; Morris et al., 2006). As of 2006, Roach reported that 3,700 institutions were using WebCT or Blackboard. As resources diminish, institutions of higher learning are strongly considering more online options to deliver courses (Sneller, 2004). Further, academia sees a growing demographic of students who need additional distance options for obtaining an education (Bickle & Carroll, 2003). Because we were seeing an expansion in online offerings, there is an increasing need for more insight into such delivery methods (Harrington et al., 2006).

Although it is true that much research has been done on the uses of LMS from the student perspective, not enough has been done from the faculty viewpoint (Harrington et al., 2006). Indeed, Hutchins (2003) suggested that research from the faculty viewpoint had not been emphasized in recent years. Further, as previously stated, Internet technology had inserted an additional layer of complexity into an already complex relationship of teaching and learning (Bickle & Carroll, 2003). For that reason, studies conducted on teaching and learning from the traditional viewpoint may not translate completely to the online realm. For instance, Conrad

(2004) demonstrated that first-time online instructors relied so much on visual cues that they failed to understand the importance of online social networks and collaborative learning. Morris et al. (2005) showed that online faculty members assume far more roles in online courses than they do in traditional classrooms. The type of teaching done in a purely online course is tactically very different than in traditional and blended courses, which means that any model on faculty engagement has to consider the manner of content delivery (Harrington et al., 2006).

The real question then is not *why* we need to study faculty engagement with an online learning management system, but *how* to conduct this research. There are even questions among field experts about the meaning of *engagement* (Kuh, 2009). Based on the desire to define engagement, to construct a reasonable model of engagement based on that definition, and to answer the research questions posed in chapter 1, the investigator intended to define a Bruner model that would serve as a heuristic of faculty engagements with an LMS.

The Problem of "Meaning": Metaphors, Models, and Finding Common Ground

It may be oversimplification of the problem to say that constructing a model depended largely on the metaphors the investigator chose to use, but there was little question that the issue of "meaning" was relevant. Lakoff and Johnson (1980) suggested that metaphors make up most of our language. Accepted meanings of technology metaphors should be useful in any study involving LMS. However, Harnad (1990) suggested that no concept has meaning in common usage outside "the meaning in our heads." A number of terms may give pause once the discussion turns to modeling behaviors. The word *engagement*, for example, has often been used in pedagogy literature, but it is clear from the literature that the term varies in intent from researcher to researcher and over time. This fact should not be surprising, as commonly accepted meaning has no static existence (Prien, 2004). Thus, it is not enough to state that the

investigator's interest is to study faculty engagement with the technology. The investigator has made every effort to effectively define engagement in context.

Justification for and Issues Concerning the Construction of a Conceptual Model of Faculty Engagement with an LMS

Justifications for developing conceptual models are varied. First, conceptual models are used in many fields to create representations of process and causality (Lindland et al., 1994; Tauro, Palmer, Siganos, & Faloutsos, 2001). Conceptual models are more than sufficient for simplifying concept hierarchies and relational topologies, which can be quite complex (Tauro et al., 2001). Also, such models might be used in the early stages of research to focus and refine definitions and properties of a process (Lindland et al., 1994). Additionally, conceptual models "set the preconditions of theory formulation" (Järvelin & Wilson, 2003, p. 1). That is, models might be used not only to find "objects or components of (a) system" (Järvelin & Wilson, 2003, p. 1) and demonstrate "relationships of the objects" (p. 1), but to show how objects or relationships change "after the functioning of the system" (p. 1). Models can also be used to illustrate "(p)romising or fruitful goals and methods of research" (p. 1). With these reasons in mind, the investigator decided to use Bruner's idea of an amplification system to create a conceptual model for faculty engagements with an LMS.

The primary concerns of constructing a model can be summed up in a 1994 paper by Lindland et al. that discussed quality in conceptual modeling. To ensure quality in modeling, Lindland et al. suggested that a framework is needed (a) that separates specification properties from those of language and method; (b) that separates goals from the means to reach them; (c) that is founded on mathematical principles so that properties can be accurately interpreted; and (d) that ensures that properties in the model relate to specification building.

To make their modeling framework operational, Lindland et al. borrowed three linguistic concepts—syntax, semantics, and pragmatics—and applied them to four aspects of modeling: language, domain, model, and audience interpretation. Syntax refers to the way models are related to the language of modeling by "describing relations among... constructs" without considering meaning. Semantics refers to the way a model is related to a domain not only by syntax, but also by relationships between statements and their accepted meanings. Pragmatics concerns not only syntax and semantics, but also how the participating audience interprets the relationships. So, syntactic quality ensures that the model corresponds well to the language, semantic quality ensures that the model corresponds well to the knowledge domain, and pragmatic quality ensures that the model corresponds well to audience interpretation. The only real goal of syntactic quality is syntactic correctness, which is achieved through error prevention, error detection, and error correction. The goals of semantic quality are feasible validity and feasible completeness, which are achieved simply by adding more statements if they make the model more complete or by removing them if the removal makes the model more valid. Finally, there is but one pragmatic quality of a model, comprehension, which is achieved by constructing a model in any way that makes it understandable. The model that the investigator developed to answer the problem statement followed Lindland et al.'s suggested approach. The method of model construction is covered in more detail in chapter 3.

Bruner's Amplification Systems

Having justified using a model to describe faculty engagements with a learning management system, and having addressed the concerns of modeling, the investigator turns to the basis of the model to be constructed. In his report to the Seventy-Third Annual Convention of the American Psychological Association, Bruner said that cultures assist in the "development

of the powers of the mind… (by providing) amplification systems to which human beings, equipped with appropriate skills, can link themselves" (1965, p. 1009). He said that "growth of mind" was assisted from outside the learner, and as such, a key role of societies was to develop means to assist in that growth (Bruner, 1965). The report, titled "The Growth of Mind," described Bruner's beliefs on how a culture provided ways to transmit important knowledge to its young, discussing not only the tools used to transmit this knowledge, but the preparation required to use the tools.

Although an abstracted concept, and although applied typically to the learner, the Bruner amplifier provided a handy foundation for modeling faculty engagement with an LMS, providing as good a model for teaching as for learning. First, Bruner's own description of such amplifiers was useful. The investigator gleaned several pieces of information from "The Growth of Mind" (Bruner, 1965):

1. The amplifier was used to develop "the powers of the mind."
2. Humans can "link themselves" to an amplifier.
3. Human beings can use the amplifiers when they are "equipped with appropriate skills."

From item (1), we know an amplifier was applied cognitively. From (2), we know there was some way by which a user can attach to or "plug into" such an amplifier. Finally, from (3), there were skills that must be acquired to attach to and use such an amplifier. Thus, one might safely assume that describing such an amplifier as a cognitively based system, showing how the system was engaged and used, and determining the skill level of faculty using the system will help provide a basis for analyzing engagements with the system.

The Effect of Faculty Attitudes on the Uses of LMS

Whatever the investigator ultimately defines as engagement, the model will have to consider the attitudes of faculty toward Internet technology in general and learning management systems in particular. Tabata and Johnsrud (2008) demonstrated a variety of reasons that this is so: Technology has changed the instructional roles of faculty; time and workload concerns cause faculty to resist adaptation of online delivery; instructional support sometimes does not meet faculty expectations; training is sometimes lacking or is sometimes considered substandard; rewards are often considered inadequate; tenure is not tied to online course development; and last, but certainly not least, faculty are concerned with the quality of online instruction. Zhang and Aikman (2007) stated that if we consider faculty engagement with an online technology in terms of reasoned action or planned behavior, use follows behavioral beliefs. Harrington et al. (2006) suggested that attitude plays a huge role in LMS usage, and that a faculty member who feels isolated and alone is going to be a poor candidate for technology adaptation. Thus, it is essential that the study review faculty attitudes as part of the modeling process, in light of the need for semantic quality.

Engagement as Instructional Presence and the Quality of Communication

In a 2009 paper by Kuh, *engagement* was partially defined as "involvement in productive learning activities" (p. 6). Although Kuh only discussed the term from the student perspective, this definition can be applied to the interactions of both students and faculty. If "quality of effort" (the other part of Kuh's definition) and "involvement" comprised engagement from the student side of the equation, then instructional presence comprised engagement from the faculty side (Hutchins, 2003). The importance of the frequency, perceived quality, and type of online communications in a successful course cannot be overstated. In the end, teaching and learning is

centered on communication. But there are real questions as to how much communication is enough (Woods, 2002). A researcher must be cognizant of the quantity of transactions between an instructor and students. Quality of communication can be seen from several different angles: the percentage of an instructor's online efforts that revolve around communicating with students (Nijhuis & Collis, 2003), inclusion of both intellectual and social facets in communications (Woods, 2002), and communication as instructional presence (Hutchins, 2003). Considering the time factor, it makes sense that if faculty are spending all of their time administering the course and never have any discourse with students, those students are going to feel isolated and abandoned (Nijhuis & Collis, 2003). Considering the content of communications, it has been discovered that an effective strategy is for faculty to encourage students as well as provide them with information, because students are social beings (Woods, 2002). Finally, if the instructor isn't communicating, students will not notice the instructor's presence in the course and will begin to feel isolated (Hutchins, 2003). Blignaut and Trollip (2003) demonstrated that there are different categories of communications in asynchronous online classes and defined six basic types that affect the success of an online course. Although this study did not cover actual communications between faculty and students, or between students, announcements and discussion board posts provided sufficient information to determine the types of communications utilized. Additionally, from tool usage reports, it is clear that mail, discussion boards, chat rooms, virtual classrooms, and video were used to teach; therefore communication was ongoing throughout the term in all courses studied. Thus, any model of faculty engagements with an LMS should consider the three elements previously described.

Returning to the issue of instructor presence as a factor of the quality of communications, we can turn to Chickering and Gamson's (1987) oft-cited work. *The Seven Principles of Good*

Practice in Undergraduate Education (Chickering & Gamson, 1987) provided us with the means to address two of the three issues listed at the beginning of this subsection: the frequency and quality of communications. Additionally, the seven principles could be considered as a means to evaluate effective instructional presence (Hutchins, 2003). Blignaut and Trollip's (2003) taxonomy of communication types addresses the third issue: types of communication planned. The method of incorporating Chickering and Gamson's (1987) principles and Blignaut and Trollip's (2003) taxonomy in the model is described in chapter 3.

Further, according to Carr-Chellman and Duchastel (2001) there is generally a lack of good "design consideration" in most online courses. Part of this is due to the fact that creating successful online courses is "tricky" (Carr-Chellman & Duchastel, 2001). The effort to create the "ideal" course is marred by the fact that there is no single ideal, but rather many possible ideals (Carr-Chellman & Duchastel, 2001). In the case of online education, creating pedagogically sound courses is complicated by the fact that LMS software is often not designed for pedagogical reasons (Govindasamy, 2002). Additionally, what is considered good pedagogy in the online environment is often found by "trial and error" (Govindasamy, 2002) rather than deliberately planned. Although there is no one ideal way to design a course, there are still ways to ensure quality instruction.

Although Chickering and Gamson's 1987 article on good practices in undergraduate education was written before online courses were an issue, their seven principles have proven to be pedagogically sound for the online teaching and learning environment. The seven principles they compiled have been proven time and time again to be effective for teaching and learning (Graham, Cagiltay, Lim, Craner, & Duffy, 2001; Hutchins, 2003). Based on Hutchins' 2003

research, the investigator was convinced that any online course designed to satisfy these best practices would provide quality communication for students.

Revisiting Transactional Distance

Now that the investigator has covered and addressed the issues, and has developed a basis for the study, let us revisit the issue of transactional distance theory (TDT). As stated before, Chen (2001), a former proponent of Moore's (2007) theory, and Gorsky and Caspi (2005) raised valid concerns about TDT. The central weaknesses of transactional distance theory are how Moore defined his variables and that researchers often misoperationalize those variables. By redefining dialogue as specific kinds of communications and interactions, the investigator planned to reduce ambiguity concerning understanding, and by studying course design, the investigator intended to strengthen the concept of structure. The investigator was not able to view actual communications within the course to see faculty-student or student-student interactions. However, by viewing courses as they were designed by faculty, the investigator was able to see how communication was planned and how apparent teaching philosophy shaped technology use.

Summary

Moore was one of the first to empirically study distance learning (2007; Chen & Willits, 1998). Based on observations on teaching and learning in distance education courses, Moore conceived the transactional distance theory. He postulated that the real "distance" in distance education was not physical or temporal, but pedagogical. He believed that this transactional distance was influenced by three variables: dialogue, course structure, and student autonomy. He hypothesized that as structure increases, student autonomy increases and dialogue decreases. As a result, transactional distance increases. A number of peer-reviewed articles have been written

based on TDT, but critics contend that most were poorly backed by empirical evidence or misused one or more of Moore's variables. Also, two critics surmised that Moore's theory resulted in a tautology and was hence unusable. The investigator believes, however, that TDT may be modified and extended to avoid these critical issues.

There was a need for research on faculty-student interactions via an LMS. The primary reasons for this include that (a) so little research, comparatively, has been done from the faculty viewpoint, (b) the interactions via online technology are tactically different and far more complex than those in-class, and (c) there is an increased emphasis to place more courses online. As such, the real question is not about why we need more research but how to conduct it.

To conduct research on the subject, the investigator wished to construct a model of faculty engagements with a course management system. There were various justifications for using a conceptual model and also several concerns involved in constructing such. For example, a justification for using models was that they can make theory building much easier and help simplify conceptual relations, not only before a process, but during a process and after the process completes. On the other hand, models had to be feasible and reliable and had to make sense to the reader.

The model the investigator wished to create is based on Bruner's amplifiers, as introduced in his 1965 paper, "Growth of Mind." Although originally very abstracted and intended for the learner, the investigator believes the Bruner amplifier meets the criteria for model building and provides a solid guideline for construction. From "Growth of Mind," we know that amplifiers (a) are cognitively applied, (b) can be "plugged into," and (c) can be used with appropriate training. The problem with a learning management system, however, is that we can't "see" one as one might see a tangible tool.

Thus, we have to consider what the model requires in order to visualize it. We need to know what tools within the LMS faculty tend to use, and why. We need to know how a course was designed in order to use tools to facilitate interaction. Finally, we need to know how perception of and attitude toward the LMS shape use. Knowing tool use, course design, and attitudes/perceptions may allow a usable model of faculty engagement with the technology to be constructed.

CHAPTER 3

METHODS

The investigator conducted a mixed-methodology study to determine if reasonable and reliable models of faculty engagements with an LMS could be constructed, and to determine how attitudes and perceptions of the technology might be reflected in those engagements. The investigator was especially interested in knowing how instructors' usage of an LMS would impact student interactions.

In this chapter, the investigator describes how the Bruner model was constructed and how it was used to define faculty engagements with the LMS. It was the intention of the researcher to develop a valid and understandable model. For that reason, the data were analyzed and evaluated several ways in order to assure a reasonably valid and reliable model.

The model comprised three interrelated parts: tool usage, design considerations, and attitudes/perceptions. Tool usage is illustrated by a graphical report, called a minimal component usage map, which demonstrates the LMS tools the typical instructor used to teach and communicate with the students. Design considerations demonstrate how content was presented to the students, and demonstrate how tools were planned to be used to foster student learning. In addition, the investigator was interested in finding patterns of engagement to determine if a model based on a relatively small sample might serve as a representative for the entire institution, or if the method might be reasonably extended to produce a workable model for the institution.

Setting of the Study

The study was conducted at a mid-major southeastern research university. Research was divided into three parts, using archived data in the learning management system and a short survey. The first aspect of the model to be addressed was the issue of tool usage. An LMS provides many tools for faculty to use, but rarely are all incorporated. The investigator was interested in constructing a model of typical usage. In order to do so, the investigator needed a way to define *typical*. The investigator proposed the construction of a minimal component usage map as the means to define representative tool use for a sample. If successful, such a method could be extended for the entire institution.

For course design, selected courses provided by participants were reviewed to study how content was delivered and how communication was planned. Course navigation and layout were considered to glean insight into how interactions were planned within the courses. The investigator sought patterns of commonality and variance within the data.

Participants

Data for the first two parts of the study were collected from 13 Fall 2010 online courses from a convenience sample of seven experienced, tenured faculty members who have created online courses or course components. The seven came from a group of 20 who were originally invited. These faculty members came from the College of Arts and Sciences (including the School of Education), the School of Business, the Graduate School, and the School of Nursing. The university's Learning Management System at the time of the study was Blackboard Vista 8.

Additionally, 23 faculty members volunteered to participate in a 25-question survey. In total, 120 members from across the campus were invited to participate, including those who originally agreed to participate in Parts 1 and 2. However, due to anonymity, the identities of the

participants in Part 3 were not known. Although follow-ups were made, only a total of 23 agreed to participate. Due to the nature of this study, however, the investigator believed the numbers were sufficient for the research.

Instrumentation

A 25-question researcher-developed survey on perceptions of, attitudes toward, and uses of the LMS was provided to willing participants. Responses to the questionnaire were expected to reveal additional patterns, to illuminate teaching philosophies, and to be matched with data from the first two parts of the study to help provide a clearer picture of how an LMS is actually used to teach online at the institution. The survey is included as Appendix A.

Construct validity for the instrument was ensured in four ways. First, only faculty members who were teaching at least partially online were asked to participate. Thus, the data reflected attitudes, perceptions and tool uses by members of the target population. Second, the variables operationalized for the study were consistent with the theoretical framework. Questions in the instrument were based on those variables. Therefore, there was conceptual consistency between the variables and the survey questions. For instance, responses to Questions 3-5 matched training and experience with the LMS with actual tool use, which was a key component of the Bruner model. Responses to Question 9 related to the pedagogical basis for course design and utilization, which matched tool use with plans of action. Responses to Question 10 reflected how closely the faculty members applied Chickering and Gamson's seven principles within their courses, which concerned the need for quality interactions and instructor presence. Questions 6 and 7 pertained to attitude toward the LMS. Additionally, responses to Questions 11-25 demonstrated gradients of attitude that helped focus the connection between

attitude and use, which agreed with the literature, showing that attitude often drove technology usage.

Third, an Arrow-May procedure, described in the Data Analysis section, was used to find representative attributes for the sample, from responses given. That is, any choices that received 51% or more of the total responses were considered definitive for the sample. And fourth, results from the survey were compared to data gathered from the first two parts of the study to determine the level of agreement between the three. High levels of agreement between the three demonstrated consistency throughout the study.

Data Collection

Archived data were collected from the course management system, which was housed at Blackboard's headquarters. No individual grades or identifying information were used. Specific courses were not cited in the study, with classes being designated A-M. Responses from the survey were collected and secured at SurveyMonkey (http://www.surveymonkey.com). Data were downloaded after collection was complete to a file located on a secure computer in a locked room.

Data Analysis

For Part 1 of the study, tool usage reports were generated for selected courses. These reports demonstrated which tools were used. The investigator also noticed a range of levels of use, differing from course to course. Because course enrollments varied from 12 to over 100 students in some classes, actual numbers of sessions proved useless. To obtain a usable comparison, the investigator converted percentages of total sessions into *z* scores to demonstrate usage levels within the sample. This proved to be an effective way, combined with other parts of

the study, to determine plans of action within the courses and help to illuminate teaching philosophies.

To construct a component usage map, the investigator used tree graphs (Berge, 1985) to illustrate the tools used (Appendix B). A minimal usage map was constructed by determining the absolute majority of faculty in the sample who used each tool to interact with the students. The reason this determined a representative usage map was based on the work of economists Kenneth May and Kenneth Arrow. Arrow proved that it was impossible to determine a fair decision on a "candidate" if three or more candidates were present and two or more voters involved in the process, without violating one of several historically accepted fairness criteria (Arrow, 1963). Arrow essentially stated that if all fairness criteria are enforced, one person would control the selection outcome (i.e., there would be one dictator), or a paradox would be created. An archival study of this sort was equivalent to a vote on the tools used. If there was no fair way to conclude representative use, it would be difficult to derive a completely defendable assertion on typical tool usage just from data collected. On the other hand, if a majority verdict was rendered on a candidate tool, the choice was reduced to "A" versus "not A," and May (1952) stated that any majority decision is definitive. Knowing that a majority in each classification used a particular tool (or not) was equivalent to stating that this tool was definitively used (or not used) within the classification. No additional investigation would be needed to reinforce the assertion. Thus, a component map showing all the tools used by at least a majority could then be categorized as a representative usage map. For the purposes of this study, 51% tool use was defined as the minimum threshold for category-wide usage.

A minimal usage map was useful not only as a representative of LMS tool use, but it could be used as a means of comparison between individual faculty members and their

departments, their school, and their university as a whole. The minimal component usage map, due to its mathematical basis both from applied graph theory and the Arrow-May restriction, ensured that the tool usage component of the overall model constructed adhered to Lindland et al.'s (1994) suggestion that conceptual models be interpretable (the third criterion for quality in model building). Further, the intent of the component usage map was to help build specifications toward an overall model of faculty engagements with the technology, which met Lindland et al.'s fourth criteria.

For Part 2 of the study, faculty-permitted courses in various departments and schools were copied into blank shells, to remove all student data, and were reviewed. The investigator enrolled in each course copy to conduct a thorough review of course navigation and layout. Tools used and how they are used were noted. From the layout, the investigator attempted to model how course design facilitated interactions. As with Part 1, the investigator was searching for patterns that might express representative use for the sample. A grounded theory methodology was used in Part 2 (Strauss & Corbin, 1998). As observations were compiled, a series of labels were developed that related to patterns the investigator found in the course designs. This process was referred to as open coding (Strauss & Corbin, 1998). Next, axial coding commenced, whereby labels were categorized by related context (Strauss & Corbin, 1998). A color-coding scheme was used to organize the codes. Following the axial coding process, selective coding was used to find a representative category from each related concept group (Strauss & Corbin, 1998). It was by these concept codes that a pattern was expected to be derived on the thought process behind course design. From the grounded analysis, the investigator expected to better model a typical faculty member's planned action for bridging

transactional distance for the students. This tied tool use with the reason for use and explained the communication process the faculty member intended to employ.

Findings from the grounded theory showed how educational goals were established in courses and separated the goals from the approach to reach them. This part of the overall model fulfilled Lindland et al.'s (1994) second criterion for model construction, as well as helped connect the first and third parts of the study.

As for communication that existed from faculty to students, Blignaut and Trollip (2003) found that students expected guidance, appreciated encouragement, liked positive criticism that leads to learning, and disliked miscellaneous conversations that had no bearing on the topic at hand. Blignaut and Trollip's taxonomy appeared adequate to determine how much communication was dialogue, in Moore's sense (2007).

Finally, in Part 3 the investigator analyzed data from the survey to find patterns of commonality, using ANOVA and other techniques, to determine statistical differences between genders, age groups, and LMS experience levels. The investigator believed that the more tightly clustered the data, the more representative it became, and the more meaningful the model of engagement became. Also, by finding where 51% or greater agreement on data existed, the investigator used the Arrow-May criterion to cite the data as definitive for representation for the sample.

Additionally, 21 possible responses for one question were tied to Chickering and Gamson's Seven Principles (1987) to determine how the principles were applied by respondents. Chickering and Gamson's principles have been used to evaluate effective teaching for many years, and one or more of the seven may categorize any given engagement. The seven principles are the following:

1. Good practice encourages student-faculty contact.
2. Good practice encourages cooperation among students.
3. Good practice encourages active learning.
4. Good practice gives prompt feedback.
5. Good practice emphasizes time on task.
6. Good practice provides high expectations.
7. Good practice respects diverse talents and ways of learning.

CHAPTER 4

RESULTS AND ANALYSIS

Summary of the Study

The purpose of the study was to determine if reasonable and reliable models of faculty engagements with an LMS could be constructed, and to determine how attitudes and perceptions of the technology might be reflected in those engagements. Modeling these engagements was expected to serve as a starting point for a theory on faculty-student interactions within a learning management system (LMS) to be constructed after further research is completed. The study was broken into three parts, in order to collect data from multiple sources. Part 1 of the study was intended to determine which LMS tools faculty tended to use, and which ones they tended to avoid. To accomplish this, tool usage reports were run on the courses of participating faculty. Part 2 was intended to determine how LMS tools were used to facilitate a pedagogical plan of action, by reviewing design of the courses of participating faculty. Finally, Part 3 was intended to determine if there was a relationship between faculty perception of and attitudes toward the LMS and how the faculty members engaged with the LMS. This was accomplished by having participating faculty complete a 25-question online survey.

Active Participants

Participants came from the population of faculty who used the LMS to teach at least partially online. Twenty full-time, terminally degreed faculty members, with at least 3 years of experience teaching hybrid or fully online courses, were asked to participate in the tool usage

and course copy portions of the study. Invitations to participate, containing a statement of informed consent (Appendix C), were delivered via email. One hundred twenty faculty, representing a broad spectrum of online teaching experience, were invited to participate in the confidential online survey (results can be found in Appendix D). That invitation also included a statement of informed consent (Appendix E). The 20 faculty from the first group were included with the second set of invitees. However, due to the anonymous nature of the survey group, participants were unidentified, and it was not known if any of the 20 completed the survey. The investigator had a 2-week window in which to collect data from the two groups.

At the end of the allotted time, seven faculty members had agreed to participate in the first two parts of the study, allowing for a total of 13 courses to be used for a tool usage and course design review. The seven included faculty from the College of Arts and Sciences, the Graduate School, the School of Nursing, and the School of Business. The courses were a mix of augmented, blended, and purely online courses.

Twenty-three faculty members completed the online survey. Nine were males and 14 were females. Three of the participants were in the 21-35 age range, eight in the 36-50 range, eleven in the 51-65 range, and only one was older than 65. The participants were spread across the experience spectrum, with two having less than 1 year of experience teaching online, three with 1 to 2 years, five with 2 to 3 years, six with 3 to 4 years, two with 4 to 5 years, and five with more than 5 years experience. It was not known which colleges or departments were represented.

Part 1: Tool Usage

Tool usage reports were run for each of the 13 classes, which were designated A-M to avoid identification. Data collected included tool type, sessions per tool, average time per

session, total time, and percentage of total sessions for each tool (measured as a function of time, not the number of sessions). Size of the classes varied, from students numbering in the teens to over 100 in one case. Thus time spent on various tools was deemed less important than overall percentages of total sessions. From the lists (Appendix F), many tools appear to be commonly used. However, time spent and percentage of total sessions demonstrates that common tools are not used in a uniform manner. From this information, the investigator concluded that, in addition to general tool use, amount of use would have to be accounted for within the model.

Participants had differing usage levels in certain tools, and the investigator became obligated to address that issue. To wit, were the uses statistically different, and if they were different, to what degree? The courses had varying numbers of students, which would affect totals. However, there was a statistical approach to creating such comparisons: the *z* score. The investigator computed the mean and standard deviation of the percentages, and then computed *z* scores to determine levels of use. The *z* scores between -0.5 and 0.5 (one standard deviation) could be considered average levels of use. Above average use would be considered any *z* score between 0.5 and 1.5. Anything above 1.5 standard deviations would be considered high levels of use. Likewise, anything between -1.5 and -0.5 could be considered below average, and anything less than -1.5 could be considered low use. Note that qualitative differences in teaching should not be inferred by the *z* scores. Levels of use might have been an indicator of how the tools conformed to overall plans of action. It should be also noted that students first connected to the home page each time they logged into the LMS. This directly impacted the Folder tool and might have skewed the percentage of total sessions for the Folder.

The investigator focused on the commonalities for the minimal component usage map. Based on a threshold of 51% use or greater, the following represents the minimal component usage map for the sample. See Appendix B for a description of the tool icons.

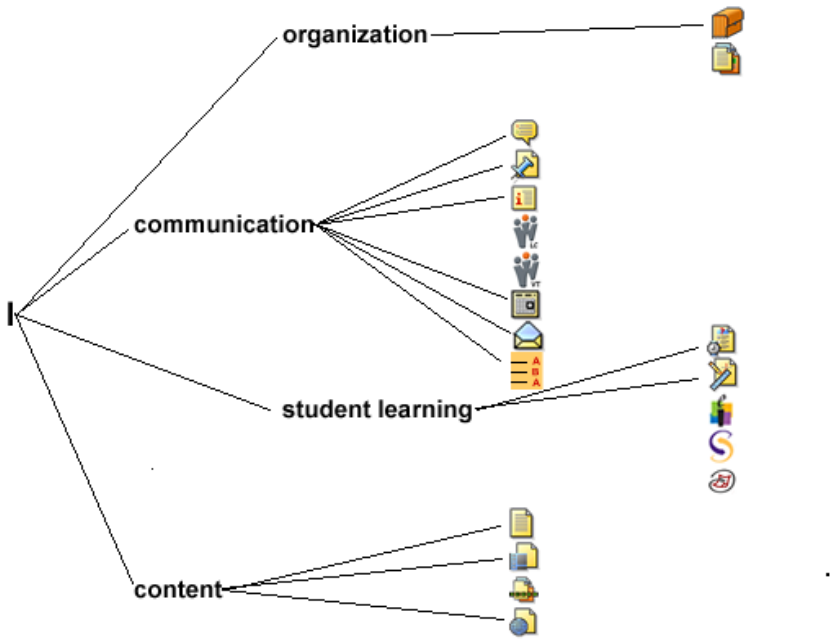

Figure 1. Minimal component usage map for the sample.

Note that folders were the primary tool of choice for organization. Communication tools tended to be textually based. Student learning in the courses tended to be measured by assessments and assignments. Content in the courses tended to be delivered via text files, whereas other media were contained in a media library or delivered from external web pages. Note that videos for the courses were delivered by streaming video servers, connected in the courses by web links.

Based on the Arrow-May criterion discussed in chapter 3, this map was considered representative for the group. That is, this component usage map could be considered definitive for general use in the sample.

Part 2: Course Design Considerations

After constructing the minimal component usage map for the sample, the investigator had an understanding of which tools faculty tended to use. By studying course design, the investigator began to comprehend how the faculty used the tools, based on a perceived plan of action. As stated in the assumptions, it was expected that a faculty member had some pedagogical viewpoint, whether or not that viewpoint was formalized. Notes were made from observations, and a grounded method approach was used to find categories for organizing the results. The following are the categories and findings from Part 2 of the study:

1. Syllabus and timelines. Every reviewed course had a syllabus. Course timelines and expectations for students were well prepared. Requirements, including textbooks and prerequisites, were listed. Grading procedures were detailed and understandable in all cases. It should be noted that these were not departmental syllabi. That is, these were all faculty-produced syllabi specific to the courses being taught.
2. Navigation. No course section had greater than a three-step drill down. Students are not likely to get lost within any of the folders or subfolders the investigator reviewed. All used tools were linked either from the main menu or found easily within a folder or single page. There did not appear to be any orphaned pages or links.
3. Organization. The courses were organized in a “hybrid filing cabinet” format. That is, there were levels of organization, typically within folders and/or learning modules, but in some cases separate files. Organization was typically by topic, not by week or textbook chapter. In over half the cases, folders were organized by file types, such as PowerPoints or PDF’s.

4. Content. Most of the content was located in flat text files. Video files made up 27.4% of the total. Some content, in every course surveyed, existed in external web sites, hyperlinked to the course. No content in the courses surveyed was interactive. That is, the content was static and contained no user-activated animations or event-driven branching.
5. Assessments. Assessments within the courses tended to be traditional. That is, assessments consisted of tests and projects/papers. Almost one third of the courses (four) used graded discussions.
6. Communication. Faculty used discussion boards and email for most of their communication. One faculty member used Wimba Live Classroom for real-time, online lectures. One used Skype for communications within a purely online class. All used announcements. The types of communication tended to be informative and corrective, which by the Blignaut-Trollip criteria developed earlier meant the outbound communication from faculty members tended to be dialogue.

From observations about course design, the investigator derived the following facts. First, there was an emphasis on delivering content in each of the courses. This seemed to take precedence over faculty-student and student-student interaction. Conduct of the courses appeared to be fairly traditional. That is, each of the courses appeared to be managed with a lecture-and-assessment approach rather than with a guided learning methodology. Thus, the prevalent philosophy of teaching seemed to be more sage-on-the-stage than guide-on-the-side, which seemed to conflict with the preferred philosophy found within the survey. The investigator believes this to be more of a perception issue than a true conflict, however, or that the instructor may have been using a “classroom flip” model of instruction. Although the survey

participants expressed a desire to guide students to knowledge rather than dispense knowledge, the faculty members also expressed a desire to maintain control in the class. Tools were used primarily for content delivery and faculty-to-student communications tended to be reminders about due dates and expectations. Participants were heavily involved in their respective classes, so instructor presence appeared to be strong.

Very little modification of the original plan of action, as given by the syllabus, was observed. Courses seemed to adhere to the original timelines. Multiple communications channels were not used in conjunction to teach, so that one channel at a time was optioned to deliver and receive information. Also, an emphasis on social knowledge construction was not evident. That is, although students were often encouraged to interact by message boards, the interaction appeared to be intended to reinforce topical understanding rather than knowledge construction. Additionally, there appeared to be little emphasis on multiple approaches to learning. That is, diversity of learning styles did not appear to be weighed into course creation in many of the sections reviewed. Only four of thirteen courses combined flat text, video, PowerPoints and discussion board entries to convey course materials, covering audio, visual, and global learning.

Part 3: Survey Results

Twenty-three faculty members anonymously completed the faculty attitudes toward and uses of an LMS survey, via SurveyMonkey (http://www.surveymonkey.com). Fourteen were females and nine were males. The overall results, by question, can be found in Appendix D.

Women represented 60.9% of the sample. There were 82.6% of the faculty members in the 36-65 age range, and 78.3% had at least 2 years experience using the LMS. The data demonstrate that the participants had a wide range of training and preparation before using the

LMS. All but two had more than one method of preparation. Uses of the LMS varied, although there were some uses common to most: Participants wanted to get syllabi distributed, provide reading materials, use discussion boards to encourage student interaction, and assign and receive projects. Additionally, most participants used audio and video to teach concepts online, and used email to communicate directly with students.

One surprising finding was that a majority of participants did not consider intellectual property issues (4, or 17.4%) or a lack of FTE applied to training or developing courses (8, or 34.8%) as a major obstacle, although many considered the amount of time to develop a quality course a drawback (13, or 56.5%). Fourteen (60.9%) considered the added responsibilities for conducting courses online an obstacle.

Several attributes were considered strengths of the system, most notably the ability to keep all materials in one location and 24/7 access (20, or 87%). Interestingly, only 11 (47.8%) considered staying in touch with students to be a strength, despite most (16, or 69.6%) maintaining two-way contact with students.

From a perspective of Chickering and Gamson's seven principles, the participants seemed to fare well, overall. Question 10 in the survey provided 21 possible responses, with each of the seven principles being accounted for in three responses each. Responses of 51% or better were considered typical for the group, again using the Arrow-May criterion for selection. Following are the results from this portion of the survey:

1. Good practice encourages contact between students and faculty—two of three responses received at least 51% of the total. Faculty considered having more than one way to communicate with students and having an "open-door policy" online to be important attributes of the system. It should be added that within the attitude and

perceptions portion of the survey, 16 participants claimed to maintain two-way communication with their students. Constant contact was not considered important by most, however.

2. Good practice develops reciprocity and cooperation among students—two of three responses received at least 51% of the total. Providing opportunities for group work and using discussion boards to encourage student interaction were considered important to participants. Having multiple communication channels for student contact was not considered important by the majority, however. This is in agreement with findings from Part 2 of the study.
3. Good practice encourages active learning—only one of three responses received 51% or better of the total. Faculty members in the group were overwhelmingly in favor of assigning projects and papers. Participants tended to be very traditional in this respect. Student-led activities and online presentations were not considered important by a majority of the participants.
4. Good practice gives prompt feedback— all three responses received 51% or more of the total. Participants considered making sure the students knew how they were doing, providing quick responses to questions and grading quickly to all be important.
5. Good practice emphasizes time on task—all three responses received at least 51% of the total. Getting the syllabus out to the students was considered most important, with 19, or 82.6%, of respondents choosing that selection. Having a usable calendar and being able to create and stick to timelines were also considered important by 12 each (52.2%).

6. Good practice communicates high expectations—surprisingly, only one of three responses was well-received by participants. Although 17 (73.9%) felt it was important to tell students what was expected of them, only 7 (30.4%) believed high quality should be central to teaching online, and only 10 (43.5%) held to the opinion that high standards should be enforced in class.
7. Good practice respects diverse talents and ways of learning—two of three responses received at least 51% of the total. Having more than one way to approach a topic (18, or 78.3%) and having ways to deal with diverse learning styles (14, or 60.9%) were considered very important. However, participants did not believe providing multiple options to account for diversity was as important. This may be accounted for in the fact that faculty members used various MIME-type (file type) content to cover topics, including flat text and video, but did not customize content for individual use.

From the attitudes and perceptions portion of the survey, the investigator viewed what seemed to be a fairly uniform attitude among the participants, overall. The investigator checked for normality of the data set with SOFA Statistics. Experience level had a skew of only -0.049, but kurtosis of 2.041. Age range likewise had a low skewness (-0.352) but kurtosis of 2.483. Only gender had sufficient skewness (-0.445) and kurtosis (1.198) to be considered normal enough to use ANOVA. Tests for differences in age and experience were computed using the Kruskal-Wallis *H* statistic. Kruskal-Wallis is a nonparametric method used to study differences between group medians, rather than means. Kruskal-Wallis does not assume normality in a data set.

1. For “I prefer to create the class online once and copy content to future sections,” ANOVA provided an *F* statistic of 1.612, with a *p* value of 0.218 for a comparison of

gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 1.17 with a *p* value of 0.557. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 2.592 and a *p* value of 0.763.

2. For "I will adjust an online course from term to term as needed, to help improve it," ANOVA provided an *F* statistic of 0.055 and a *p* value of 0.817 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 1.387 and a *p* value of 0.500. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 3.507 and a *p* value of 0.622.
3. For "I will adjust a course during the term if it will help improve it," ANOVA provided an *F* statistic of 0.711 and a *p* value of 0.409 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 1.122 and a *p* value of 0.571. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 2.157 and a *p* value of 0.827.
4. For "I only use Blackboard because it is expected of me," ANOVA provided an *F* statistic of 1.78 and a *p* value of 0.196 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 3.183 and a *p* value of 0.204. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 3.912 and a *p* value of 0.562.
5. For "I have come to appreciate Blackboard the more I use it," ANOVA provided an *F* statistic of 1.654 and a *p* value of 0.212 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 0.218 and a *p* value of 0.897. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 9.652 and a *p* value of 0.086.

6. For “I prefer to teach online whenever possible,” ANOVA provided an *F* statistic of 0.017 and a *p* value of 0.898 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 5.697 and a *p* value of 0.058. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 1.789 and a *p* value of 0.878.
7. For “I find Blackboard difficult to use, so I only do what I must and no more,” ANOVA provided an *F* statistic of 1.141 and a *p* value of 0.298 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 1.196 and a *p* value of 0.550. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 6.149 and a *p* value of 0.292.
8. For “Using Blackboard helps keep me and my class organized,” ANOVA provided an *F* statistic of 2.72 and a *p* value of 0.114 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 0.32 and a *p* value of 0.852. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 7.792 and a *p* value of 0.168.
9. For “Blackboard helps keep me and my students connected,” ANOVA provided an *F* statistic of 0.52 and a *p* value of 0.479 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 0.711and a *p* value of 0.701. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 3.049 and a *p* value of 0.692.
10. For “I contact students whenever it is necessary,” ANOVA provided an *F* statistic of 0.045 and a *p* value of 0.835 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 5.16 and a *p* value of

0.076. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 6.115 and a *p* value of 0.295.

11. For "I prefer students contact me if they have questions," ANOVA provided an *F* statistic of 3.252 and a *p* value of 0.086 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 3.605 and a *p* value of 0.165. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 2.484 and a *p* value of 0.779.
12. For "I have regular two-way contact with students," ANOVA provided an *F* statistic of 1.124 and a *p* value of 0.301 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 0.071 and a *p* value of 0.965. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 3.952 and a *p* value of 0.556.
13. For "Blackboard is important for disseminating content," ANOVA provided an *F* statistic of 0.169 and a *p* value of 0.685 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 1.655 and a *p* value of 0.437. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 0.17 and a *p* value of 0.680.
14. For "Blackboard has a variety of useful tools for teaching," ANOVA provided an *F* statistic of 1.562 and a *p* value of 0.225 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 0.053 and a *p* value of 0.974. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 14.004 and a *p* value of 0.016.

15. For “Blackboard is central to all I do with students,” ANOVA provided an *F* statistic of 0.001 and a *p* value of 0.972 for a comparison of gender. The same question comparing age ranges provided a Kruskal-Wallis *H* statistic of 6.749 and a *p* value of 0.034. Comparing the same question for experience levels provided a Kruskal-Wallis *H* statistic of 4.315 and a *p* value of 0.505.

In each case, $p > 0.01$, which seemed to suggest there existed no evidence that any of the categories differed statistically on the attitudes toward and perceptions of the LMS. Although the size of the sample was small, there were surprising levels of conformity in the results, across the categorical strata.

Summary

Seven faculty members agreed to participate in Parts 1 and 2 of the study, concerning tool use and course design, respectively. Additionally, another 23 agreed to complete a survey on perceptions of, attitudes toward, and uses of an LMS. Despite the small samples, a rich data set was collected that was expected to shed light on how faculty members used an LMS to teach and how philosophy and plan molded that use.

In addition to actual use, the investigator discovered that the classes did not use the tools in a uniform manner. Based on percentages of total sessions in each class, there were clear differences in the levels of use. By computing *z* scores, the investigator was able to make some reasonable comparisons from the differences in order to determine level of use for the courses in the sample. The same technique may be applied on a broader range, to determine level of use across an institution. According to the findings, a minimal component usage map was constructed based on 51% use or better.

The investigator was able to combine tool use with purpose of use from the course design component of the study to make observations about teaching philosophy and the resulting plan of action for each course. What the investigator derived from a grounded theory approach to those observations was that faculty members appear to be very involved with their courses, but seemed to be very traditional in their approaches. Emphasis seemed to be placed more on content delivery than knowledge construction. Assessments tended to be very traditional, with tests, projects, and papers dominating most of evaluation. Content tended to be static and noninteractive. Video was used in some classes to provide examples and context for course materials. Most communication was asynchronous.

From the Part 3 survey, data displayed a strong clustering in some cases, which provided some strong similarity in thought among the participants. Over half the participants were female. Most were between 31 and 65 years of age. Most had at least one year of experience with the LMS. Although there was a broad range of preparation for using the LMS, faculty tended to learn how to use the LMS in more than one way.

From the survey, faculty tended to use the LMS to deliver content to the students, which agrees with findings in the first two parts of the study. Teaching approaches appeared to be very traditional. The faculty did tend to actively encourage students toward learning goals, rather than allow exploration.

Faculty fared well with the Chickering-Gamson assessment, with all but two (enforcing high expectations and encouraging active learning) receiving at least two of three marks in agreement with good practice. Thus, it appears that faculty members are aware of the need for quality design toward teaching online, which seems to support the assumption that these participants had a reasonably well-grounded pedagogical approach to LMS use.

Finally, when tested for differences in attitude and perception across gender, age range, and experience categories, the investigator determined that no statistical difference existed within the sample.

CHAPTER 5

CONSTRUCTING A BRUNER MODEL OF FACULTY ENGAGEMENT

Intrigued by the idea of learning management systems (LMS) as Bruner amplifiers, the investigator was motivated to determine at least one way in which to describe LMS as such. Physical tools, such as hammers, swords, and pencils, are fairly easy to describe as Bruner amplifiers. However, an LMS is virtual, existing solely on Internet servers and accessed via web browsers. The investigator became convinced that in order to describe LMS as amplification systems, engagement with the systems would have to be first modeled.

In order to construct a workable model of faculty engagement with an LMS, the investigator decided to conduct a three-part study, in order to acquire multiple sources of data. The three parts consisted of a review of tool use, a review of course design, and a review of attitudes toward and perceptions of an LMS compared and contrasted with use. Seven full-time faculty members, each with some online teaching experience, agreed to participate in the tool use and course design components of the study, providing access to 13 courses. Twenty three additional faculty members agreed to complete a 25-question survey of perceptions, attitudes, and usage. Findings from the research suggest to the investigator that there was a strong amount of uniform attitude, perception, and use of the available LMS within the sample. There appeared to be sufficient consistency between the parts of the study to make a case for the LMS as a Bruner amplifier, and where the findings differed, they differed in a way that proved to enlighten

rather than confuse. Thus the investigator believed that a reasonable, representative model of faculty engagement might be developed from those findings.

Revisiting Bruner's Amplifiers

Bruner defined an amplification system, in his 1965 address to the American Psychological Association, as a construct created by a society to provide its members with ways to extend their abilities when plugged into the amplifier. The concept was intended primarily for learners and was meant to be a cognitive amplifier, but the investigator was convinced that the concept was appropriate for the teacher, as well. According to Bruner, there were three primary types of amplifiers: enactive, iconic, and symbolic. For purposes of war, a sword was an amplifier because it extended a soldier's ability to fight and defend himself. For building, a hammer was an amplifier because it extended the builder's ability to construct objects, such as furniture or homes. For the student, a pencil was an amplifier because it extended the student's ability to learn by providing a means to help record ideas. In each case, the user had to learn how to use the amplifier, and once the amplifier was engaged, the user's native ability was increased in some fashion.

The problem with identifying a learning management system as a Bruner amplifier was surprisingly simple: One can not see an LMS and can not directly observe how an LMS is being used. It is not tangible. It can not be held or even touched. Thus, it is not easy to "see" how it is engaged. The best way to determine how it is to be engaged, then, is to model that engagement. However, modeling brings about other issues that require addressing: primarily, is there a way to describe a model that is reasonable and accurate, and is it possible to construct a model of representative use? According to Lindland et al. (1994), good models should accomplish four things: (a) they should separate specification properties from properties of language and method;

(b) they should separate goals from the means to reach goals; (c) they should be founded on mathematical principles, and (d) they should ensure that all properties relate to specification building. To do this, the authors suggested that any reasonable model should meet three criteria: (a) a model should be as free of error as possible; (b) a model should be feasibly valid and complete, and (c) a model should be comprehensible by the average member of the knowledge domain. From Bruner, the investigator knew that an amplifier must be cognitively applied, it must be plugged into, and the amplifier requires some form of training in order to use it. Thus, to model engagement, the investigator applied Lindland et al.'s methodology to Bruner's conceptualization.

Modeling Faculty Engagement with an LMS

From the study, patterns of belief, attitude, and action seemed apparent to the investigator. The investigator believed that the findings from the study would provide a means toward constructing a useful model of faculty engagement with the system.

From Bruner, in order to model faculty engagement with the LMS, the investigator needed to demonstrate how faculty members were trained to use the technology, show how they plugged into the system, and show how the system amplified the act of teaching. Using Lindland et al.'s (1994) approach and information from the data collected, the investigator began to construct a model.

The system primarily consisted of the user (faculty member), the interface (a web browser), and the application. Faculty members had attitudes toward and perceptions of the LMS that seemed to have molded tool use and course design, which agrees with the literature (Harrington et al., 2006; Tabata & Johnsrud, 2008; Zhang & Aikman, 2007). The primary teaching philosophy seemed to be traditional, with a lecture-and-assessment approach to

education. There was no single driving design principle, which was predicted by Carr-Chellman and Duchastel (2001), but there was some common tool usage. For that reason, the tools used most tended to be for file manipulation and linkage. Communication tended to lean toward course expectations and deadlines. Most of the communication was asynchronous. The faculty members were very involved in the class, so instructor presence seems to have been sufficient, which appears to agree with Nijhuis and Collins (2003), as well as Hutchins (2003). Responding to queries was a priority, and faculty would initiate contact with students, if it were needed. However, it is clear that the faculty did not desire constant contact with the students and rarely used synchronous communication such as chat rooms and virtual classrooms.

Faculty members had numerous options for preparing to use the LMS, and most faculty members used more than one. The prevalent methods were to attend a basic training session, to seek one-on-one consulting, and to be trained by the faculty members' schools or departments. Although training materials were available online, it appeared that this option was less desirable.

Faculty members engaged the system through a variety of tools that primarily focused on file distribution and linking, as well as asynchronous communication. To do this, they used the file system to upload and link text documents and websites (including streaming video content) and used announcements to communicate deadlines and expectations. They often used discussion boards for introductions and to reinforce topics being covered. Course conduct seemed to be mostly traditional, with the faculty using a lecture-and-assessment approach to teaching. The perception of the system as a file cabinet or command center demonstrated that the primary concerns were content delivery and control. Tool use was a reflection of this concern, as files and folders were used more than any other tool. Thus, faculty members'

metaphorical understanding of the technology seemed to agree with Lakoff and Johnson's (1980), as well as Harnad's (1990), perceptions on how language drives behaviors.

The LMS was primarily used by faculty as an enactive amplifier, to enhance the activities of course administration, content delivery, and course organization. Communication was two-way, but communication types tended to be mostly informative and corrective. There appeared to be neither guiding postings nor encouragement of socially constructed knowledge, which was fostered by Allen et al. (2004). There also did not appear to be affective postings, as encouraged by Woods (2002) and Blignaut and Trollip (2003).

Answers to Research Questions

In the course of the study, the investigator found satisfactory answers for each of the original research questions. The questions and answers are provided below.

Question 1: Which tools do faculty members use and how do they use them? Might a reason be inferred, from a given plan of action, for this use?

Faculty members in the study primarily used file management and organizational tools to prepare their classes. Communication channels used included mail, discussion boards, streaming video files, announcements, and the calendar tool. Communication tools were not used in conjunction with one another to teach, but used individually to express a goal or idea. Based upon the findings, it appears that faculty were traditionalists, using communication to encourage students in the correct directions, but focused more on content delivery than socially constructed knowledge.

Question 2: Which tools do faculty members tend to avoid? Might a reason be inferred, from a given plan of action, for this avoidance?

Faculty tended to avoid third-party tools and synchronous communications. They seemed to be more at home with native Blackboard tools, of which use was covered in basic

training provided by Instructional Technology. Again, the reason for this avoidance appeared to be the traditional nature of faculty teaching philosophy. It may also have been a sign that more training on third-party tools was needed to familiarize faculty with those tools.

Question 3: How does course design affect the communication process?

In the study, it appeared that the communication process was formed by the traditional approach to teaching. Most communication within the course appeared to be informative and corrective in nature, which by definition within this study constituted dialogue. Also, quantity of communication appeared to be sufficient to ensure instructional presence. Course design was not encouraging of socially constructed knowledge, which seemed to agree with the teaching approach used by most of the faculty members that participated.

Question 4: How flexible does course structure become across a term?

As noted in chapter 4, course structure, from a concept of timelines, was not flexible. Once timelines were set, there was no deviation. Content did not seem to be changed or modified during the term for any of the courses reviewed.

Question 5: How does faculty's use of LMS technology and services influence faculty-student interactions?

Although interaction between faculty and students was not observed, clues as to the nature of planned interactions appeared to exist in the data collected. As stated, the plan of action in most classes reviewed tended to be very traditional. Faculty members encouraged students to ask questions, if needed, and provided content they felt the students required to learn. Interactions were not based on a guide-on-the-side model, although faculty expected students to learn from material provided and would "nudge" the students in the right direction if the students

appeared to become lost. Thus student interactions were mostly planned to be student-content, with student-instructor interactions primarily of the "course correction" variety.

Question 6: How might one describe an LMS as a Bruner amplifier, given faculty engagement with the system?

As stated earlier, in this case of this sample, the LMS enacted the activities of course organization, content delivery, and administration. For communication, the LMS was used to enact the process of maintaining deadlines and providing feedback for queries and prompt grading. Faculty plugged in via course tools, primarily for file management, file linking, and asynchronous communication. Faculty members were prepared for LMS use primarily by attending training sessions or by one-to-one consultations.

Implications of the Study

The primary implication of this study is that faculty engagement with the LMS could be reasonably modeled as a Bruner amplifier, if the culture of online teaching at an institution were considered. It appears that attitude, philosophy, and perceptions guided course development and conduct. Because third-party tools were not prevalent in reported use, further study is advised to assert whether such tools are being used sufficiently to warrant the cost. This might also be a sign that faculty weren't as familiar with these tools as they should have been, and might signal a need for additional exposure, support, and training. Considerations for the type of training might be researched. That is, is it preferable to conduct large sessions, small-group sessions, online tutorials, or departmentally tailored sessions? Perhaps the culture itself should be targeted and training be tailored to take advantage of perceptions and attitudes among existing online faculty.

Toward a Theory of Online Teaching and Learning

From what was discovered in the study, there is a need for a working theory of online teaching and learning from which to base program evaluations. The courses overviewed and the survey results from this study have enough commonality to suggest a culture of online teaching that may be present within the institution. Certainly enough was discovered to encourage additional research. The Bruner model constructed was likely a result of this culture, and such a model constructed at another institution may have resulted in a different model. Thus constructing a sound theory of teaching and learning online, with a complex, multichanneled tool system, is necessary. For now, let us reconsider Moore's transaction distance theory (TDT).

Moore (2007) postulated that distance learning had three primary components for which must be accounted: course structure, dialogue, and student autonomy. Critics of Moore's theory, particularly Chen (2001) and Gorsky and Caspi (2005), stated that TDT was not sufficiently supported by empirical evidence, that the variables were misoperationalized, and that the theory resulted in a tautology. Despite these criticisms, numerous papers have been written on experiments that seem to support elements of transactional distance theory, if not the whole, so there must be some merit to the concept.

It seemed to the investigator that additional structure might have made TDT more valid and reliable. First, dialogue was too vague a concept for practical use. Granted, this vagueness yielded much flexibility, but vagueness could also lead to misapprehension. Blignaut and Trollip (2003) provided a more cohesive conceptualization. First, consider all the communication and content in a course, and then classify them according to Blignaut and Trollip's six categories. All that classified as affective (encouraging), corrective, informative, or Socratic (guiding) could then be considered dialogue. This would allow researchers to quantify dialogue in a course.

For structure, it may be that flexibility in timelines and the plan of action are not as important as the flexibility of content. Course rigidity is not necessarily an undesirable trait. For instance, Chickering and Gamson (1987) had among their seven principles one concerning "time on task." Timelines seem necessary, according to Chickering and Gamson, for quality education to take place. But maintaining a timeline could be accompanied by customizable content. There existed LMS at the time of this study that had programmable lessons, which allowed for branching events, depending on student responses. Perhaps if content were made flexible, via customized interactivity, then there would be less concern about student autonomy. Such interactivity, aimed at improving learning, would qualify as dialogue, in Moore's sense (2007).

Thus, if dialogue is given stricter definition, if flexibility of structure is focused on content rather than timelines, then reducing student autonomy may become more meaningful. Transactional distance theory could then be reformatted as "if Blignaut-Trollip dialogue is present and content structure is sufficiently customized to greater meet individual needs, student autonomy may be significantly reduced."

Suggestions for Future Research

Although this study garnered rich data that supported the modeling of faculty engagement with an LMS, more research is needed for teaching and learning online. Continuing this research with a larger sample is desirable to see if similar results occur, further validating findings in this study. Collecting actual faculty-student interactions within courses might reinforce the heuristic of the LMS as a system for content delivery and course control. Having this data would certainly allow for communication to be categorized by the Blignaut-Trollip criteria to determine how much can be considered dialogue.

Additionally, there appears to be a misunderstanding about the technology, from a metaphorical standpoint. It might provide insight to conduct a survey of Internet metaphors, especially concerning online teaching and learning, to see if there is a difference between age and experience groups pertaining to understanding these metaphors. Also, from the study, it appears that there exists a culture of online teaching at an institution, or at least in certain schools, divisions, or departments. The investigator believes it may be beneficial to study this culture, as such research may give clues to improve training and support. Plus, it would be interesting to compare models from different institutions, to determine if different Bruner models demonstrate differences in online teaching culture. LMS are complex by nature. It would not be surprising to see that the Bruner model for any given organization may depend on attitude toward and perception of the technology by organizational members more than tool availability.

A question arose concerning the nature of pedagogy that may appear in any Bruner model. What is the source of the pedagogy? That is, is pedagogy within any online course or course component a result of what an instructor brings, or is it imposed from without? Is pedagogy something that is planned, is it limited or enforced by software design, or is it mandated from external authority? Also, might there be significant differences between the Bruner models for purely online, hybrid, and augmented courses? Future research is needed to answer these questions.

It is recommended that any future studies on modeling technology uses include an attitude and perceptions component. It is recommended that all tools be weighed in the study rather than studies on tool use conducted in a piecemeal fashion. Not only should tool use be considered in such a study, levels of use ought to be considered, for, combined with other data, levels of use provide clues as to how the LMS is used for teaching.

Whatever approach is taken, the investigator believes the effort to learn more about faculty attitudes, perceptions, and uses of online technologies is warranted. LMS technology seems almost limitless and appears to evolve rapidly, but attitudes, philosophies, and perceptions mold how teaching is accomplished, in general, and how teaching is conducted online, in particular. Depending on that molding, teaching online may become unnecessarily limited, despite the seemingly endless possibilities the technology grants. As more and more courses are moved online, we should not allow our understanding of how and why the technologies are used by our faculty to falter.

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APPENDIX A

FACULTY SURVEY

The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagements with an Online Technology

1. What is your gender (choose one)?

   Female ___ Male ___

2. What is your age range (choose one)?

   21-35 ___ 36-50 ___ 51-65 ___ 66 and up ___

3. What have you done to prepare for using Blackboard to teach (check each that apply)?

   Used Blackboard Help files ___
   Read a manual ___
   Took an online tutorial ___
   Asked for one-on-one consulting ___
   Was trained by school or department ___
   Blackboard Vista Basic training ___
   Blackboard Vista Enhanced Training ___
   Wimba Live Classroom Training ___
   Respondus Training ___
   Turnitin Training ___

4. How long have you used Blackboard (choose one)?

   Less than one year ___
   Between one and two years ___
   Between two and three years ___
   Between three and four years ___
   Between four and five years ___
   More than five years ___

5. Which ways do you use Blackboard (check all that apply)?

I upload a syllabus for my students ___
I upload reading materials ___
I use interactive Flash ___
I use discussion boards ___
I use chatroom or Wimba Live Classroom to conduct online lectures ___
I use chatroom or Wimba Live Classroom to conduct virtual office hours ___
I have students watch videos pertaining to course content ___
I use Blackboard mail ___
I set up groups and do group activities ___
I set up projects ___
I have students submit research papers ___
I use podcasts ___
I use tools not listed here ___

For the following, choose the response that best describes your opinions

		Strongly agree	Agree	Not sure	Disagree	Strongly disagree
6	I prefer to create the class online once, and copy content to future sections					
7	I will adjust an online course from term to term to help improve it.					
8	I will adjust a course during the term if it will help improve it.					
9	I only use Blackboard because it's expected of me.					
10	I have come to appreciate Blackboard the more I use it.					
11	I prefer to teach online whenever possible.					

12	I find Blackboard difficult to use, so I only do what I must in it, and no more than that.	
13	Using Blackboard helps keep me and my class organized.	
14	Blackboard keeps me and my students connected.	
15	I contact students whenever it is necessary.	
16	I prefer students to contact me if they have questions.	
17	I have regular two-way contact with my students.	
18	Blackboard is important for disseminating content.	
19	Blackboard has useful tools that help in teaching.	
20	Blackboard is an integral part of how I teach.	

21. Which of the following do you consider to be obstacles for using Blackboard (check all that apply)?

Lack of FTE applied to building online courses ___
Intellectual property issues ___
Lack of departmental support ___
Lack of adequate training ___
Students don't understand how to use it ___
I don't understand how to use it ___
A good course requires planning ___
Additional responsibility for faculty ___

22. What are Blackboard's greatest strengths (check all that apply)?

Has well-designed tools ___
Dependability ___
Makes it easy to stay in touch with students ___
Keeps everything in one place ___
24/7 access ___
Shallow learning curve ___
Ease of use ___

23. If you were asked to describe Blackboard with one metaphor, which of the following might best describe it (choose only one)?

Storage Room ___
File Cabinet ___
Black Box ___
Command Center ___
Town Hall ___
Coffee Shop ___
Switchboard ___
Roundtable ___

24. What teaching philosophy do you believe you use most in your online class (choose one)?

I am the knowledge expert. The students need what I know, so I give it to them ___

I believe in guiding the students to what they need to know, so I show them the paths available to knowledge and nudge them in the right direction if they lose their way___

I believe learning is a journey, so I give them a map and send them on their way. I only help them if they ask for it. ___

I believe students have to participate in their own learning, so I give them options to follow and make them take responsibility for their own learning___

I believe learning is a social event, so I provide ways for the students to help each other learn ___

25. Which of the following are important for you in an online class (choose all that apply)?

Constant contact between the students and myself ___
More than one way to communicate ideas between the students and myself___
Creating opportunities for group work ___
Channels for the students to talk to each other ___
Encouraging student-led activities ___
Assigning projects ___

Making sure the students always know how they are doing ___
Giving prompt responses to student queries ___
Making sure everyone stays on track ___
Setting and sticking to timelines ___
Making sure we keep high standards in class ___
Letting the students know what is expected of them ___
More than one way to learn a topic ___
Giving students a variety of options ___

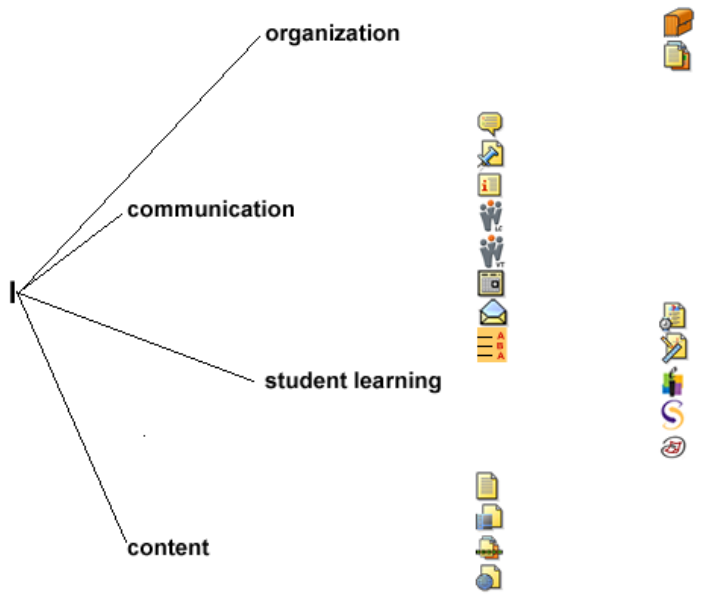
APPENDIX B:

ICON LIST AND EXAMPLE TOOL USAGE MAPS

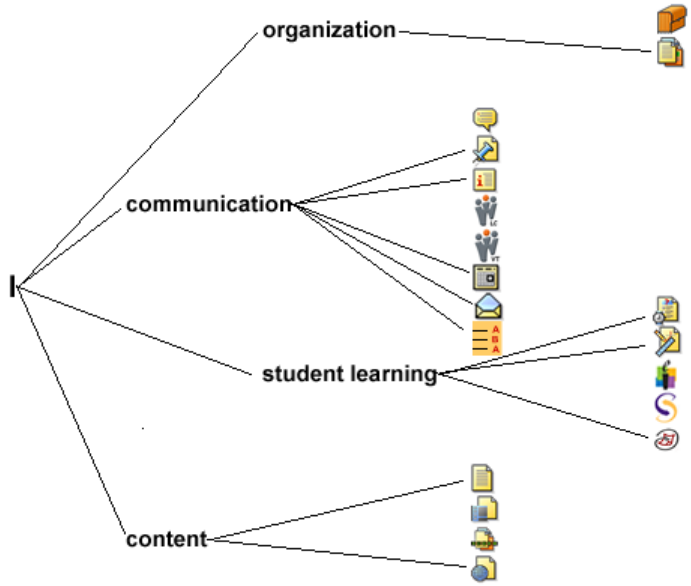
Icons and Their Designations

	Assessments
	Assignments
	Chat/Whiteboard
	Discussion Board
	eInstruction (clicker integration tool)
	Files
	Folder
	Learning Module
	Media Library
	SCORM package
	Syllabus
	TaskStream (ePortfolio integration)
	TurnItIn Assignment
	Web Link
	Wimba Live Classroom (Virtual Classroom)

	Wimba Voice Tools (Voice Board, Podcaster, etc)
	Calendar Tool
	Mail
	My Grades



Basic component usage map, unassessed.



Example of a component usage map.

APPENDIX C

INFORMED CONSENT FOR COURSE COPY AND TOOL USE REPORTS

TITLE OF RESEARCH: The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagement with an Online Technology

IRB PROTOCOL: X110215008

INVESTIGATOR: Terrance Harrington

Greetings! I am a senior instructional designer for ITIT at UAB and a doctoral student in Educational Leadership/Instructional Technology at the University of Alabama. As part of my dissertation research, I am asking faculty members at UAB for permission to use certain data from their online courses. Participation is completely voluntary and there is no penalty for declining to participate. There is no direct benefit for participants.

My dissertation involves modeling faculty uses of our learning management system, Blackboard Vista. In order to do this, I wish to determine which tools faculty use in the online portion of their courses and how they use them. This would be accomplished two ways. First, I would need a Tool Usage report for any course or courses you designate, which can be acquired by Charles Tomberlin, UAB's Blackboard administrator, from his Blackboard Administration panel. Second, I propose to review course design. In order to conduct this review, I am requesting permission to have an instructor-designated Fall 2010 course or courses copied into empty shells, in order to remove all student identification, activities, grades and communications from completed courses. The intent of this action is to view how courses were structured, to see what the intended plan of action was for tools selected. Permission is requested because, even though I will not be recording or using content from the courses directly in the study, I would be able to see any syllabus, announcements, copyrighted materials, etc. in the process of examining design. Analysis of the tool usage reports and course design will me to construct a model of faculty engagement with Blackboard, to determine how faculty plan to conduct teaching online, over the course of a term.

There is a risk that faculty identities and content from these courses might become publically available, but measures are to be taken to eliminate that possibility. These measures are listed below.

The tool usage report and course copies would not include any student identifying information, grades, activities or communications. There will no risk to the students in those courses at all, as a result. The tool usage reports would be kept on a secure computer, within the ITIT office, in Lister Hill Library, Room 142. This office is locked when no one is present, and the computer logged off when I'm not present. The computer requires a login to access information and this login is encrypted.

For the course copies, Charles Tomberlin, the systems administrator for ITIT, would create an empty shell within Blackboard and copy any Fall 2010 course you designate into this shell. The purpose of the course copy is to keep layout and links from Fall 2010 courses in place, but remove all student communications, student identification, activities and grades from the course. These copies would reside on Blackboard's secure servers with access limited to Charles and myself. Charles would be overseeing the process to ensure IRB and FERPA compliance as well as copyright protections. Charles is IRB certified.

The data will only be housed for two weeks, maximum. Once the study is completed, the reports and the course copies would be deleted completely. Participants would be informed when the tool usage reports are done and course copies are completed. Participants would also be informed when the data is deleted. The study will be conducted in English.

Additionally, anyone who chooses to participate may withdraw from the study at any time, without penalty. In such cases, both the tool usage report and the course copy would be eliminated from the system and data not used in the study.

For questions about the study, please contact me at tharring@uab.udu or call 535-0297. If you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact Ms. Sheila Moore. Ms. Moore is the Director of the Office of the Institutional Review Board for Human Use (OIRB) at the University of Alabama at Birmingham (UAB). Ms. Moore may be reached at (205) 934-3789 or 1-800-822-8816. If calling the toll -free number, press the option for "all other calls" or for an operator/attendant and ask for extension 4-3789. Regular hours for the Office of the IRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday. You may also call this number in the event the research staff cannot be reached or you wish to talk to someone else. The UAB IRB approval date for this study was March 29, 2011. The study expires on March 29, 2012.

To grant permission to use tool usage data and copies from your course(s), please click on the link below and add the course(s) permitted to the end of the email that is created. Sending the email will be viewed as granting permission to use requested data from the course(s).

To withdraw from the study after granting permission, please click on "I WISH TO WITHDRAW FROM THE STUDY" below and submit that email. You will be notified by email as soon as your data is removed from the system.

Thank you for your time and consideration,

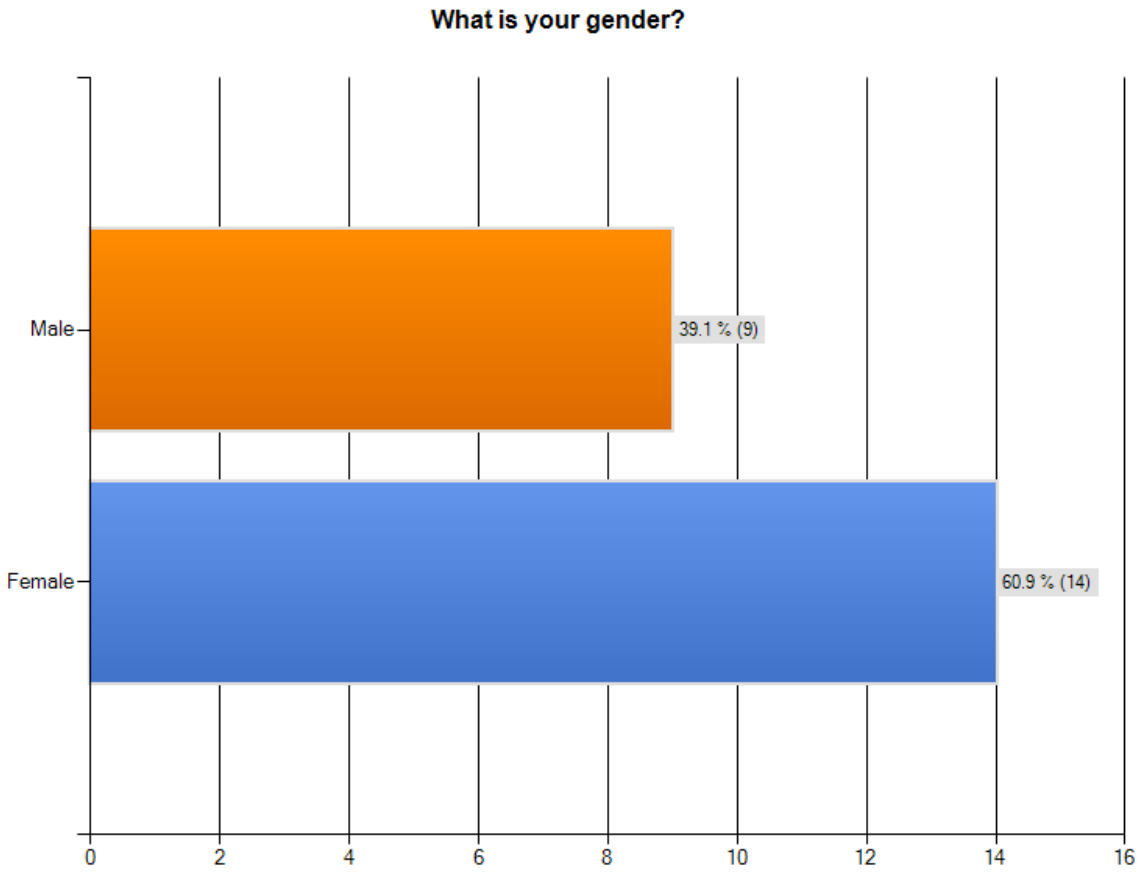
Terrance Harrington

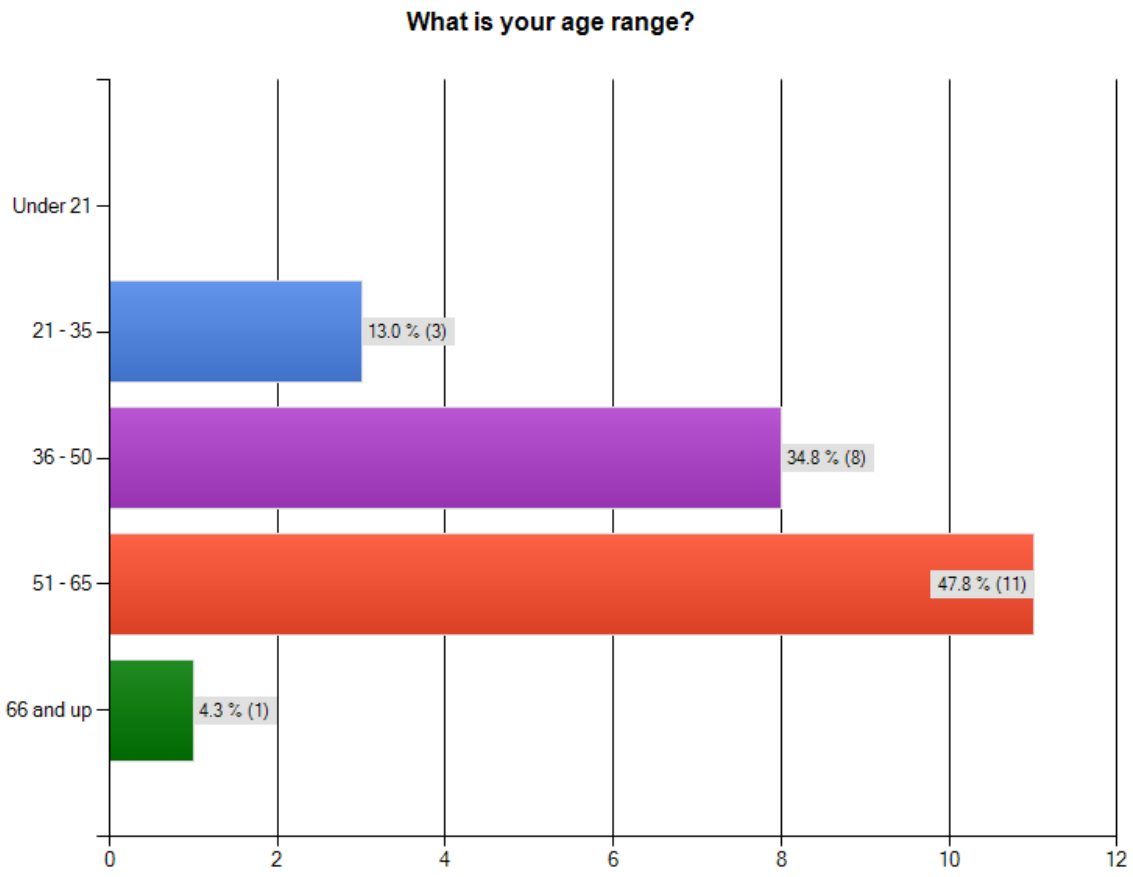
I GRANT PERMISSION TO RUN A TOOL USAGE REPORT AND COPY DESIGNATED COURSES TO SECURE SHELLS

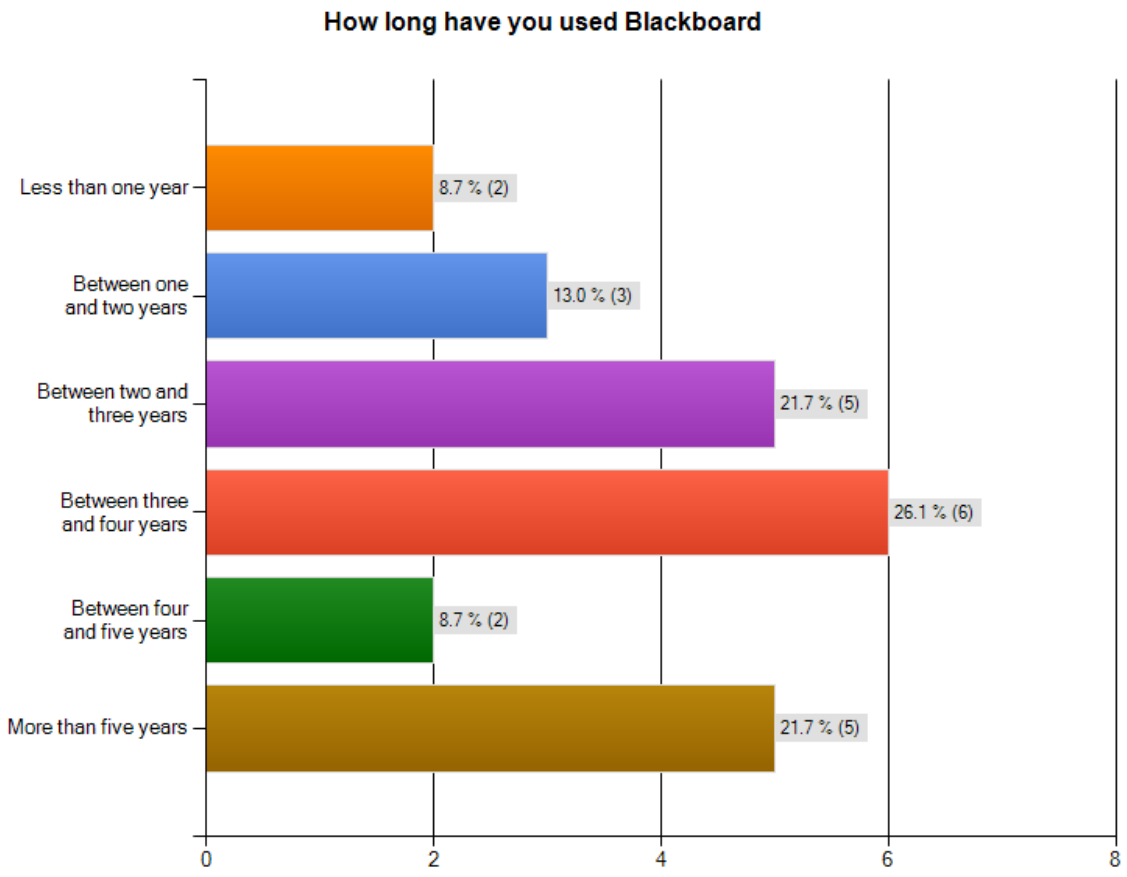
I WISH TO WITHDRAW FROM THE STUDY

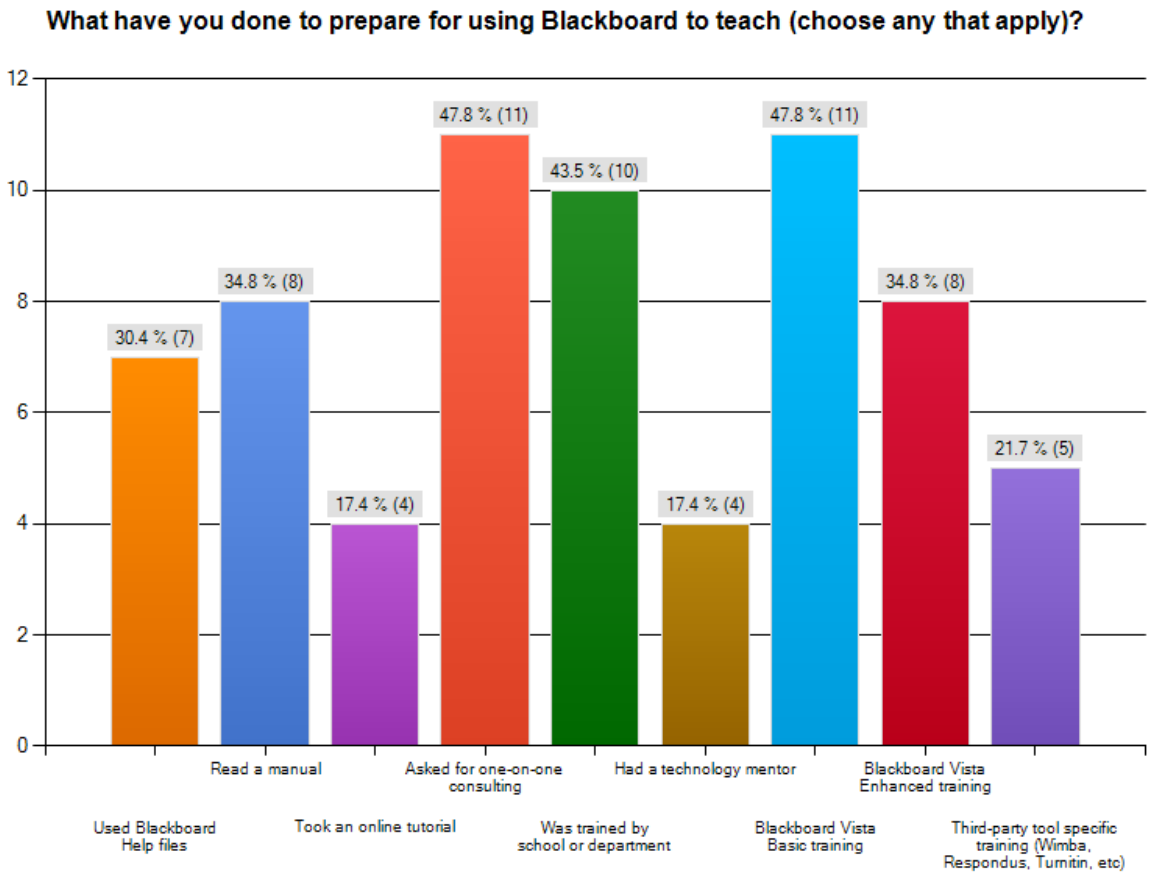
APPENDIX D

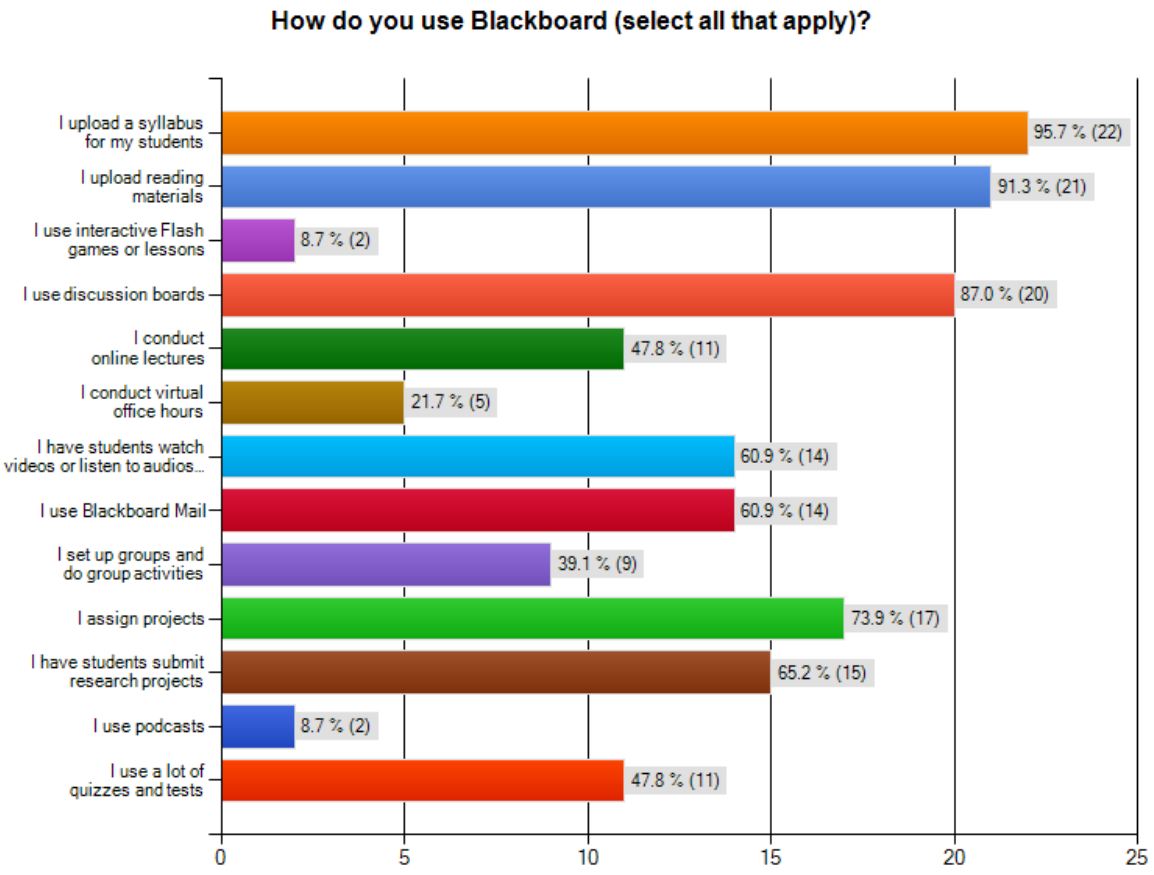
GRAPHICAL RESULTS FROM THE SURVEY



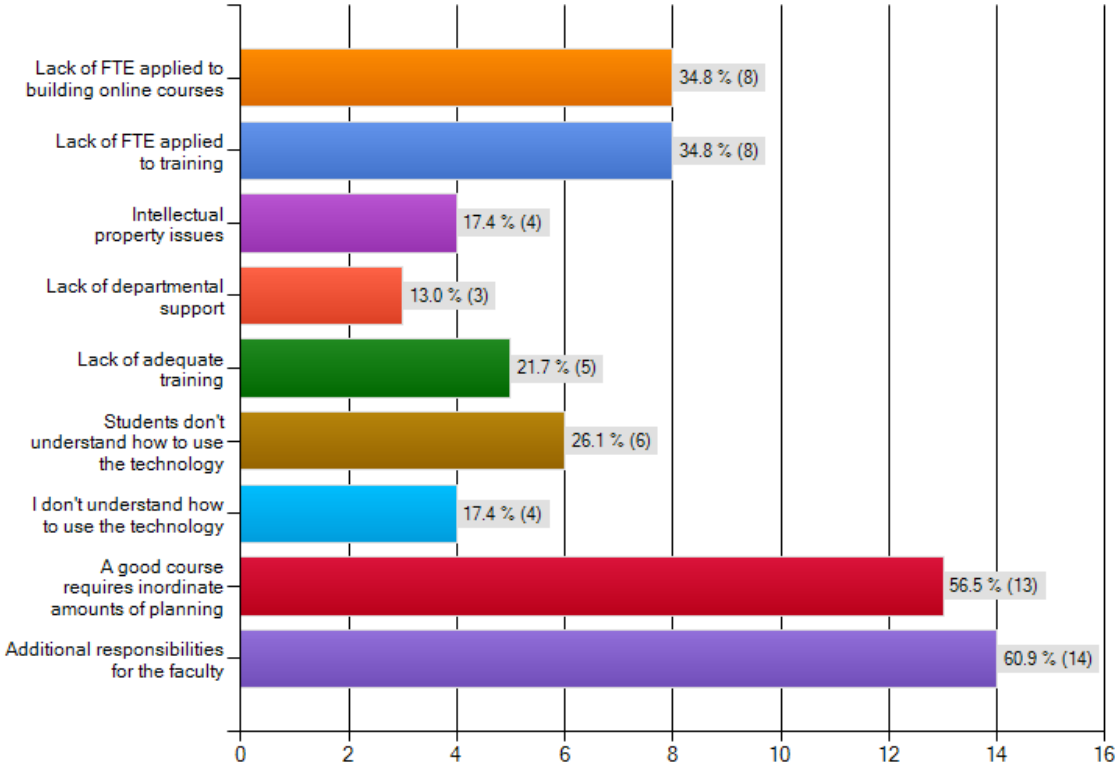

What is your age range?
Under 21
21 - 35
36 - 50
51 - 65
66 and up
13.0 % (3)
34.8 % (8)
47.8 % (11)
4.3 % (1)
0
2
4
6
8
10
12


How long have you used Blackboard
Less than one year
8.7 % (2)
Between one and two years
13.0 % (3)
Between two and three years
21.7 % (5)
Between three and four years
26.1 % (6)
Between four and five years
8.7 % (2)
More than five years
21.7 % (5)
0
2
4
6
8

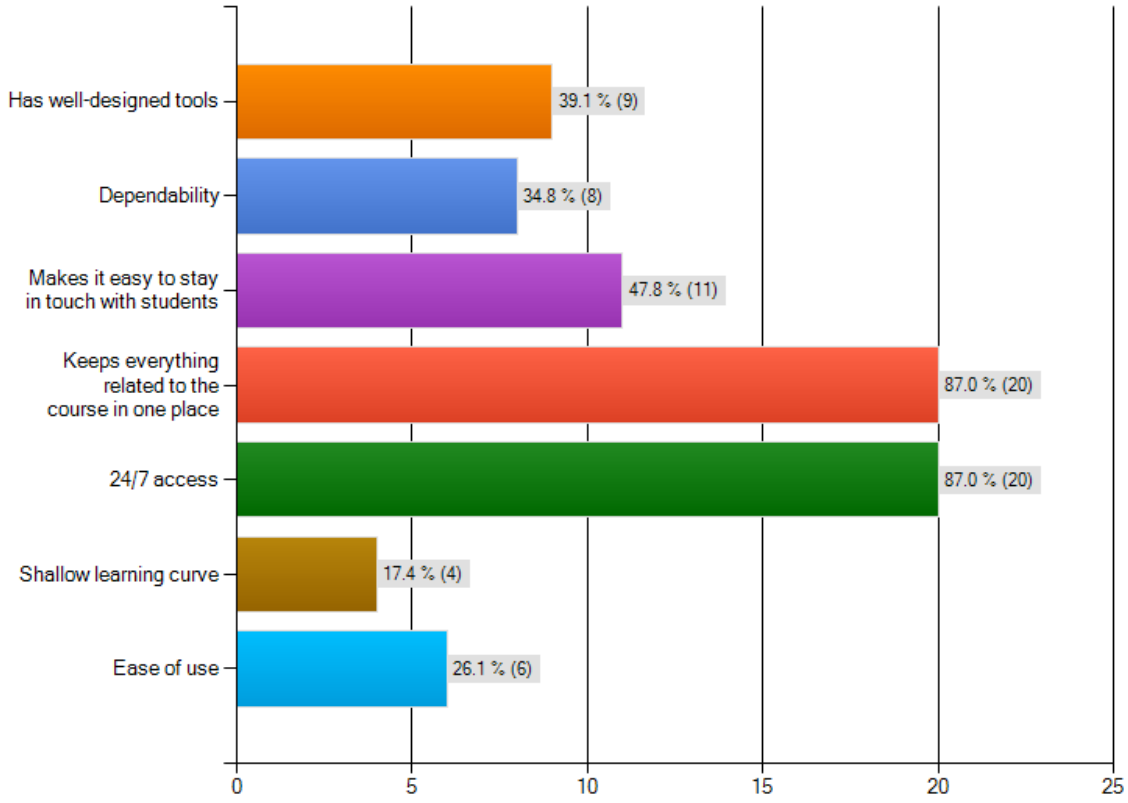

What have you done to prepare for using Blackboard to teach (choose any that apply)?
12
10
8
6
4
2
0
30.4 % (7)
34.8 % (8)
17.4 % (4)
47.8 % (11)
43.5 % (10)
17.4 % (4)
47.8 % (11)
34.8 % (8)
21.7 % (5)
Used Blackboard Help files
Read a manual
Took an online tutorial
Asked for one-on-one consulting
Was trained by school or department
Had a technology mentor
Blackboard Vista Basic training
Blackboard Vista Enhanced training
Third-party tool specific training (Wimba, Respondus, Turnitin, etc)


How do you use Blackboard (select all that apply)?
I upload a syllabus for my students
95.7 % (22)
I upload reading materials
91.3 % (21)
I use interactive Flash games or lessons
8.7 % (2)
I use discussion boards
87.0 % (20)
I conduct online lectures
47.8 % (11)
I conduct virtual office hours
21.7 % (5)
I have students watch videos or listen to audios...
60.9 % (14)
I use Blackboard Mail
60.9 % (14)
I set up groups and do group activities
39.1 % (9)
I assign projects
73.9 % (17)
I have students submit research projects
65.2 % (15)
I use podcasts
8.7 % (2)
I use a lot of quizzes and tests
47.8 % (11)
0
5
10
15
20
25

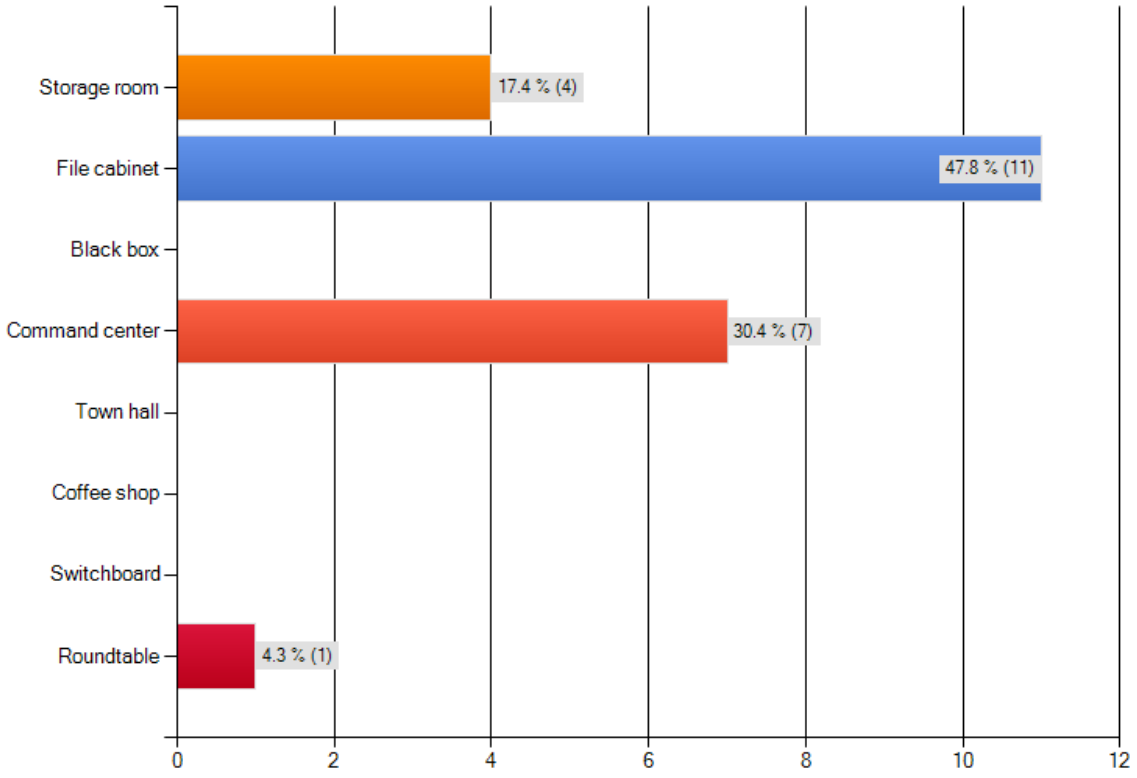
Which of the following do you consider to be obstacles for using Blackboard (choose all that apply)?



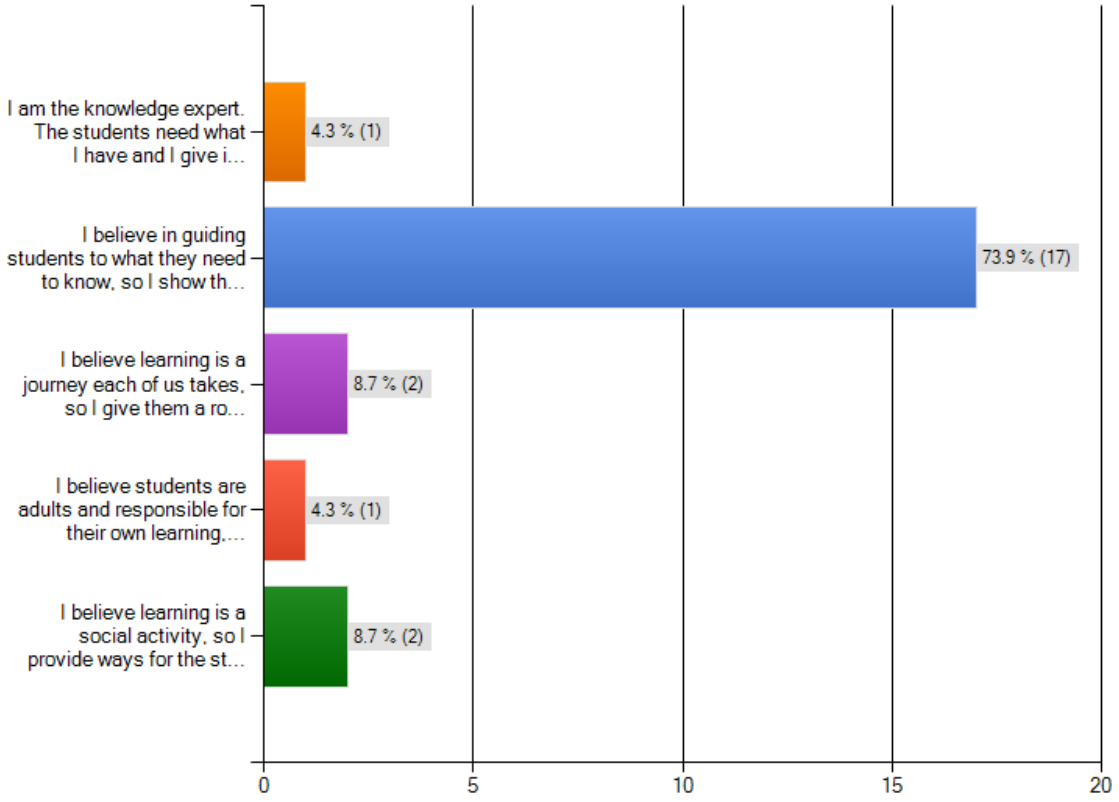
In your opinion, what are Blackboard's greatest strengths (choose all that apply)?



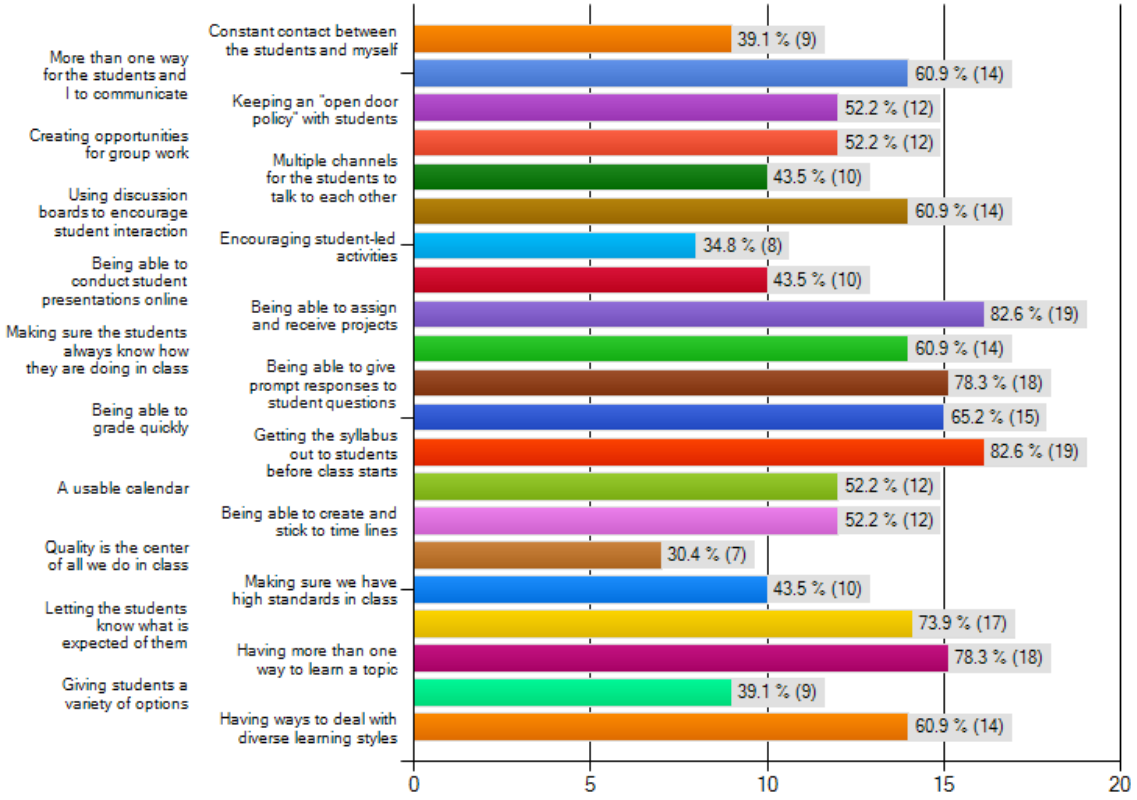
If you were asked to describe Blackboard with one metaphor, which if the following might best describe it (choose only one)?

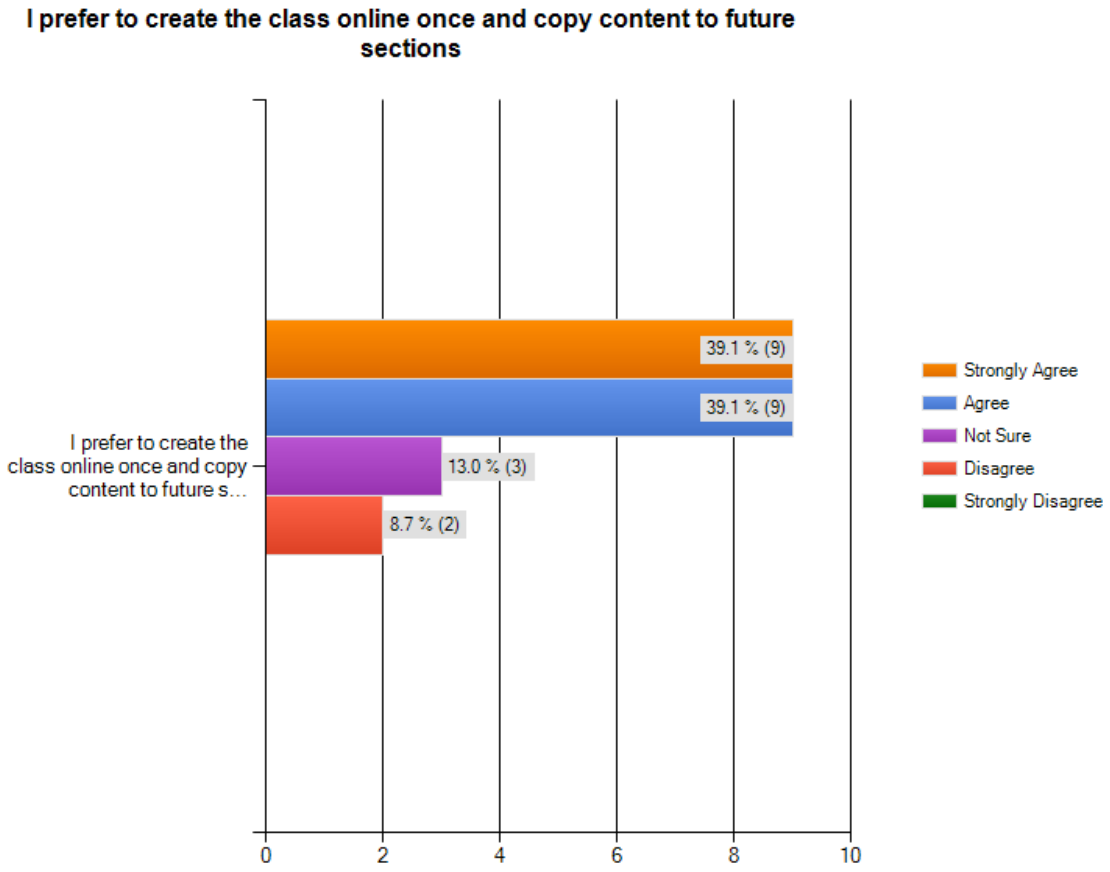


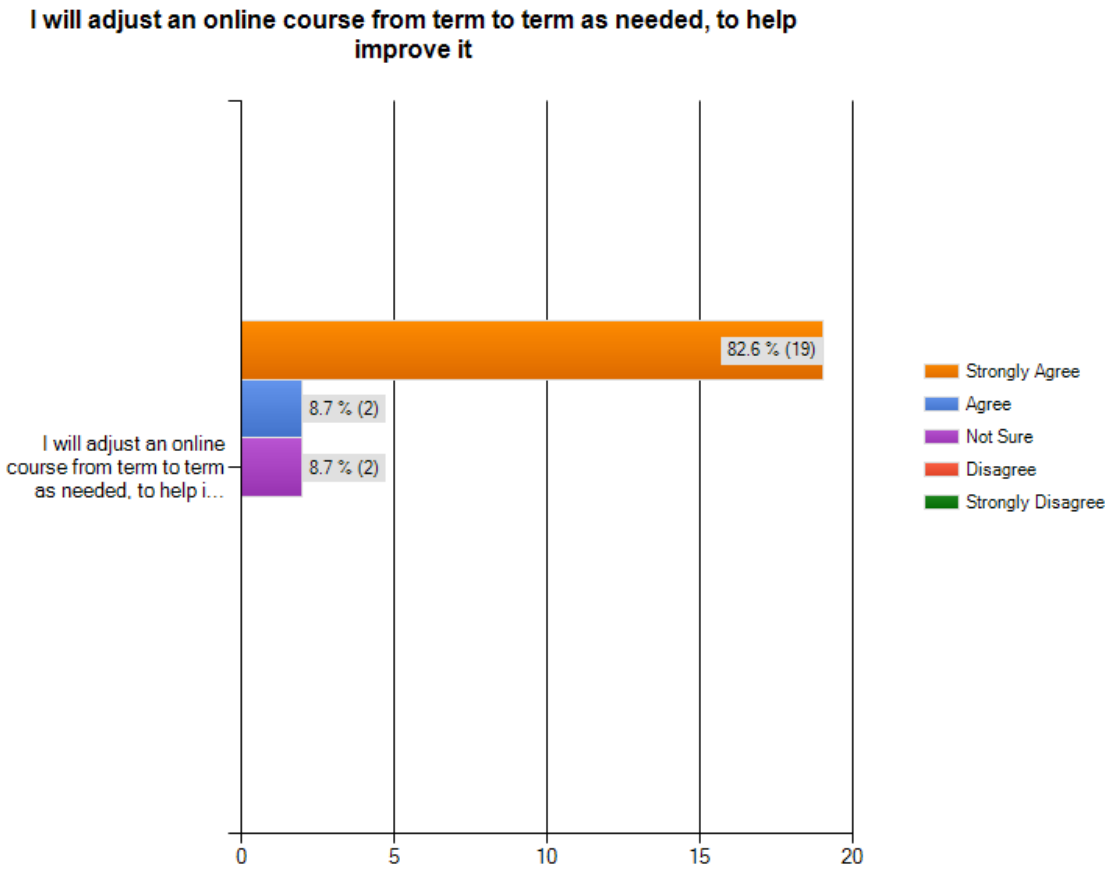
What of the following teaching philosophies best describe your online approach?



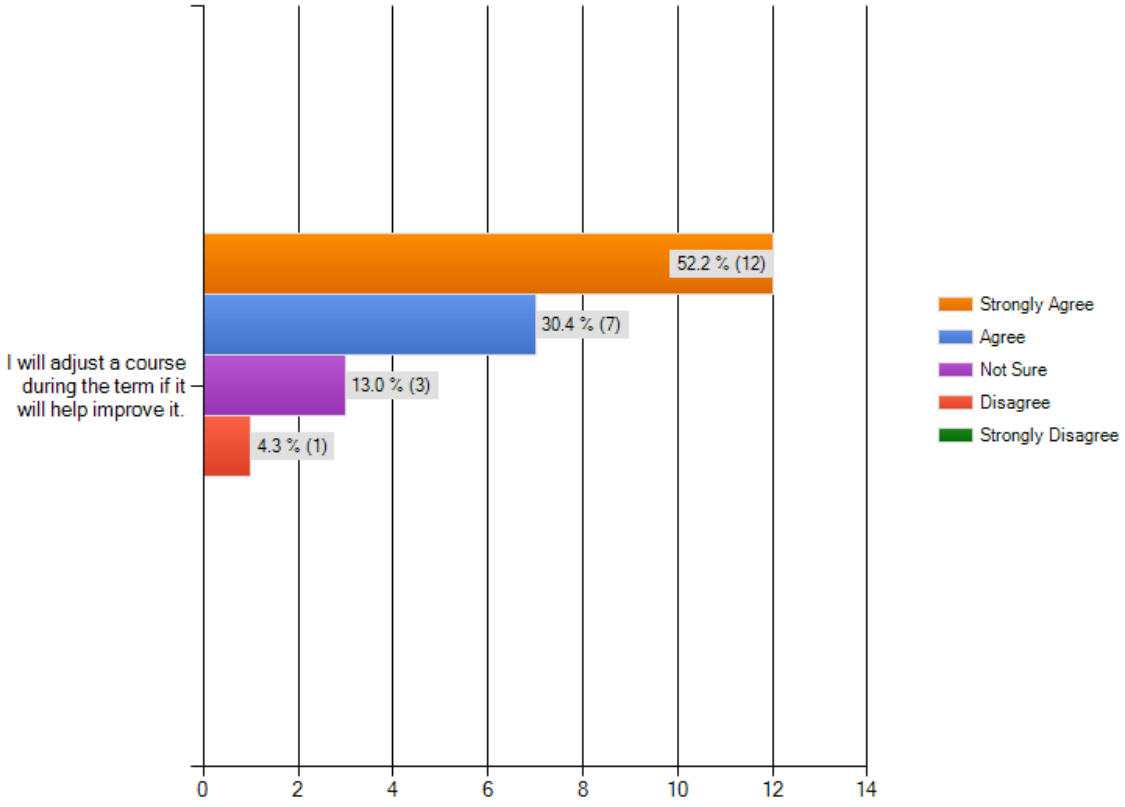
Which of the following are important for you in an online class (choose all that apply)?

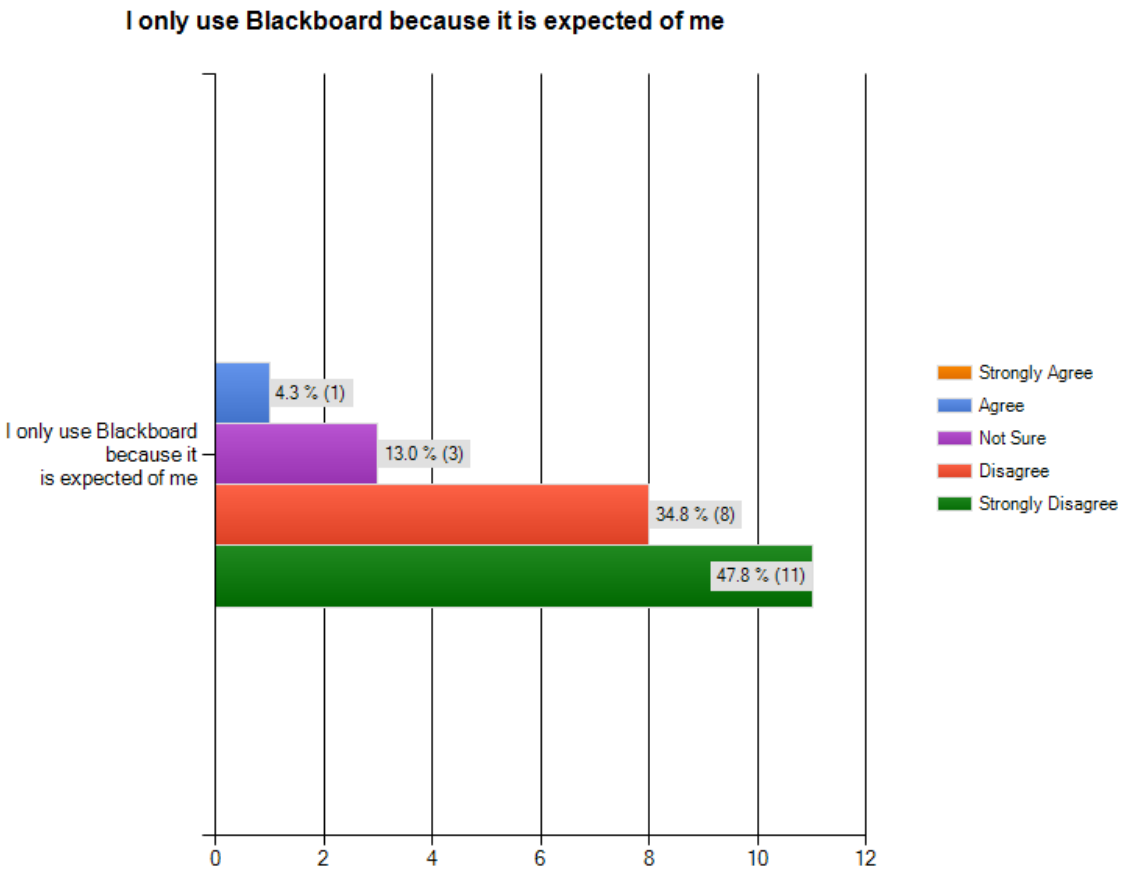


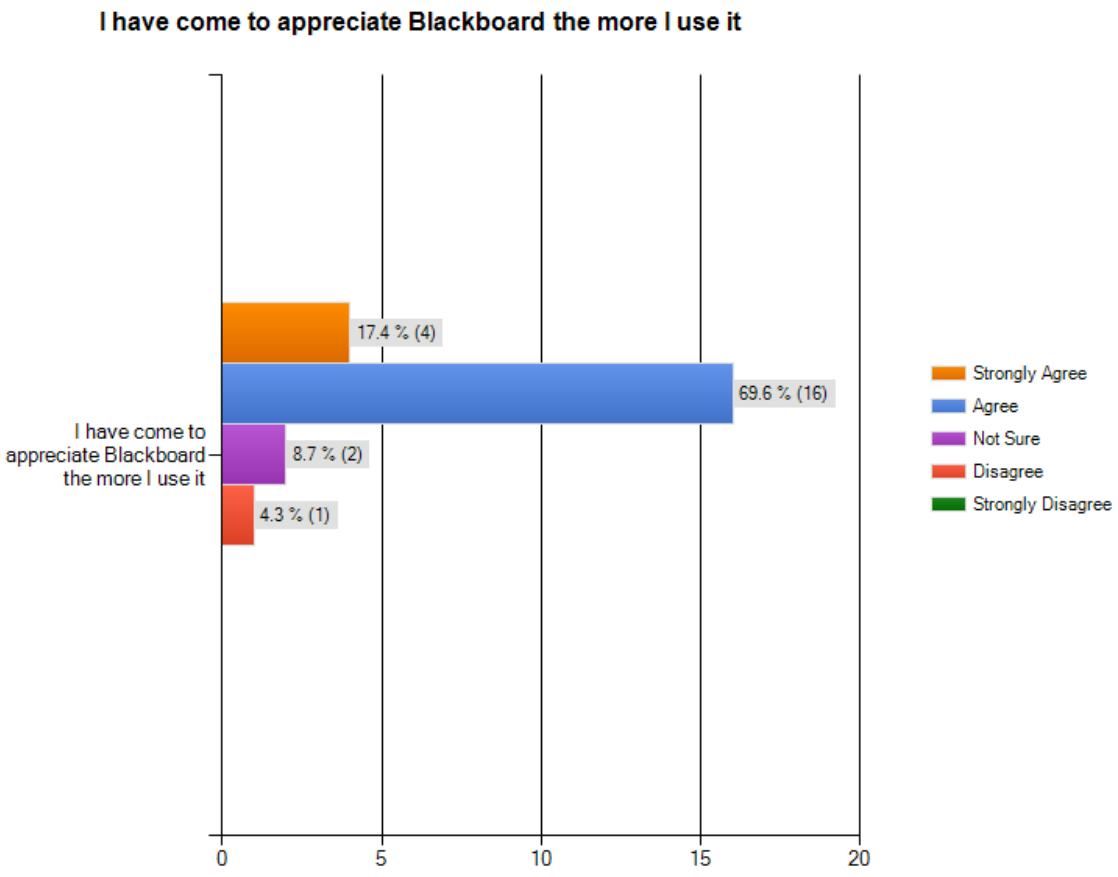

I prefer to create the class online once and copy content to future sections
I prefer to create the class online once and copy content to future s...
39.1 % (9)
39.1 % (9)
13.0 % (3)
8.7 % (2)
0
2
4
6
8
10
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

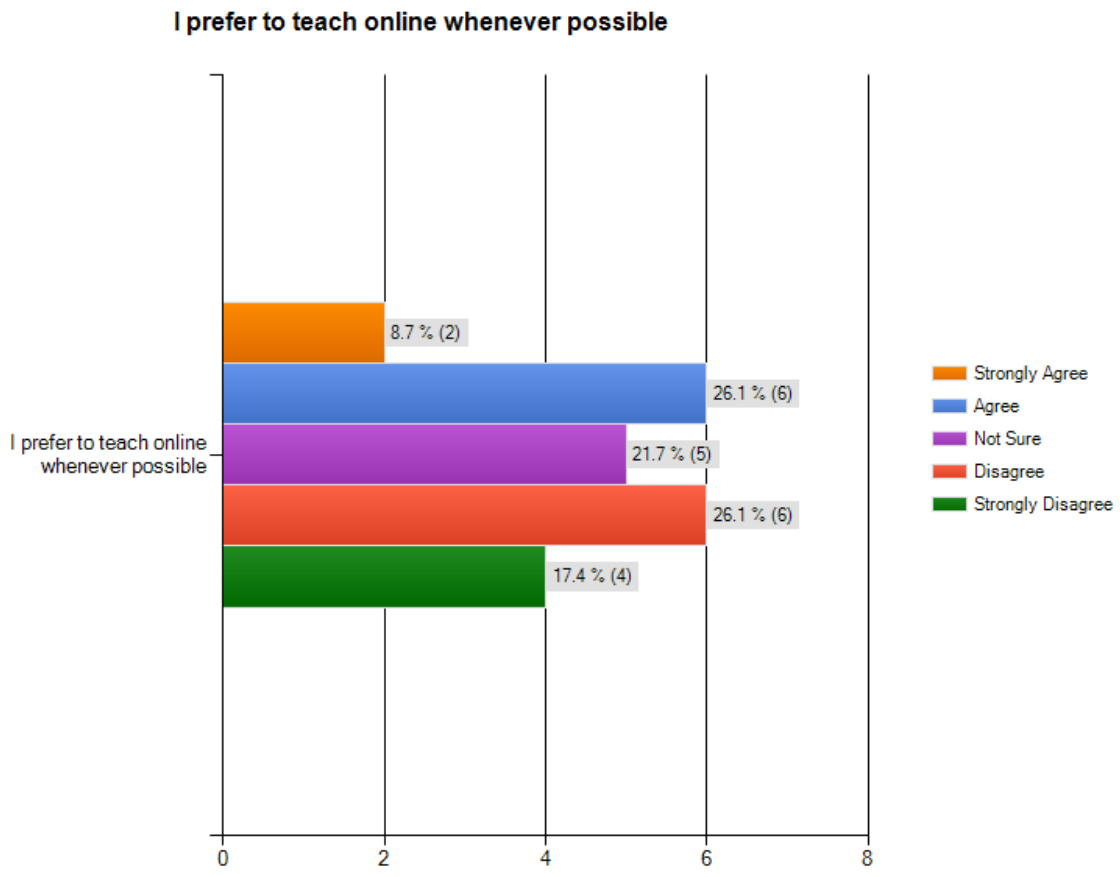

I will adjust an online course from term to term as needed, to help improve it
82.6 % (19)
8.7 % (2)
8.7 % (2)
I will adjust an online course from term to term as needed, to help i...
0
5
10
15
20
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

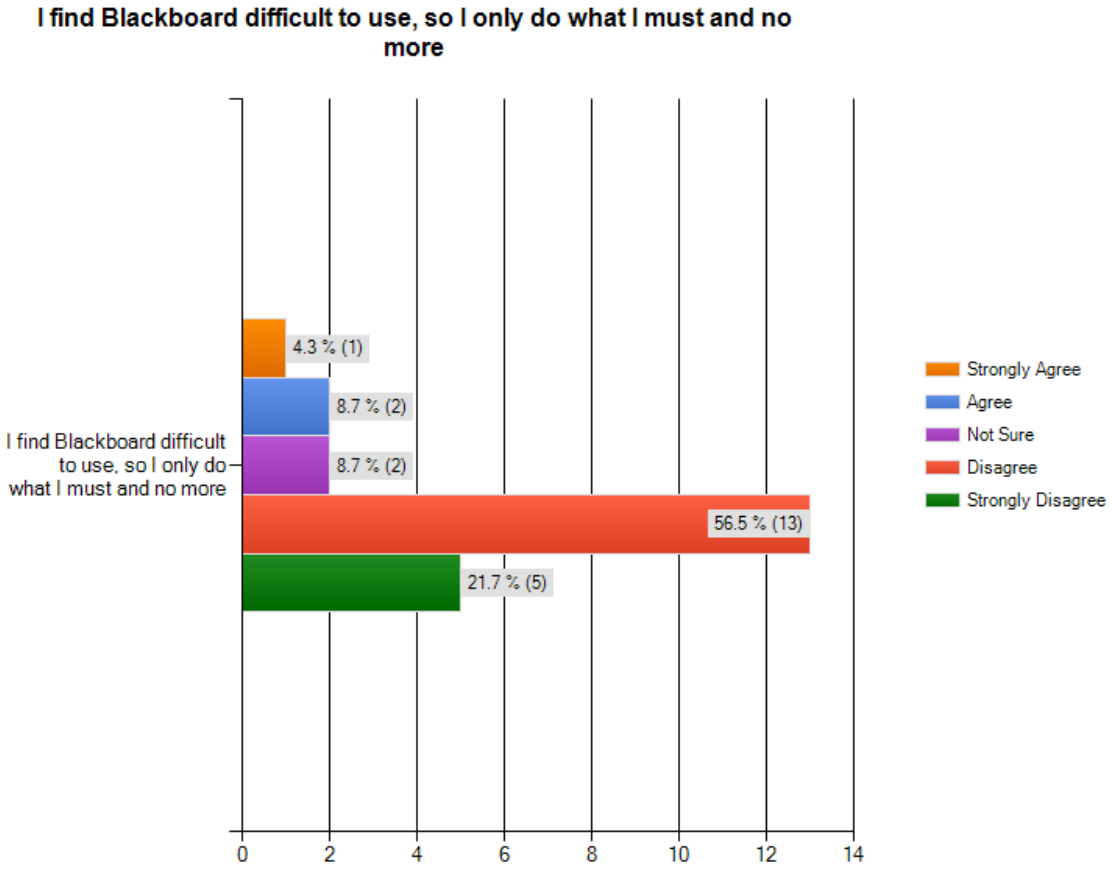
I will adjust a course during the term if it will help improve it.

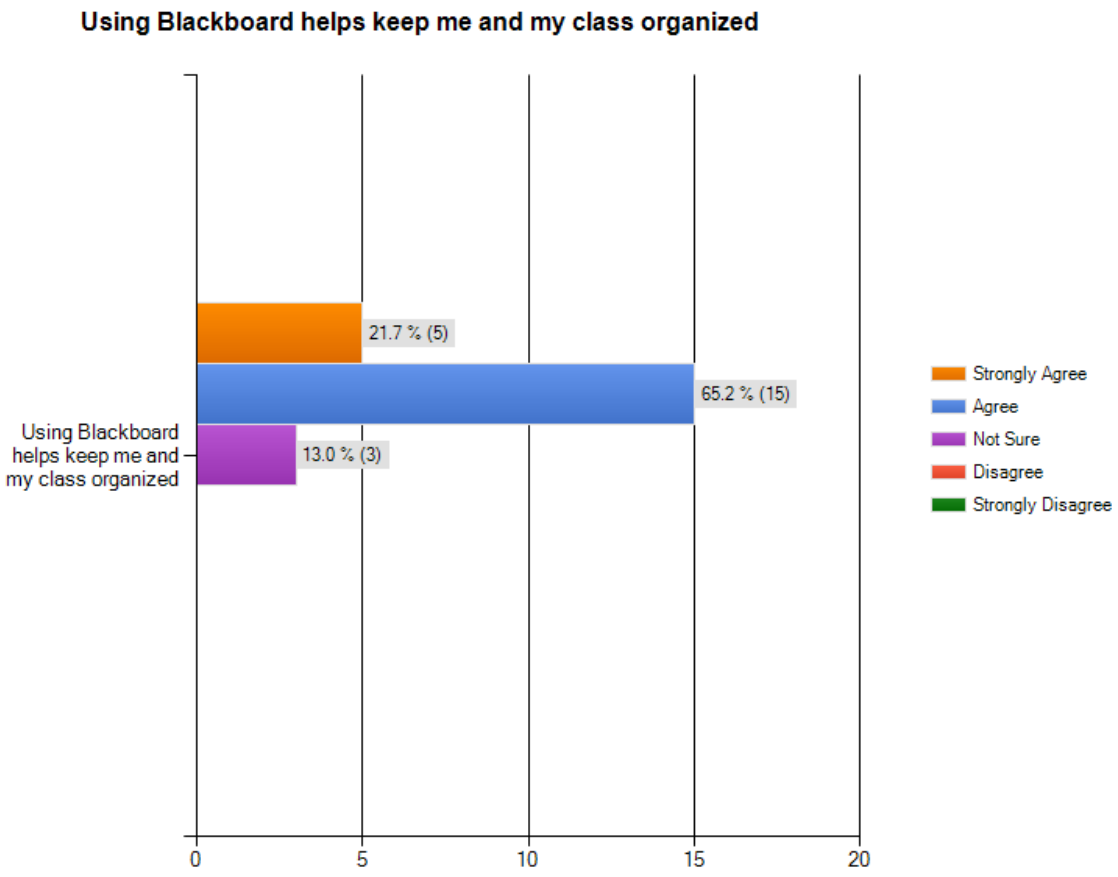


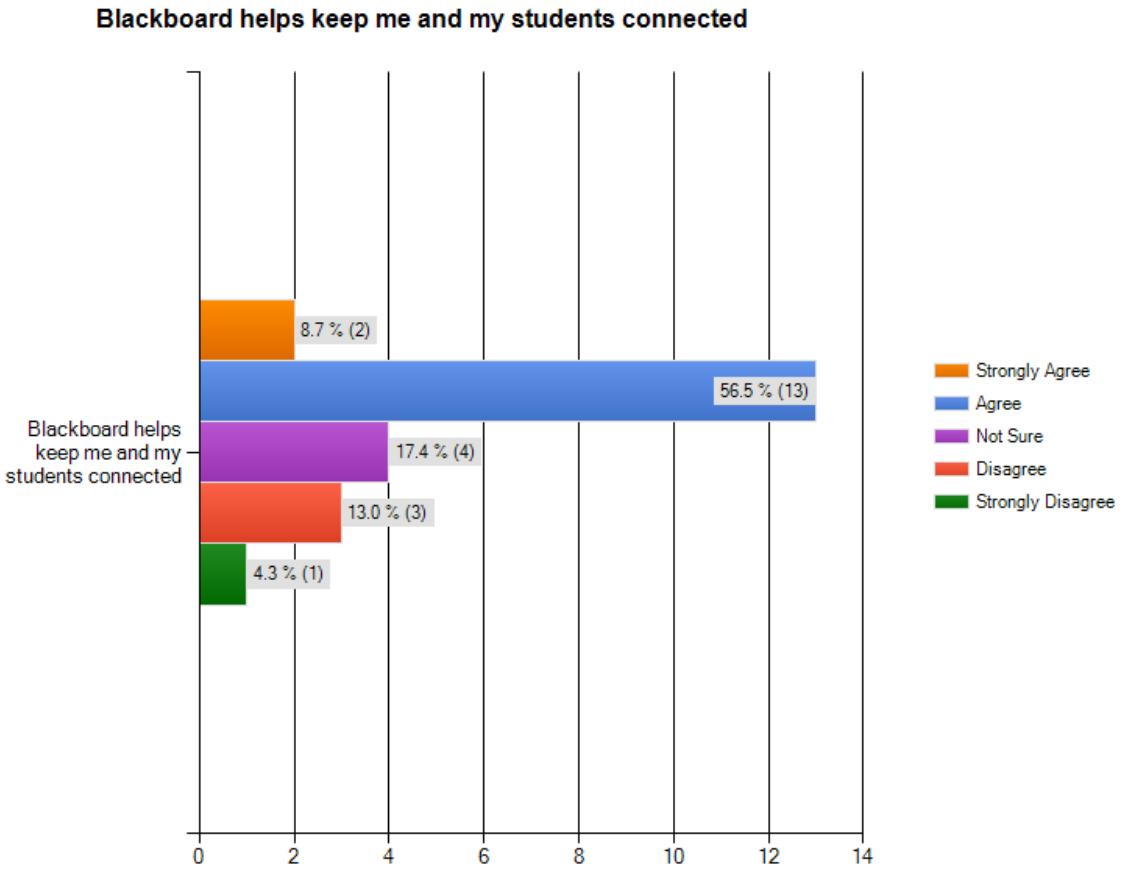

I only use Blackboard because it is expected of me
I only use Blackboard because it is expected of me
4.3 % (1)
13.0 % (3)
34.8 % (8)
47.8 % (11)
0
2
4
6
8
10
12
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

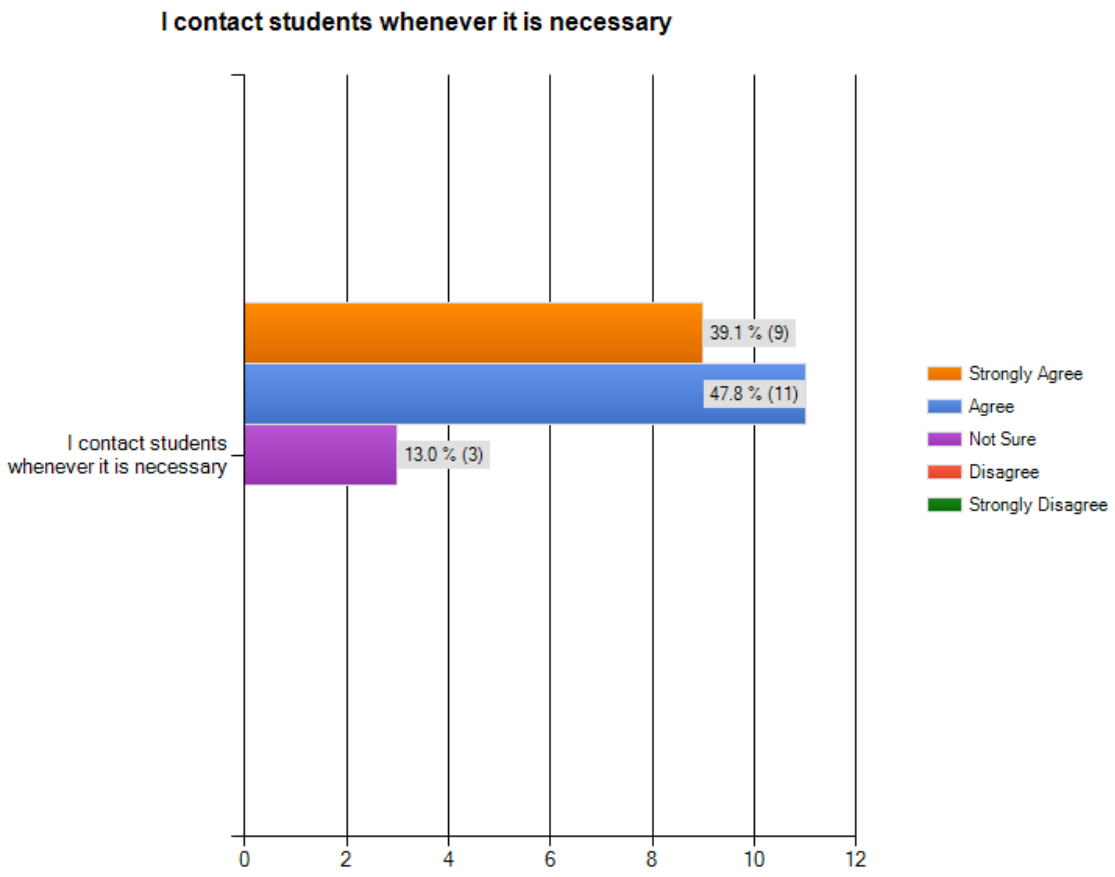

I have come to appreciate Blackboard the more I use it
17.4 % (4)
69.6 % (16)
8.7 % (2)
4.3 % (1)
I have come to appreciate Blackboard the more I use it
0
5
10
15
20
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

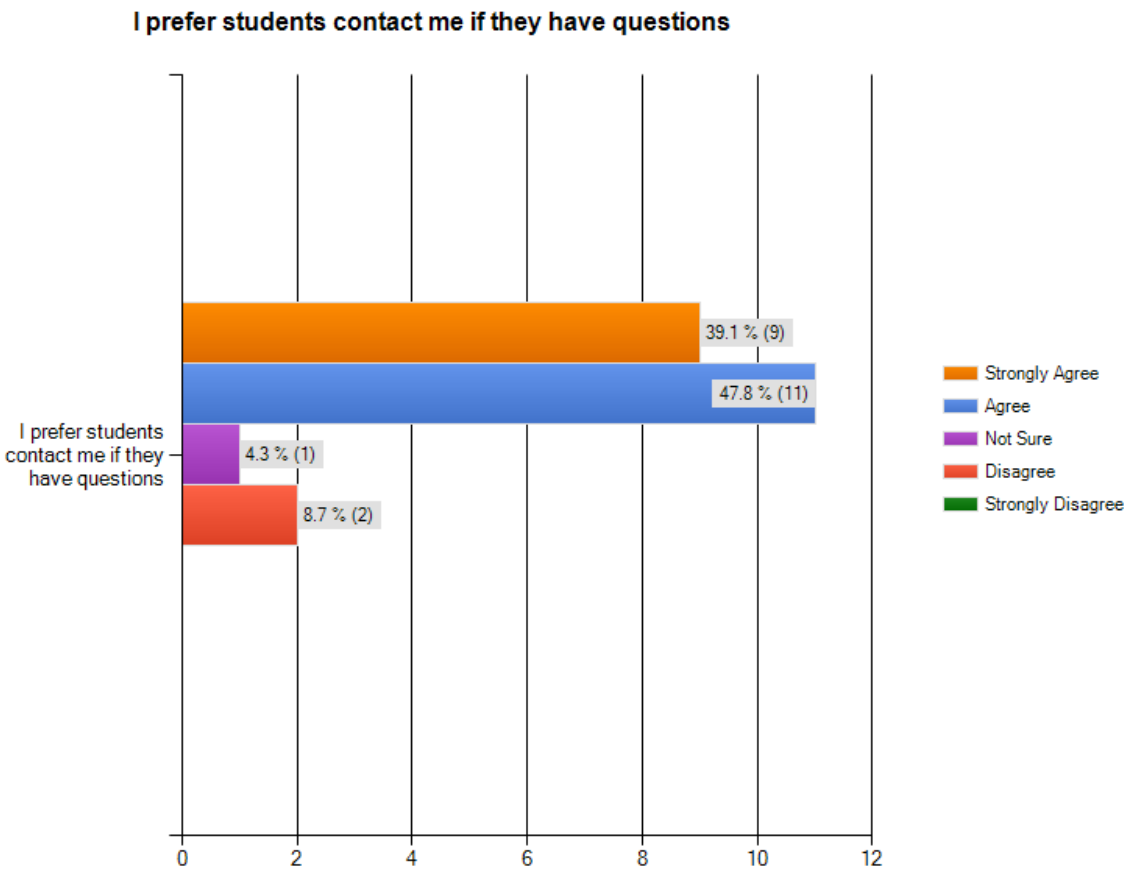

I prefer to teach online whenever possible
8.7 % (2)
26.1 % (6)
21.7 % (5)
26.1 % (6)
17.4 % (4)
I prefer to teach online whenever possible
0
2
4
6
8
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

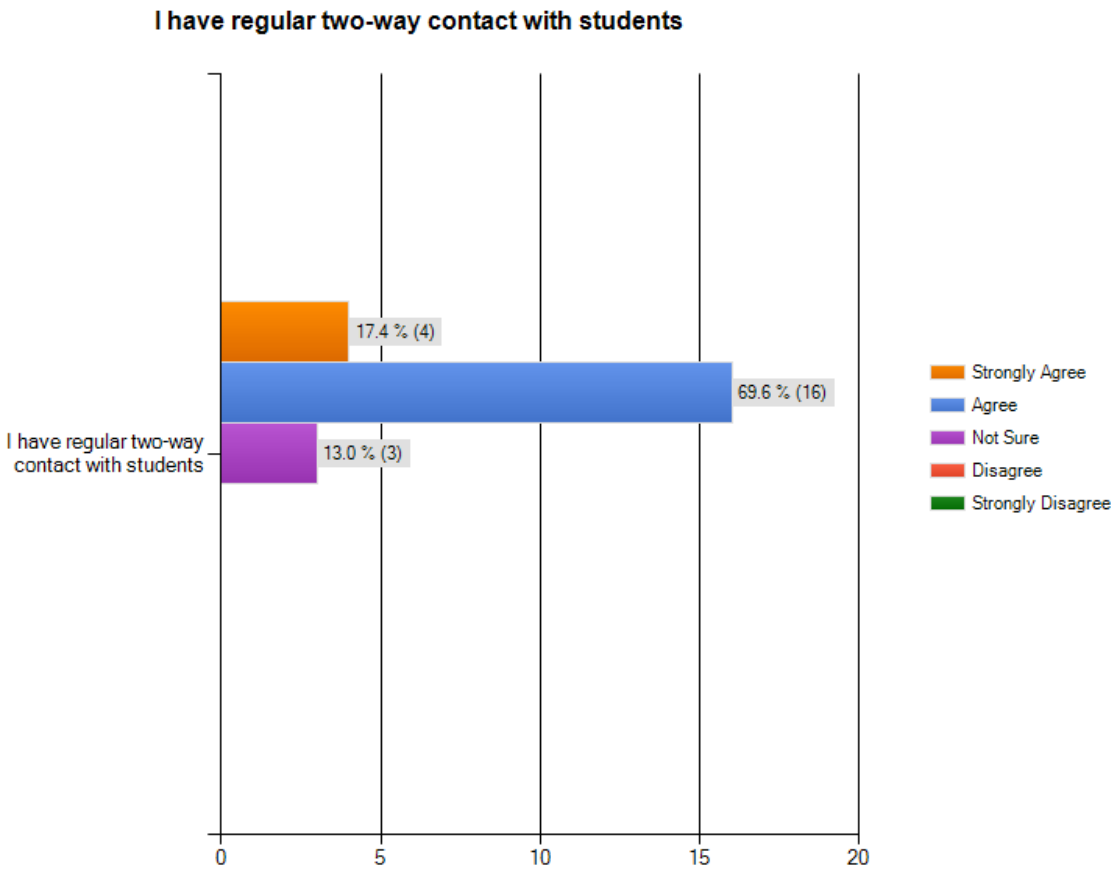

I find Blackboard difficult to use, so I only do what I must and no more
I find Blackboard difficult to use, so I only do what I must and no more
4.3 % (1)
8.7 % (2)
8.7 % (2)
56.5 % (13)
21.7 % (5)
0
2
4
6
8
10
12
14
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

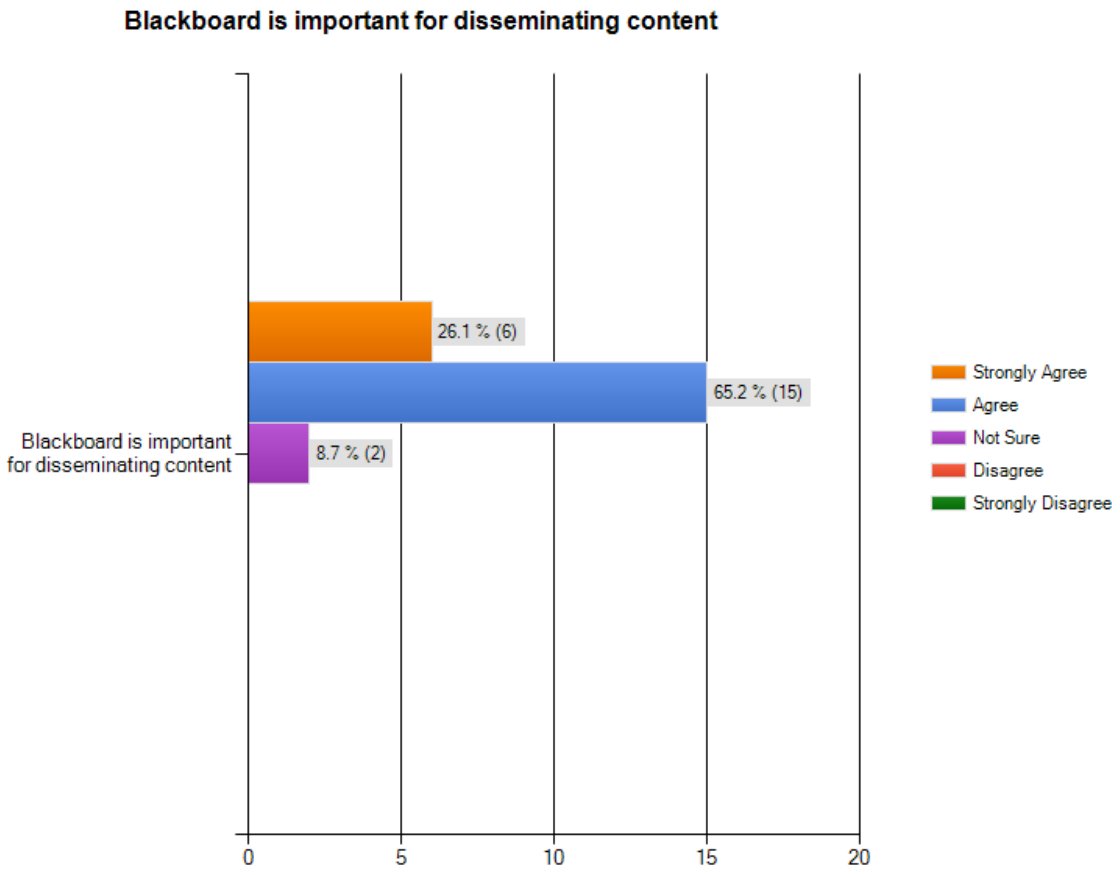

Using Blackboard helps keep me and my class organized
21.7 % (5)
65.2 % (15)
13.0 % (3)
Using Blackboard helps keep me and my class organized
0
5
10
15
20
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

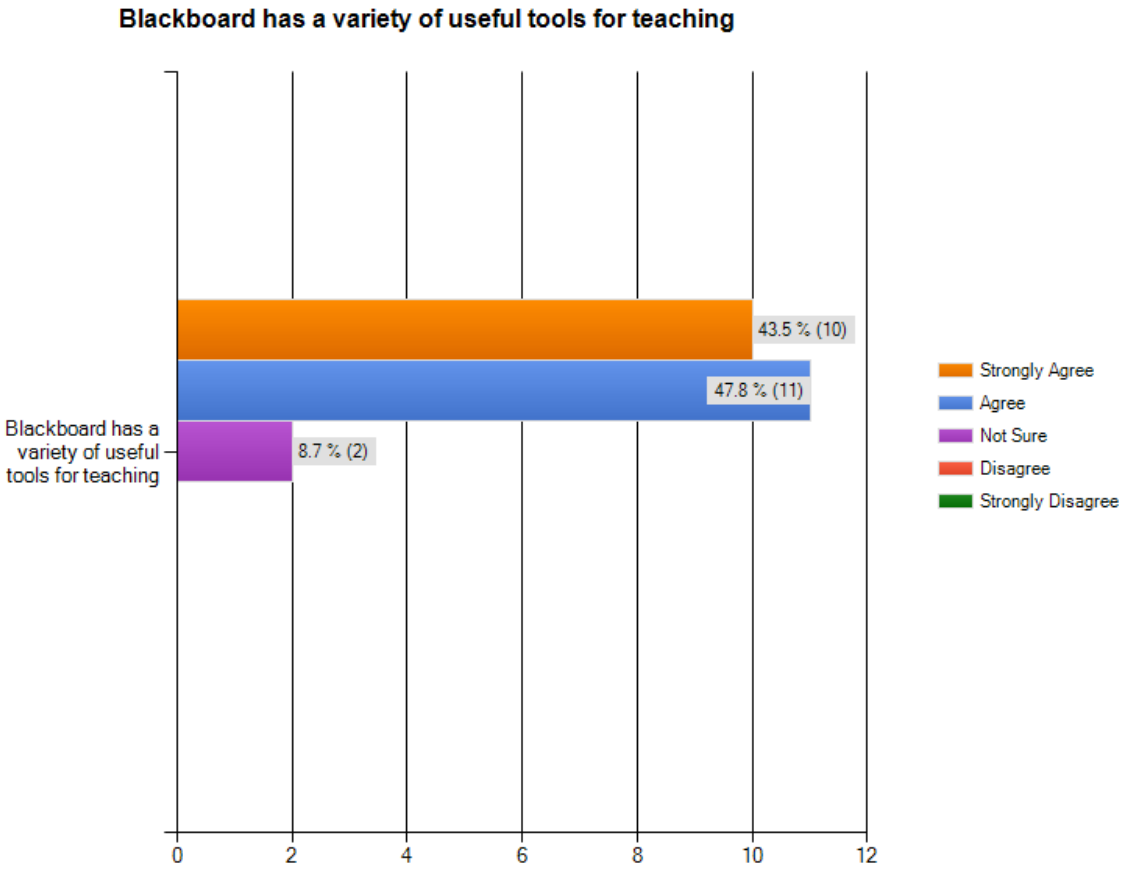

Blackboard helps keep me and my students connected
Blackboard helps keep me and my students connected
8.7 % (2)
56.5 % (13)
17.4 % (4)
13.0 % (3)
4.3 % (1)
0
2
4
6
8
10
12
14
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

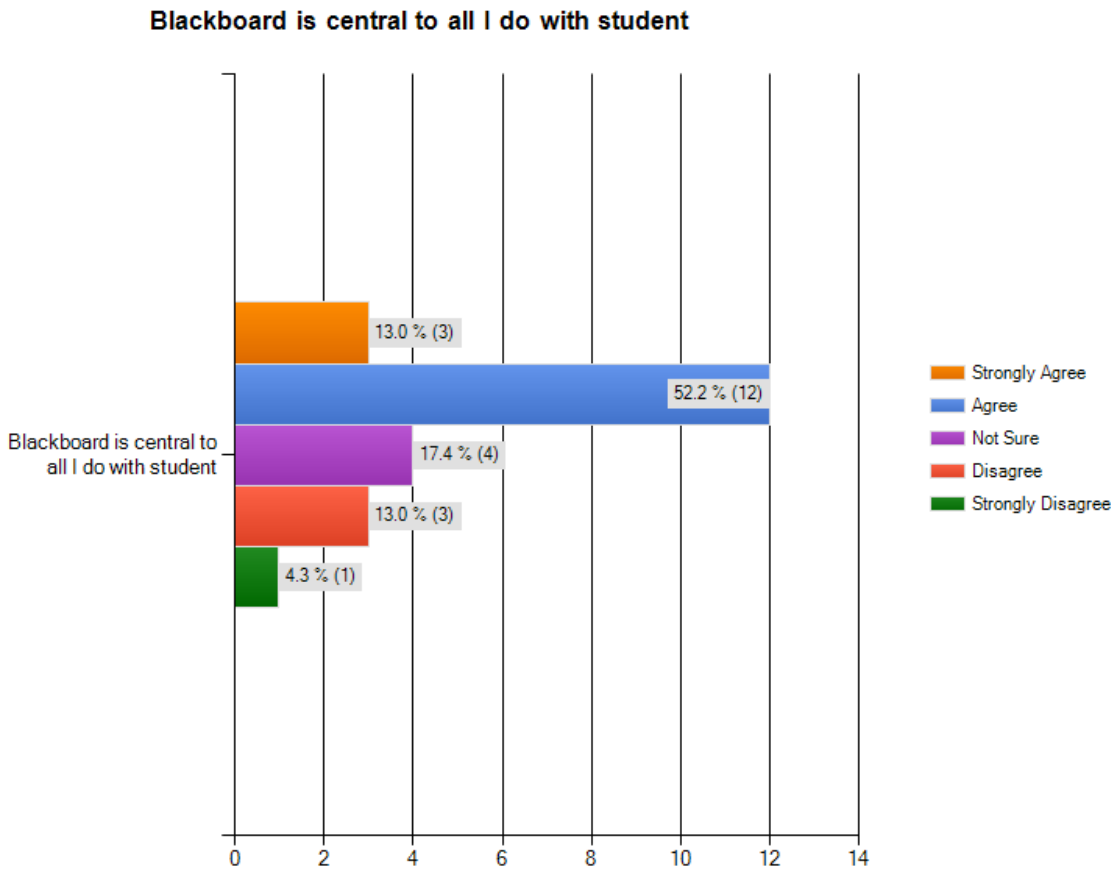

I contact students whenever it is necessary
39.1 % (9)
47.8 % (11)
13.0 % (3)
I contact students whenever it is necessary
0
2
4
6
8
10
12
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree


I prefer students contact me if they have questions
39.1 % (9)
47.8 % (11)
4.3 % (1)
8.7 % (2)
I prefer students contact me if they have questions
0
2
4
6
8
10
12
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree


I have regular two-way contact with students
17.4 % (4)
69.6 % (16)
13.0 % (3)
I have regular two-way contact with students
0
5
10
15
20
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree


Blackboard is important for disseminating content
26.1 % (6)
65.2 % (15)
8.7 % (2)
Blackboard is important for disseminating content
0
5
10
15
20
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree


Blackboard has a variety of useful tools for teaching
43.5 % (10)
47.8 % (11)
8.7 % (2)
Blackboard has a variety of useful tools for teaching
0
2
4
6
8
10
12
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree


Blackboard is central to all I do with student
13.0 % (3)
52.2 % (12)
17.4 % (4)
13.0 % (3)
4.3 % (1)
Blackboard is central to all I do with student
0
2
4
6
8
10
12
14
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree

APPENDIX E

INFORMED CONSENT FOR ONLINE SURVEY

TITLE OF RESEARCH: The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagement with an Online Technology

IRB PROTOCOL: X110215008

INVESTIGATOR: Terrance Harrington

Greetings! I am a senior instructional designer for ITIT here at UAB and a doctoral student in Educational Leadership/Instructional Technology at the University of Alabama. As part of my dissertation research, I am asking faculty members who teach at least partially online at UAB to participate in a brief, 25-question survey, made up of multiple choice and Likert scale selections. The survey will take approximately 15 minutes to complete. The data for the survey is collected in a secure, online database. The study is conducted in English.

The purpose of the survey is to try to find how attitudes toward and perceptions of a learning management system, in this case Blackboard Vista, influence and affect the use of the technology and its tool set.

Due to a risk of identification of participants being accidently released to the public, participation in the survey will be confidential. The only demographic data collected will be age range and gender. Participation in the study is voluntary. There is no benefit from participating and no penalty for refusing to participate.

For questions about the study, please contact me at tharring@uab.udu or call 535-0297. If you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact Ms. Sheila Moore. Ms. Moore is the Director of the Office of the Institutional Review Board for Human Use (OIRB) at the University of Alabama at Birmingham (UAB). Ms. Moore may be reached at (205) 934-3789 or 1-800-822-8816. If calling the toll -free number, press the option for “all other calls” or for an operator/attendant and ask for extension 4-3789. Regular hours for the Office of the IRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday. You may also call this number in the event the research staff cannot be reached or you wish to talk to someone else. The UAB IRB approval date for this study was March 29, 2011. The study expires on March 29, 2012.

Findings from this survey will be used to help determine how faculty view and use a learning management system to teach. If you agree to participate, please click the link below to take the anonymous, online survey. If you decline, please disregard this email.

Thank you!

Terrance Harrington

Click HERE to participate.

APPENDIX F

TOOL USE REPORTS BY CLASS

Class A

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	118	0:00:17	0:33:08	0.81%	-0.42
Assessments	17	0:00:02	0:00:26	0.01%	-0.57
Assignments	14	0:00:04	0:00:50	0.02%	-0.65
Calendar	3	0:00:02	0:00:07	0.00%	-0.87
Chat	4	0:00:01	0:00:05	0.00%	-0.52
Discussions	85	0:00:37	0:52:36	1.29%	-0.35
File	956	0:02:51	45:26:29	66.88%	0.96
File Manager	3	0:00:23	0:01:10	0.03%	***
Folder	1476	0:00:46	19:01:37	28.00%	0.72
Goals	3	0:00:06	0:00:17	0.01%	***
Mail	21	0:03:07	1:05:20	1.60%	-0.72
Media Library	1	0:00:13	0:00:13	0.01%	-0.39
My Grades	55	0:00:37	0:34:04	0.84%	-0.92
Notes	1	0:00:25	0:00:25	0.01%	***
Syllabus	13	0:00:33	0:07:14	0.18%	-0.42
Tracking	1	0:00:03	0:00:03	0.00%	***
Weblinks	10	0:00:08	0:01:16	0.03%	-0.53
Who's Online	120	0:00:06	0:11:25	0.28%	***
Total	**2901**		**67:56:45**	**100.00%**	

Class B

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	4269	0:01:06	77:57:08	3.13%	0.74
Assessments	11729	0:05:17	1032:19:27	41.45%	1.86
Assignments	1363	0:00:10	3:51:13	0.15%	-0.54
Calendar	404	0:00:29	3:16:14	0.13%	-0.53
Chat	198	0:01:25	4:40:20	0.19%	0.24
Discussions	1969	0:00:38	20:51:24	0.84%	-0.4
File	10635	0:04:15	753:36:11	30.26%	-0.66
File Manager	205	0:00:30	1:43:29	0.07%	***
Folder	27148	0:00:37	276:05:52	11.09%	-0.78
Goals	167	0:00:33	1:32:28	0.06%	***
Mail	4154	0:00:48	55:57:00	2.25%	-0.53
Media Library	108	0:00:08	0:14:26	0.01%	-0.39
My Grades	4756	0:01:27	115:35:46	4.64%	-0.37
MyCourses	1	0:00:00	0:00:00	0.00%	***
Notes	76	0:00:19	0:23:44	0.02%	***
Search	51	0:00:24	0:20:34	0.01%	***
Syllabus	397	0:01:16	8:19:41	0.33%	-0.38
Tracking	175	0:00:44	2:09:30	0.09%	***
Weblinks	247	0:00:20	1:22:24	0.06%	-0.53
Who's Online	591	0:01:27	14:13:49	0.57%	***
Wimba Podcaster	1308	0:05:19	115:53:30	4.65%	***
Total	**69951**		**2490:24:10**	**100.00%**	

Class C

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	712	0:00:04	0:50:28	0.02%	-0.81
Assessments	27160	0:03:19	1503:32:26	36.09%	1.76
Assignments	2051	0:00:13	7:21:36	0.18%	-0.51
Calendar	1243	0:00:15	5:01:27	0.12%	-0.55
Chat	324	0:00:09	0:46:13	0.02%	-0.44
Discussions	1731	0:00:27	13:02:02	0.31%	-0.45
File	18097	0:03:58	1196:31:03	28.72%	-0.73
File Manager	300	0:00:27	2:13:36	0.05%	***
Folder	51773	0:01:06	945:38:14	22.70%	0.25
Media Library	178	0:00:08	0:23:46	0.01%	-0.39
My Grades	14252	0:01:47	422:44:38	10.15%	0.43
MyCourses	9	0:00:20	0:03:00	0.00%	***
Printable View	161	0:03:47	10:10:02	0.24%	***
Syllabus	1796	0:00:47	23:13:40	0.56%	-0.31
Weblinks	1060	0:00:48	14:07:17	0.34%	-0.35
Who's Online	1006	0:01:13	20:21:50	0.49%	***
Total	**121853**		**4166:01:18**	**100.00%**	

Class D

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	776	0:00:11	2:18:28	1.75%	0.05
Assessments	1073	0:00:08	2:18:02	1.74%	-0.47
Assignments	932	0:00:08	2:00:32	1.52%	0.63
Calendar	428	0:00:13	1:29:55	1.13%	2.11
Chat	283	0:00:14	1:06:01	0.83%	2.8
Discussions	1449	0:00:33	13:24:06	10.14%	0.54
File	12	0:01:19	0:15:51	0.20%	-2.02
File Manager	175	0:00:21	0:59:53	0.75%	***
Folder	5771	0:00:28	45:11:17	34.17%	1.27
Goals	253	0:00:23	1:37:18	1.23%	***
Mail	704	0:00:39	7:37:54	5.77%	0.51
Media Library	164	0:00:11	0:30:43	0.39%	1.72
My Grades	2343	0:00:51	33:15:09	25.15%	2.6
MyCourses	1	0:00:00	0:00:00	0.00%	***
Notes	76	0:00:17	0:22:04	0.28%	***
Search	124	0:00:07	0:14:30	0.18%	***
Student Bookmarks	1	0:01:00	0:01:00	0.01%	***
Syllabus	527	0:00:37	5:28:13	4.14%	0.03
Tracking	143	0:00:29	1:09:18	0.87%	***
Weblinks	595	0:00:45	7:24:35	5.60%	2.79
Who's Online	348	0:00:57	5:28:53	4.15%	***
Total	**16178**		**132:13:42**	**100.00%**	

Class E

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Assessments	11343	0:03:44	704:48:03	42.92%	1.98
Assignments	843	0:00:14	3:12:49	0.20%	-0.5
CPSOnline Registration	796	0:02:38	34:50:16	2.12%	***
Discussions	90	0:00:16	0:23:52	0.02%	-0.48
File	8928	0:04:18	639:28:28	38.94%	-0.28
Folder	22118	0:00:23	143:16:32	8.73%	-0.99
My Grades	4705	0:01:11	93:10:40	5.67%	-0.22
MyCourses	2	0:00:00	0:00:00	0.00%	***
Notes	2	0:00:26	0:00:51	0.00%	***
Printable View	93	0:04:15	6:35:28	0.40%	***
Student Bookmarks	5	0:00:30	0:02:30	0.00%	***
Syllabus	967	0:00:37	10:04:20	0.61%	-0.3
Weblinks	110	0:02:04	3:48:09	0.23%	-0.41
Who's Online	133	0:01:03	2:18:56	0.14%	***
Total	**50135**		**1642:00:54**	**100.00%**	

Class F

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	83	0:00:02	0:03:23	0.48%	-0.58
Assessments	152	0:00:04	0:10:03	1.44%	-0.49
Assignments	116	0:00:06	0:11:36	1.66%	0.75
Calendar	25	0:00:10	0:04:07	0.59%	0.68
Chat	18	0:00:04	0:01:08	0.16%	0.12
Discussions	27	0:00:09	0:04:10	0.60%	-0.42
File Manager	9	0:00:13	0:01:56	0.28%	***
Folder	652	0:00:28	5:06:31	43.90%	2.13
Goals	19	0:01:00	0:19:02	2.73%	***
Mail	77	0:00:55	1:10:54	10.15%	1.8
Media Library	12	0:00:16	0:03:08	0.45%	2.06
My Grades	145	0:00:32	1:18:10	11.20%	0.58
MyCourses	1	0:00:00	0:00:00	0.00%	***
Notes	2	0:00:33	0:01:06	0.16%	***
Search	9	0:00:09	0:01:24	0.20%	***
Syllabus	79	0:01:01	1:19:50	11.43%	2.91
Tracking	9	0:00:24	0:03:36	0.52%	***
Weblinks	88	0:00:17	0:25:33	3.66%	1.63
Who's Online	57	0:01:16	1:12:36	10.40%	***
Total	**1580**		**11:38:13**	**100.00%**	

Class G

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	661	0:00:30	5:25:54	2.12%	0.23
Assessments	49	0:00:02	0:01:22	0.01%	-0.57
Assignments	97	0:00:06	0:10:15	0.07%	-0.61
Calendar	40	0:00:10	0:06:33	0.04%	-0.76
Chat	17	0:00:03	0:00:43	0.00%	-0.52
Discussions	195	0:00:08	0:26:36	0.17%	-0.46
File	4292	0:02:53	205:57:07	80.42%	1.57
File Manager	12	0:01:12	0:14:21	0.09%	***
Folder	6284	0:00:16	28:15:42	11.04%	-0.79
Mail	193	0:00:34	1:49:39	0.71%	-0.99
My Grades	894	0:00:49	12:15:32	4.79%	-0.33
Notes	17	0:00:18	0:04:59	0.03%	***
Syllabus	116	0:00:12	0:23:18	0.15%	-0.43
Tracking	18	0:00:36	0:10:41	0.07%	***
Weblinks	10	0:00:10	0:01:43	0.01%	-0.54
Who's Online	113	0:00:22	0:41:00	0.27%	***
Total	**13008**		**256:05:25**	**100.00%**	

Class H

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	1164	0:00:34	11:05:07	1.47%	-0.08
Assessments	142	0:00:04	0:09:14	0.02%	-0.57
Assignments	169	0:00:04	0:10:20	0.02%	-0.65
Calendar	120	0:00:24	0:48:13	0.11%	-0.58
Chat	20	0:00:11	0:03:43	0.01%	-0.48
Discussions	383	0:00:17	1:47:06	0.24%	-0.46
File	6185	0:06:03	624:20:33	82.79%	1.67
File Manager	136	0:00:53	2:01:08	0.27%	***
Folder	9675	0:00:19	50:26:31	6.69%	-1.17
Mail	984	0:01:17	20:55:36	2.77%	-0.38
My Grades	1475	0:01:04	26:19:37	3.49%	-0.54
Notes	34	0:00:23	0:12:45	0.03%	***
Search	59	0:00:21	0:20:54	0.05%	***
Turnitin Assignment	121	0:03:54	7:51:42	1.04%	Only 1
Weblinks	247	0:00:17	1:12:01	0.16%	-0.45
Who's Online	316	0:01:13	6:24:22	0.85%	***
Total	**21230**		**754:08:52**	**100.00%**	

Class I

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	21	0:01:26	0:30:02	7.74%	3.03
Assessments	6	0:00:02	0:00:13	0.06%	-0.57
Assignments	12	0:00:03	0:00:39	0.17%	-0.52
Calendar	4	0:00:18	0:01:10	0.30%	-0.01
Chat	8	0:00:12	0:01:36	0.41%	1.12
Discussions	9	0:00:04	0:00:40	0.17%	-0.46
File	86	0:02:17	3:17:00	50.74%	0.25
Folder	268	0:00:15	1:08:38	17.68%	-0.2
Mail	9	0:00:30	0:04:26	1.14%	-0.86
My Grades	116	0:00:36	1:09:24	17.88%	1.54
Syllabus	24	0:00:28	0:11:15	2.90%	0.38
Weblinks	13	0:00:08	0:01:42	0.44%	-0.29
Who's Online	5	0:00:18	0:01:30	0.39%	***
Total	**581**		**6:28:15**	**100.00%**	

Class J

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	52	0:00:03	0:02:50	0.24%	-0.7
Assessments	51	0:00:01	0:01:00	0.09%	-0.57
Assignments	65	0:00:05	0:05:16	0.45%	-0.28
Calendar	23	0:00:03	0:01:04	0.09%	-0.63
Chat	18	0:00:02	0:00:30	0.04%	-0.36
Discussions	22	0:00:03	0:00:56	0.08%	-0.47
File	240	0:02:48	11:10:52	57.18%	0.53
File Manager	13	0:00:11	0:02:20	0.20%	***
Folder	533	0:00:29	4:15:55	21.81%	0.17
Goals	15	0:00:10	0:02:29	0.21%	***
Mail	95	0:01:20	2:06:28	10.78%	1.99
Media Library	14	0:00:02	0:00:26	0.04%	-0.22
My Grades	80	0:00:36	0:47:21	4.04%	-0.49
Notes	1	0:00:15	0:00:15	0.02%	***
Search	8	0:00:10	0:01:17	0.11%	***
Syllabus	35	0:00:04	0:02:34	0.22%	-0.41
Tracking	10	0:00:27	0:04:25	0.38%	***
Weblinks	35	0:00:14	0:07:53	0.67%	-0.15
Who's Online	47	0:00:50	0:39:28	3.36%	***
Total	**1357**		**19:33:19**	**100.00%**	

Class K

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	18	0:00:04	0:01:20	0.21%	-0.72
Assessments	21	0:00:06	0:01:57	0.31%	-0.56
Assignments	17	0:00:05	0:01:19	0.21%	-0.49
Calendar	7	0:00:06	0:00:41	0.11%	-0.58
Chat	4	0:00:00	0:00:01	0.00%	-0.52
Discussions	5	0:00:02	0:00:09	0.02%	-0.48
File	232	0:01:36	6:10:45	58.76%	-0.6
File Manager	4	0:00:01	0:00:04	0.01%	***
Folder	319	0:00:38	3:20:20	31.75%	1.05
Goals	2	0:00:01	0:00:01	0.00%	***
Mail	4	0:10:23	0:41:32	6.58%	0.75
Media Library	4	0:00:18	0:01:10	0.18%	0.56
My Grades	17	0:00:15	0:04:20	0.69%	-0.94
Notes	1	0:00:07	0:00:07	0.02%	***
Search	2	0:00:03	0:00:05	0.01%	***
Syllabus	6	0:00:21	0:02:04	0.33%	-0.38
Tracking	4	0:00:20	0:01:21	0.21%	***
Weblinks	16	0:00:06	0:01:31	0.24%	-0.4
Who's Online	14	0:00:09	0:02:10	0.34%	***
Total	**697**		**10:30:57**	**100.00%**	

Class L

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	449	0:01:35	11:52:39	2.11%	0.23
Assessments	137	0:01:27	3:18:49	0.59%	-0.54
Assignments	761	0:00:32	6:40:27	1.19%	0.35
Calendar	458	0:00:46	5:48:31	1.03%	1.82
Discussions	7097	0:01:45	206:34:51	36.71%	3.21
File	2975	0:04:11	207:27:31	36.00%	-0.37
File Manager	331	0:01:33	8:31:28	36.87%	***
Folder	8983	0:00:19	22:32:10	1.51%	-1.03
Mail	2469	0:00:59	16:44:10	8.27%	0.94
My Grades	1172	0:00:46	14:51:58	7.24%	-0.66
Printable View	32	0:04:52	2:35:45	2.64%	***
Who's Online	564	0:00:49	7:43:12	1.37%	***
Total	**25428**		**562:41:31**	**100.00%**	

Class M

Tool	Sessions	Average Time per Session	Total Time	Percent of Total Sessions	Z_score
Announcements	156	0:01:10	3:00:51	1.34%	-0.15
Assessments	190	0:00:25	1:18:28	0.58%	-0.53
Assignments	461	0:01:16	9:47:05	4.35%	3.05
Calendar	166	0:00:33	1:31:10	0.68%	0.92
Discussions	1391	0:01:07	1:51:16	11.49%	0.67
File	2107	0:03:34	125:27:36	55.77%	0.47
File Manager	153	0:01:00	2:32:20	1.13%	***
Folder	3281	0:00:31	4:39:24	12.74%	-0.64
Live Classroom	9	0:00:45	0:06:47	0.05%	Only 1
Mail	330	0:01:29	8:11:56	3.64%	-0.12
My Grades	432	0:00:42	5:02:22	2.24%	-0.72
Printable View	68	0:11:10	12:39:53	5.63%	***
Search	19	0:00:11	0:03:30	0.03%	***
Voice Direct	23	0:00:26	0:09:55	0.07%	***
Weblinks	12	0:00:18	0:03:35	0.03%	-0.52
Who's Online	51	0:00:38	0:32:23	0.24%	***
Total	**2901**		**224:58:31**	**100.00%**	

APPENDIX G: IRB CERTIFICATION

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on September 29, 2013. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator:	HARRINGTON, TERRANCE K.
Co-Investigator(s):	
Protocol Number:	**X110215008**
Protocol Title:	*The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagement with an Online Technology*

The IRB reviewed and approved the above named project on 3/29/11. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.

IRB Approval Date: 3-29-11

Date IRB Approval Issued: 3/29/11

Marilyn Doss, M.A.
Vice Chair of the Institutional Review
Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

470 Administration Building
701 20th Street South
205.934.3789
Fax 205.934.1301
irb@uab.edu

The University of
Alabama at Birmingham
Mailing Address:
AB 470
1530 3RD AVE S
BIRMINGHAM AL 35294-0104

Office for Research

Office of the Director of
Research Compliance

THE UNIVERSITY OF
ALABAMA
RESEARCH

April 1, 2011

Terrance Harrington
University of Alabama at Birmingham
LHL 142
1530 3rd Ave S.
Birmingham, AL 35294-0013

Re: IRB#: 11-OR-105 "The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagements with an Online Technology"

Dear Mr. Harrington:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on March 31, 2012. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure Form. If you wish to modify the application, complete the Modification of an Approved Protocol. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the Continuing Review and Closure Form.

Please use reproductions of the IRB approved stamped consent forms to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Carpantato T. Myles, MSM, CIM
Director & Research Compliance Officer
Office of Research Compliance
The University of Alabama

152 Rose Administration Building
Box 870104
Tuscaloosa, Alabama 35487-0104
(205) 348-5157
fax (205) 348-8882

IRB Project #: 11-02-105

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Terrance Harrington	Margaret Rice	Charles Tomberlin
Department:	Educational Leadership	Educational Leadership	ITIT
College:	College of Education	College of Education	
University:	University of Alabama at Brmingham	University of Alabama	University of Alabama at Brmingham
Address:	LHL 142 1530 3rd Ave S Birmingham, AL 35294-0013	College of Education Box 870231 Tucaloosa, AL 35487-0231	LHL 142 1530 3rd Ave S Birmingham, AL 35294-0013
Telephone:	205-934-0417	205-348-1165	205-975-6545
FAX:	205-934-0443		
E-mail:	tharring@uab.edu	mrice@bamaed.ua.edu	tomberc@uab.edu

Title of Research Project: The Learning Management System as a Bruner Amplifier: Defining a Model of Faculty Engagements with an Onlime Technology

Date Submitted: 3/22/11
Funding Source: None

Type of Proposal	☒ New	☐ Revision	☐ Renewal Please attach a renewal application	☐ Completed	☐ Exempt
			Please attach a continuing review of studies form		
			Please enter the original IRB # at the top of the page		

UA faculty or staff member signature: _____

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):
Type of Review: _____ Full board X Expedited

IRB Action:
___ Rejected Date: _____
___ Tabled Pending Revisions Date:
___ Approved Pending Revisions Date: _____
X Approved-this proposal complies with University and federal regulations for the protection of human subjects.
Approval is effective until the following date: 3/31/2012
Items approved: X Research protocol (dated _____)
X Informed consent (dated _____)
___ Recruitment materials (dated _____)
___ Other (dated _____)

Approval signature _____ Date 4/1/2011