BRIDGING THE THEORY-TO-PRACTICE GAP: A MULTIVARIATE CORRELATIONAL STUDY EXPLORING THE EFFECTS OF A GRADUATE ONLINE LEARNING ENVIRONMENT AS A COMMUNITY OF PRACTICE FRAMEWORK

Tonda Jenean Bone, BA, MA

Dissertation Prepared for the Degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

December 2013

APPROVED:

Elizabeth Figa, Major Professor
Barbara Schultz-Jones, Committee Member
Linda Smith, Committee Member
Suliman Hawamdeh, Chair of the Department of Information Sciences
Herman Totten, Dean of the College of Information
Mark Wardell, Dean of the Toulouse Graduate School

Bone, Tonda Jenean, Bridging the theory-to-practice gap: A multivariate correlational study exploring the effects of a graduate online learning environment as a community of practice framework. Doctor of Philosophy (Information Science), December 2013, 184 pp., 14 tables, 8 figures, references, 248 titles.

In this multivariate correlational study, the researcher examined the course culture of an online graduate course whose environment exhibited characteristics of a Community of practice (CoP). An online survey captured data used to explore the relationships among variables shown to describe a CoP in field environments and among student perceptions of their experience in the course culture. A canonical correlation analysis (CCA) and commonality analysis (CA) were conducted using five predictor variables and three criterion variables to evaluate the degree and direction of the relationships. The CCA revealed that the full model was significant, explaining approximately 74% of the variance among the two synthetic variates. Impact, faculty leadership, and connection were the largest contributors to the predictor variate. The criterion variate was primarily explained by value and perceived CoP, with exposure to the profession providing a smaller contribution. The CA confirmed these findings.

Results from this study indicate that a CoP could be fostered in an online graduate course. The overall significance of the model indicates teachers can nurture an environment wherein graduate students will take the initiative to work with others to create and acquire knowledge that creates a sense of professional connection with each other and with the profession overall. The results of this study suggest further empirical research in implementing and assessing CoPs in online graduate courses is warranted.

ACKNOWLEDGMENTS

I am deeply grateful for the emotional, spiritual, and financial support from my parents, Robert E. (Bob) Bone (deceased) and Bobbie L. Bone. Without their support, I would not have accomplished this goal. I regret deeply not completing it before the death of my father.

I appreciate, as well, the support of my family and friends through this journey. Those phone calls, emails, and Facebook posts helped keep me going. For my colleagues, past and present: “Thank you” for the words of encouragement and the occasional “kick in the pants” to keep me on track. As well, your dedicated efforts as teachers and mentors in the Introduction to Information Access and Retrieval course studied here revealed themselves in the results.

I am grateful to Dr. Elizabeth Figa, my committee chair and mentor, for her steadfast support during this endeavor. Our brain storming sessions were invaluable to for generating ideas and for developing this topic.

I also appreciate very much Dr. Barbara Schultz-Jones’ valuable input and suggestions during the methodology phase of this project. Finally, I extend special thanks to Dr. Linda Smith, whose research in reference services helped inform the course around which this research centered. “Thank you” for extending your expertise to this study.

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CHAPTER 1

INTRODUCTION

Introduction to the Study

There is an old saying that goes "Times, they are a-changin'." Quite possibly, this has never been truer for higher education. In particular, the tremendous growth in online learning has driven new research protocols and frameworks in an effort to discover and describe the elements that comprise a successful online educational experience (Allen & Seaman, 2009; Arbaugh, Bangert, & Cleveland-Innes, 2010). This understanding is especially critical at the graduate level, where students are expected to learn both “the ropes” of conducting research in their discipline (West Virginia University Graduate Council, 2010) and the skills needed not only to communicate with their colleagues, but also to lead them (G. E. Walker, Golde, Jones, Bueschel, & Hutchings, 2008). For one, online courses are especially appealing to graduate and post-baccalaureate students because these students traditionally are working adults that often do not have the freedom or desire to attend regularly scheduled face-to-face courses (Peltier, Schibrowsky, & Drago, 2007). For another, the online classroom often is the dominant mode of university interaction for a graduate student, and the online course environment thus acts as the primary venue for helping these students develop the scholarly and professional skills expected of them. Because many online graduate students also are distance students that may never step foot upon the physical campus, administrators and faculty need to understand how the communicative experiences in an online course may be structured to support not only the students' educational and professional needs, but also to facilitate the graduate program's curricular and administrative goals.

Of primary interest in this study was the role the online graduate course could play in the development of a student's sense of professional connection with his/her discipline. While a robust research stream exists for study of distance and online education (Garrison & Cleveland-Innes, 2010), little of that research focuses primarily on the graduate student's experience, and even less addresses the aspect of building professional identity within the online course. However, in disciplines which create practicing professionals, such as librarianship, where graduate curriculums often are grounded in standards of core competencies set by organizations such as the Association of College and Research Libraries (Bailey, Jr., 2010) and the American Library Association (American Library Association, 2008), the course culture offers an untapped venue within which to help students not only develop the formal skills, but also gain the tacit practices that mark professional librarianship.

This research followed a non-experimental design using a correlational model (B. Johnson & Christensen, 2008). I took a pragmatist perspective informed by Wenger's (1998) community of practice (CoP) learning model in order to explore student perceptions of 1) participating within a CoP course culture and 2) the benefits such membership has on the learning experience. Data was collected through a Likert-syle survey based on research by Hemmasi and Csanda (2009) which employed close-ended questions. The subscales measured the effectiveness of the CoP environment as based upon specific variables. The research context (the case) was an online graduate library science course in information access and retrieval (IIAR). Library science programs "historically have focused on the elements of professional practice that define

the profession (Lynch, 2008), which makes them an excellent candidate for utilizing a CoP environment.

The Growth of Online Learning

Online learning is growing "at rates far in excess of the total higher education student population," with no indication of slowing down (Allen & Seaman, 2009; Artino & McCoach, 2008). The seventh annual Sloan Foundation study on the nature and extent of distance education in higher education in the United States found that more than one in four students were taking at least one online course in fall 2008, bringing the number to over 4.6 million students -- a 17% increase over the number reported in the 2007 study (Allen & Seaman, 2009). One of the most cited reasons for offering online courses was improved student access; other reasons included higher degree completion rates and the appeal of -- and demand for -- online courses to nontraditional students (J. Seaman, Allen, & Seaman, 2007). However, institutions also indicated concerns regarding online education, including lack of student discipline in the online environment, issues with faculty acceptance, and high development and delivery costs (Allen & Seaman, 2007). Studies continue to explore how student satisfaction of online education compares to that of traditional face-to-face learning models (Rovai, 2004; Young, 2006); however, as research continues to illustrate the effectiveness of online education (Sitzmann, Kraiger, Stewart, & Wisher, 2006), the focus has turned to discovering how to help students learn to learn online and to structuring courses that, as with their face-to-face counterparts, meet students' learning needs (Arbaugh et al., 2010; Arbaugh, 2004; Rovai, 2004). Technological growth and application development have allowed for new modes of delivery that move online education past its roots of

individual study with limited peer and professor interaction (Pauls, 2003) and into the realm of a rich, immersive and collaborative environment that better supports student learning (Akyol & Garrison, 2011; Rovai, 2002a).

The Complexity of Graduate Program Goals

The ability to complete coursework from varying geographical locations, across differing time zones, and without the ‘seat time’ of a traditional classroom makes distance education particularly attractive to graduate students, many of whom are currently employed adults with additional family responsibilities (Buchanan, Myers, & Hardin, 2005; Peltier et al., 2007). As with traditional, face-to-face education, the goal of online and distance education is to construct an environment amenable not only to learning course content, but also, on a larger scale, to fostering a sense of fidelity toward the academic institution which can translate into future alumni support (J. W. Johnson, Thomas, & Peck, 2010; Sun, Hoffman, & Grady, 2007; Tsao & Coll, 2005).

The primary agents separating graduate-level studies from those of undergraduate are the specialized, in-depth immersion into a particular discipline and the emphasis on research to extend that field. Whereas undergraduate education aids in creating a stable economy by "providing students with foundational knowledge and work skills and offering college graduates a wide range of employment options," graduate education "goes beyond just providing students with advanced knowledge and skills -- it also further develops critical thinking skills and produces innovators" (Wendler et al., 2010, p. 1). To meet these goals it is imperative that the educational context move beyond mere assessment of a final product, as focusing on outputs fails to take into account the details of the student's educational process (Clayton, 2007). It can be

argued, then, that an important focus of graduate education is to cultivate informed professionals who not only are conversant on their specific subject matter, but also who identify themselves as members of a particular community. Such professionals possess the knowledge and skill-set required to situate themselves as productive practitioners in their discipline (West Virginia University Graduate Council, 2010). A lack of such experiences of professional knowledge can be considered a weakness in an educational program (Smeby, 2007). Thus, a primary goal for graduate programs is to create scholars -- subject matter experts and "caretakers" of the discipline. However, while subject matter mastery is necessary, it

> is not in itself sufficient to the formation of scholars. Learning to present oneself as a member of a discipline, to communicate with colleagues, and to apply ethical standards of conduct is part and parcel of formation. Creativity, responsibility, and leadership are also critical areas for attention in programs that aim for excellence. (Walker et al., 2008, p. 61)

Assessing quality also is an important aspect of developing and advancing graduate programs. Being able to provide evidence that a program "meets or exceeds the standards of excellence expected by the institution *and the profession*" (Augustine & Hanner, 2010, emphasis added) is particularly important. In general, the goal of programs in graduate studies is to provide new knowledge to the respective disciplines (West Virginia University Graduate Council, 2010). Most graduate programs, regardless of discipline, have similar educational outcomes they expect their successful students to exhibit:

> (a) acquisition of advanced knowledge; (b) acquisition of professional, verbal, and written skills; (c) ability to undertake appropriate research, scholarly or creative endeavors, and contribute to their discipline; (d) ability to teach, often at the collegiate level; and (e) ability to find employment in their, or a related, field. (West Virginia University Graduate Council, 2010)

As well, at the doctoral level, completion/attrition rates and career outcomes are growing in their importance within the graduate community as key indicators for assessing doctoral programs (Denecke, 2006).

The globalization of the job market also is impacting graduate program focus. Members of the Council of Graduate Schools and the University Continuing Education Association met to discuss how advanced and continuing education would be effected by the demands of adult workers for new learning opportunities driven by new job markets, new technologies, and an information-driven society (Kohl & LaPidus, 2000). The summit found that to meet the changing face of employment, many master's and other post baccalaureate programs, for the most part, are now "focused on the state and needs of professional practice" (LaPidus, 2000). These degrees and certificates can be characterized by their emphasis on specialization, professionalization, application, and defined professional competencies (Augustine & Hanner, 2010). Successful programs recognize this focus on professionalization and application also requires alternative learning initiatives in the form of mentoring and additional training options (G. E. Walker et al., 2008; Wendler et al., 2010), along with guidance in understanding and finding career options (M. J. Baker, 2005).

Attrition also is an important consideration in graduate programs. Some studies have indicated doctoral attrition rates as high as 40 to 50%, and they call for both individual programs and institutions to intervene to improve student completion rates at both master's and doctoral levels (Wendler et al., 2010). Corporate Voices for Working Families, "a nonprofit group that is doing significant work catalyzing the conversation between education and employers about supporting working students," argued that

“simply adding an online section or even a blended component to a course can significantly increase the likelihood that a working student or parent will not only attend but succeed" (Milliron, 2010). Such online and blended options help to address constraints brought on by ‘seat time’ issues (e.g., scheduling conflicts due to work, parenting responsibilities, distance, etc.).

Reconceptualizing student support within graduate programs also can lessen attrition and increase the strength of the program. Knowing how to find additional learning resources and understanding what careers are available for one's major can help students stay focused and form career goals during their studies. For example, the Commission on the Future of Graduate Studies in the United States noted that not all graduate programs, particularly at the master's level, are structured to produce teachers, and they suggested programs clarify and expand upon "nonacademic career pathways for graduate students" (Wendler et al., 2010). In other words, graduate schools and disciplines should expand opportunities available to their students in terms of training, mentoring, and additional information regarding career opportunities that exist outside of academia (Wendler et al., 2010).

Additional training opportunities and awareness of career options are but one support-focused intervention. Other such efforts can boost program quality and lessen attrition, as well. For example, a study by Park and Choi (2009) indicated attrition could be lowered if program developers and instructors find ways to enhance student support and perceived relevance of the course. The researchers examined quantitative data from 147 students who had dropped out of doctoral studies, and they found two factors to be particularly strong predictors of student persistence: organizational support (i.e.,

support from the student's place of employment) and relevance. Organizational support, like other external factors, cannot be controlled by professors and graduate programs. However, recognizing such factors and providing strong support against them can sometimes counteract any negative impact. For example, Park and Choi (2009) noted that when “learners have a heavy workload and little time for study, they are more likely to drop out of a course when they cannot get feedback or if it is hard to contact the instructors than when [students] can easily communicate with [their teachers] and get more responses” (p. 208). In other words, quick feedback and prompt responses to student inquiries can help mediate some external problems, particularly if the student is feeling overwhelmed.

Perceived relevance of a course is an internal factor and the other element with strong predictive abilities noted in Park and Choi's study (2009). Both perceived relevance and satisfaction are sub-dimensions of motivation that have been studied in detail (Cheung & Lee, 2009; J.-W. Lee, 2010; Levy, 2003; Park & Choi, 2009; Preece, 2001) and that have been shown to be highly correlated with course-based aspects of organization, instructional design, and instructor interaction and facilitation within the course (Shea, Pickett, & Pelz, 2003; Shea, Sau Li, & Pickett, 2006). Studies at the University of California, Berkeley, not only supported these factors of support, relevance, and satisfaction, but also emphasized the importance of feeling a personal connection to the program. Their work indicates "factors such as the relationship between student and advisor/other faculty and student involvement in program and institutional activities" seem to mediate student persistence in their doctoral programs (Wendler et al., 2010). It appears that feeling a personal sense of support from faculty

and the school can help maintain student persistence, as well as fostering an overall sense of academic satisfaction.

The Role of the Graduate Course

As the previous discussion indicates, two key factors distinguish themselves in the stated goals of graduate programs and in the research regarding defining characteristics of effectiveness:

1. Students need additional administrative support and information beyond course planning, and
2. The graduate course should be structured to provide professional information above and beyond content knowledge.

What begins to surface from recent studies examining characteristics of successful graduate programs is an emphasis on student support throughout the educational journey. Support is operationalized through administrative, professorial, and program efforts to extend the academic experience to include not only foundational knowledge of the respective field, but also the professional skills required to enter the field as a competent member well-versed in community practices. Little research exists, however, that examines the phenomenon of negotiating the transitional distance from student to professional identity. In particular, how can the graduate experience mediate this transition? How can the graduate course leverage its role as direct intermediary with students to help students begin to form a sense of identity and belonging in their (real world) disciplines? This researcher posits that the graduate classroom environment provides an excellent arena wherein students can seek, share, and learn

professional practices impacting their current lives and roles as both students and working professionals.

Online courses are of particular interest regarding graduate program quality and student perceived satisfaction with their educational experience. Such courses are especially appealing to graduate and post-baccalaureate students because these students traditionally are working adults that often do not have the freedom or desire to attend regularly scheduled face-to-face courses (Peltier et al., 2007). McGorry (2003) noted, though, that “although the number of courses being delivered via the Internet is increasing rapidly, our knowledge of what makes these courses effective learning experiences is limited” (p. 160). However, because many online graduate students also are distance students that may never step foot upon the physical campus, administrators and faculty need to understand how the communicative experiences in an online course may be structured to support not only the students' educational and professional needs, but also to facilitate the graduate program's curricular and administrative goals.

A Supportive Framework: The Community of Practice

CoPs are voluntary learning environments grounded in a specific domain/joint enterprise to which members feel a connection and within which members seek to learn and share information about the domain using domain-related language, tools, and practices. They are "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, et al., 2002, p. 4). CoPs are characterized by their collaborative, member-driven structure that consists of a 1) domain (the defining

area/issue of interest), 2) community (the interaction by the member practitioners), and 3) shared repertoire of practices (the specialized artifacts and methods created and used by the community) (Wenger, 1998). New members interact with the community as legitimate peripheral participants, and their degree of membership grows toward that of full participant as they learn and form relationships in the community (Barab, Barnett, & Squire, 2002). Of interest to this sense of connection is that ‘relationship’ does not necessarily indicate friendship or emotional attachment but DOES infer a level of openness and trust (Wenger, 1998). Because of its nature of self-perpetuation and its focus on a specific domain space (as opposed to an academic content area), Barab and Duffy (2000) have questioned the ability to create a ‘true’ CoP environment within the artificial confines of a classroom.

Members participate in CoPs in order to learn both the explicit and the tacit knowledge, skills, and tools necessary to negotiate the domain space (Wenger, 1998). A CoP "is a particular type of network that features peer-to-peer collaborative activities to build member skills and steward the knowledge assets of organizations and society” (Snyder, Wenger, & Briggs, 2003). Because of their member-driven nature, CoPs cannot be created; rather, an environment conducive to CoP development can be structured and fostered. Thus, while a CoP's existence involves structure and leadership, it is the participants that create the dynamics that constitute a practice-based community (Snyder, et al., 2003-04; Wenger, 1998).

Industry has long fostered CoPs as information management tools in order both to support employees and to preserve the employees’ tacit knowledge (Hara, Shachaf, & Stoerger, 2009; M. Seaman, 2008). In organizational settings, managers and

administrators often cultivate CoPs for knowledge management by developing a "knowledge strategy" that involves 1) defining strategic goals and the "core competencies, business processes, and key activities" required to meet them; 2) analyzing these components in terms of "domains"; 3) identifying the people who need this knowledge; and 4) exploring ways to "connect them into communities of practice so that together they can 'steward' this knowledge" (Wenger, et al., 2002, p. 7). The goal of domain-specific employee support and the ability to capture tacit practices also makes CoPs attractive to educational settings. CoPs have seen a growth in their application to various academic areas, such as a method for supporting faculty (Nagy & Burch, 2009), online course design teams (A.-P. Correia & Davis, 2008), and mediating postdoctoral research (Coetsee, 2011; Wisker, Robinson, & Shacham, 2007). Information scientists point out that in this context, the CoP is being harnessed for its power as an information behavior model (Borgatti & Cross, 2003). For example, Davies (2005) argued that many information science studies of professionals' information behaviors were, in fact, "applications of communities of practice theory before it was so named" (p. 106). To illustrate, she pointed to Davenport and Cronin's (1998) call to consider workplace studies in terms of "the world of work per se," rather than categorical aspects of information seeking, information needs, information uses, and information use environments (p. 266). Instead, Davenport and Cronin (1998) called for a holistic study of information behavior -- from need to acquisition methods to application.

This same context-driven information behavior model clearly resonates in Wenger's (1998) CoP model. The theoretical basis was developed from a field study that began with work with Jean Lave regarding the situated learning that occurs in both

professional and personal aspects of everyday life (see Lave & Wenger, 1991), and it explores learning as a holistic process involving an individual's "interplay of experience and competence" (Wenger, 1998, p. 50). This form of information acquisition as learning goes beyond "learning about" and focuses "on the construction of whole persons" within the CoP (Barab & Duffy, 2000). A CoP environment effectively melds the constructive aspects of learning and individual information behavior, and it models aspects of identity construction through the negotiation of meaning and its subsequent ownership.

In spite of its power as a learning theory and an information networking process model, however, CoPs have not been leveraged acceptably as classroom-based learning models (Yukawa, 2010a), particularly in the online course environment. Yukawa (2010a, 2010b) has presented an approach for using the CoP framework to create and analyze blended library and information science (LIS) courses, particularly in terms of assessing student acquisition of core LIS concepts. Unfortunately, studies such as these are rare and have not fully considered the ability of a course-based CoP environment to shape a student's sense of professional identity. Furthermore, even though some industry studies have examined the role of participation in terms of a member's perceived benefit (Cadiz, Sawyer, & Griffith, 2009), and though learning community research often examines satisfaction (Rovai, 2002a; Shea, 2006), inquiries in general have failed to address the student's perception of such a supportive community even if s/he did not fully participate within it. Lave and Wenger (1991) called this phenomenon "legitimate peripheral participation" and argued that members can achieve benefit without fully committing to the community (Wenger, 1998). Thus, it is important to understand not only the impact of a learning environment structured

according to the defining characteristics of a CoP, but also the degree to which such a context mediates the experience of students who are less active in the environment. Though beyond the scope of this research, it also is important to note that “peripherality” can act as a position of power (legitimate peripherality) or powerlessness (marginalized peripherality) in the communicative exchange and relational aspects within a CoP; the reader is directed to Lave and Wenger (1991) and Wenger (1998) for a detailed discussion.

The Research Gap

While a robust research stream exists for study of distance and online education (Garrison & Cleveland-Innes, 2010), little of that research focuses primarily on the graduate student's experience, and even less addresses the aspect of building professional identity within the online course. As a learning theory and an information behavior model, CoPs represent a promising method for creating enhanced learning environments that not only support participant formal learning, but also provide a collaborative, mentoring community which encourages both tacit and formal professional knowledge sharing which can aid a student’s transition into the profession. Though CoPs have been implemented in academia as, for example, a method for supporting faculty (Nagy & Burch, 2009), for online course design teams (e.g., Correia & Davis, 2008), for cohort formation (Conner, 2009; Green, 2006), and for mediating postdoctoral research (Coetsee, 2011; Wisker et al., 2007), they have been underutilized as a formal learning model within the online graduate course environment. This is particularly unfortunate in terms of graduate education, as the goals of those programs are to create scholars and specialists in their fields (Clayton, 2007; Wendler

et al., 2010; West Virginia University Graduate Council, 2010) – objectives that go beyond content knowledge and expand into the area of transition to professionalization. And while characteristics of successful CoPs – both online (Corso, Martini, & Balocco, 2008; Hemmasi & Csanda, 2009) and face to face (McDermott & Archibald, 2010; McDermott, 2001) – have been explored and examined in industry-based case studies, such characteristics have not been examined within the graduate academic classroom context. This study begins to address these issues by examining how students perceive their educational experience within an online graduate learning environment whose community seeks to foster a CoP.

Closer Examination: Case Study of a Core Library Science Course

A case study context is indicated when “the inquirer has clearly identifiable cases with boundaries and seeks to provide an in depth understanding” of said case(s) (Creswell, 2007). In this particular study, I sought to explore one specific CoP implementation strategy to determine the efficacy of this strategy in terms of student perceptions of CoP membership, learning value, and connection with the discipline. In addition to observing if a course environment could be implemented such that students would perceive themselves to be burgeoning members of the library science discipline, I also explored the degree to which student’s validate the community in accordance with characteristics shown in previous research (Cadiz et al., 2009; Hemmasi & Csanda, 2009; McDermott, 2001; Wenger, McDermott, & Snyder, 2002) to be indicative of an effective CoP environment.

While the tensions of library science education as theoretical- or professional-based approach (see, for example, Haddow & Klobas, 2004; Marouf & ur Rehman,

2007; Ponti, 2008) exceeds the scope of this research, what remains cogent to this study is that as a certified program, library science is bound to an accreditation process which acts to affirm the institution “meets established levels of quality in carrying out its program” (Lynch, 2008). For example, the American Library Association (ALA) set forth in its core competencies (2009) the base expected proficiencies for library science professionals, and their Office for Accreditation (http://www.ala.org/offices/accreditation/) coordinates the elements and processes required for library science programs to achieve and maintain their official accredited status. The emphasis by the ALA on “core competencies” in the profession typically is met by academia through required courses that are built upon these competencies. For instance, the case study that forms the context for this research was a core course entitled “Introduction to Information Access and Retrieval” (IIAR). The course catalog described the course as the “epistemological foundations of information use,” covering the following areas:

> Basic principles and techniques of information access and knowledge inquiry. Survey of research in information seeking behavior and user interaction. Introduction to systems of access, search, retrieval, and navigation, as well as reference collection management and services. Study of evaluation methods for resources in all formats, services and user satisfaction. (University of North Texas, 2012)

Furthermore, library science programs “historically have focused on the elements of professional practice that define the profession” (Lynch, 2008). It is this melding of theory and practice, along with the emphasis on preparing students for their professional lives, which makes a graduate online library science course an excellent candidate for studying the impact of a course-based CoP community. In terms of the

CoP model, the professional and critical focus of such a course creates a domain within which a CoP can develop.

Definition of Terms and Acronyms

It is important that the reader understand several terms before proceeding. The following list of terms – with accompanying acronyms, where relevant – will be used throughout this text.

Graduate learners. MacDonald and Thompson (2005) described master's students as adult learners because in addition to holding at least one previous university degree, graduate learners often also “have family and community responsibilities,”[with] “the majority working in full-time jobs" (p. 4). This description fails to account for graduate students that enter their post-baccalaureate education immediately after obtaining their Bachelor’s degree and who, therefore, may not have the work history or “family and community responsibilities” often attributed to the definition of a graduate student. In this study, “graduate learner” includes both these “nontraditional” students and the traditional adult learner.

Community. Community is a key structure both in this research and within the majority of theories which ground it, so a concise definition is in order. Gusfield (1975) identified two dimensions in the community construct: geographical/territorial -- interaction due to proximity, such as a neighborhood or city -- and relational notions -- interaction based upon common values, skills, etc. However, the key element in the notion of community is the social cohesion that binds it, and though the two (proximity/relational) are not mutually exclusive, the relational dimension *must* be present for a community to exist. Thus, Sarason (1974), in his seminal work, argued

that the psychological notion of community should be the focus of the construct, as one's sense of community " is one of the major bases for self-definition" (p. 157). A psychological emphasis focuses on the individual's experience of community. Sarason's observation is especially important in terms of community building in cyberspace in general and virtual communities in particular because it emphasized that while proximity *can* be a factor of a community, it is not a requirement. McMillan and Chavis (1986) defined this "sense of community" as ‘‘a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together" (p. 9). This research uses this "psychology of community" approach and definition.

Community of practice (CoP). A community of practice is a model for learning/information acquisition that "not only shares knowledge; but also it creates, organizes, revises, and passes on knowledge among members of the community" (M. Seaman, 2008). CoPs can be considered a form of specialized learning community, differentiated primarily by its voluntary participatory nature, its focus on a specific domain, its special set of practices which help to define both the domain and the community, and the sense of identity with the group that binds both the community and its individual members. CoPs focus as much on creating, capturing, and curating tacit knowledge as they do formal knowledge. For this reason, in practice, CoPs arguably are associated as much as an organizational knowledge management tool as they are a method of mentoring, training, learning, and problem solving. The CoP model forms the theoretical basis of this study.

Learning community. A learning community can be defined as a group "of learners who share knowledge, values, and goals" (Rovai, 2002b) while experiencing a sense of community wherein they feel a sense of belonging, trust, and commitment (McMillan & Chavis, 1986). In this research, a learning community is considered a formal entity (i.e., classroom, training course, etc.) that exists for the explicit purpose of learning.

Legitimate peripheral participation. In general, participation is defined as "the process or fact of sharing in an action, sentiment, etc.," particularly the "active involvement in a matter or event, esp[ecially] one in which the outcome directly affects those taking part" (Oxford English Dictionary). This definition encompasses the meaning inferred in its use by educators, researchers, scholars, and administrators in regards to students, classrooms, and content. In terms of learning, however, Lave and Wenger (1991) found “participation” did not adequately describe the events occurring during a situated learning event. “Legitimate peripheral participation” is the term they used, instead, to describe the "engagement in social practice that entails learning as an integral constituent" (p. 35). More specifically, it is a "central defining characteristic" (p. 29) of learning describing the fact that

> learners inevitably participate in communities of practitioners and that the mastery of knowledge and skill requires newcomers to move toward full participation in the sociocultural practices of a community. . . . It concerns the process by which newcomers become part of a community of practice. A person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice. (p. 29)

In other words, when adult learners are engaged in a situated learning experience, that learning involves and is reflected in changing relationships and

changing levels of participation within the community, accompanied also with "identity transformation" (Wenger, 1998, p. 10). The intent of the construct is to operationalize the conditions "under which people become members" of a CoP -- namely, that "the required learning takes place not so much through the reification of a curriculum as through modified forms of participation that are structured to open the practice to nonmembers" (Wenger, 1998, p. 100).

Full participation. Within a CoP, full participation describes the role of "old timer" – keeper of the formal and tacit experiences, knowledge, and "rules-of-thumb" of the community (Wenger, 1998) – and of degree of participation, encompassing the CoP's most active members (Wenger et al., 2002). It should be noted that degree of participation is an external method to assist in fostering an environment conducive to a CoP rather than being an indicator of learning, though the two certainly are not mutually exclusive. Instead, degree of participation provides an expectation of actual member activity within the community in terms of discussion or debate, including the acts of identifying topics for the community to address (Wenger et al., 2002).

Peripheral participation. In the context of a CoP, peripheral participation does not refer to centrality or marginality. Rather, it is a method of describing a new member's (necessary) experiences and relationships which can lead to "full participation" within the CoP (Wenger, 1998). Peripherality is "an opening, a way of gaining access to sources for understanding through growing involvement" in the community (Lave & Wenger, 1991, p. 37). By nature of their newness to the CoP, these members will not participate fully in the community. At first, some activities might be unrelated to the individual's current level of experience (Lave & Wenger, 1991), or it might be that the

new member is not yet experienced enough to fully influence an activity or decision making process (Wenger, 1998). Regardless, "the partial participation of newcomers is by no means 'disconnected' from the practice of interest" (Lave & Wenger, 1991, p. 37).

Purpose/Objectives of the Study

The purpose of this study was to examine the value associated with an online graduate course learning environment fostered according to CoP framework principles. Specifically, I sought to determine the degree to which students perceived their learning environment as a CoP along with the learning and professional value associated with such an experience. Educational programs with a strong practical and/or professional emphasis – such as library science (Yukawa, 2010a), nursing (Andrew, Ferguson, Wilkie, Corcoran, & Simpson, 2009), and teacher education (Jung Won & Brush, 2009), to name a few – could benefit from the added value of a framework that helps students become indoctrinated to the tacit and formal practices of their respective professions. Furthermore, students should find it beneficial to their learning experience to have the option of participating in real-world questions and answers at the community table. These objectives were explored through a correlational study of a community design framework implemented within an online, masters-level LIS course in information access and retrieval which exhibited characteristics of a CoP.

The goals of a CoP are determined by the information needs of its members and are centered around specific contexts: problems, projects, groups, professions, even tasks (Guldberg & Mackness, 2009). It is this self-formation that gives each community both its purpose and its particular "essence." In formal communities, the CoP's existence and goals may be formally articulated to its constituency; and in this context,

administration and management find CoPs particularly valuable for their role in advancing professional practices while also acting as stewards for knowledge management (McDermott & Archibald, 2010). However, formal articulation is not required – nor is it particularly even the “norm” for a CoP. Rather, the individuals who come together to learn and to solve problems pertaining to a particular domain do so to meet specific information needs – regardless of the formality of the setting (Lave & Wenger, 1991; Merriam, Courtenay, & Baumgartner, 2003). Also, in addition to the community’s focus on a specific domain, its members “have a desire to share work-related knowledge,” have a “passion for learning,” and “gain value from their membership” (Serrat, 2008). If these qualities can be generated within the online graduate classroom, not only can graduate program goals be advanced, but also students should find similar personal benefits as do their “real world” counterparts. The scope of this study was to explore the emergent properties of a CoP within an online classroom fostered to combine academic and professional learning, encourage shared professional experiences and practices, and elicit a sense of professional identification with the field. The expected outcome was a better understanding of CoP characteristics and participant perceptions that best explained this environment wherein students appeared to associate themselves with a professional community through the voluntary information seeking, sharing, and creation characteristic of membership within a CoP.

Research Objectives

The overall research objectives of this study were to: 1) Determine the degree to which empirically derived characteristics of effective professionally-based online CoP environments also would describe a graduate course-based CoP culture, and 2)

Determine the degree that these characteristics related to students' perceptions of educational and/or professional value in that culture. More specifically, I structured the study around these three objectives:

1) Explore the degree to which characteristics indicative of effective CoPs also related to a member's perceived experience within an online course-base CoP environment.
2) Evaluate the relationship of CoP variables to student perceived educational value within an online course-base CoP environment.
3) Evaluate the relationship of CoP variables to student perceived exposure to professional experiences within an online course-base CoP environment.

To facilitate these objectives, I examined student perceptions of their experiences in an online, core library and information science course (specifically: Introduction to Information Access and Retrieval) offered in the Department of Library and Information Sciences at the University of North Texas. The objectives were studied through a series of research questions that allowed for examining the course culture in terms of the presence and relationships of certain constructs indicative of a CoP (Cadiz, et al., 2009; Davies, 2005; Wenger, 1998) and students' perceptions toward the learning environment.

Research Questions

CoPs may vary greatly in size (small to large), geographical dispersion (local to global), mode of implementation (face-to-face to fully online), and formality (recognized to invisible). They may be intra- or inter-organizational (Wenger, 2006). It is logical, however, to assume that just as there are dimensions that characterize the existence of

a CoP (Wenger, 1998, and discussed earlier in this chapter), there also would be characteristics that mark a successful implementation of a CoP. Furthermore, because CoP's are intangible entities (Wenger, 1998), their existence can best be determined and measured through behaviors and beliefs associated with a member's interaction (Cadiz, et al., 2009; Hemmasi & Csanda, 2009). In previous research, Hemmasi and Csanda (2009) illustrated that impact on job processes, sense of commitment, community leadership, sense of connection, and trust were important predictors characteristic of a nationwide online CoP implemented by State Farm Insurance Companies. Furthermore, domain- and practice-related interaction (i.e., “shared experiences”) by participants is the fuel that drives a CoP (Wenger, 2006), an aspect that has been studied and proven empirically (Andrew et al., 2009; Barab et al., 2002; Cadiz et al., 2009; Hemmasi & Csanda, 2009; Yukawa, 2010b). Thus,

> *RQ1. To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences characterize a CoP experience within an online graduate course?*

A major goal of the graduate study experience is to advance new knowledge within the discipline through innovation and research (G. E. Walker et al., 2008; Wendler et al., 2010; West Virginia University Graduate Council, 2010). Thus, scholarly work at the graduate level should produce professionals whose work will help further the profession (Smeby, 2007). However, little is understood about how the individual graduate class can facilitate this professional growth. A primary function of a CoP is to foster a sense of identity with the community through professional development (B. Baran & Cagiltay, 2010) through learning, sharing, and generating relevant practices. A

course-based CoP, then, not only should enhance learning, but also should generate a sense of professional connection with the discipline. Thus:

> *RQ2: To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences mediate a student's perceived value on learning in an online course which exhibits a CoP environment?*

and

> *RQ3: To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences mediate a student's perceived sense of professional experience in an online course which exhibits a CoP environment?*

These three research questions helped direct the study. They acknowledged the multidimensional nature of a CoP experience while also allowing for the varying relationships which could exist among the variables.

Theoretical Foundation: The Community of Practice

This research was grounded in Wenger's (1998) community of practice (CoP) theory which defines CoPs as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2006). Three interacting constructs must be present for a community to be a "community of practice" as opposed to other forms of community: the domain, the practice, and the community (Wenger, 1998), and the CoP's effectiveness depends upon the strength of these "core structural dimensions" (Snyder et al., 2003, p. 17). This conceptual framework is illustrated in Figure 1.

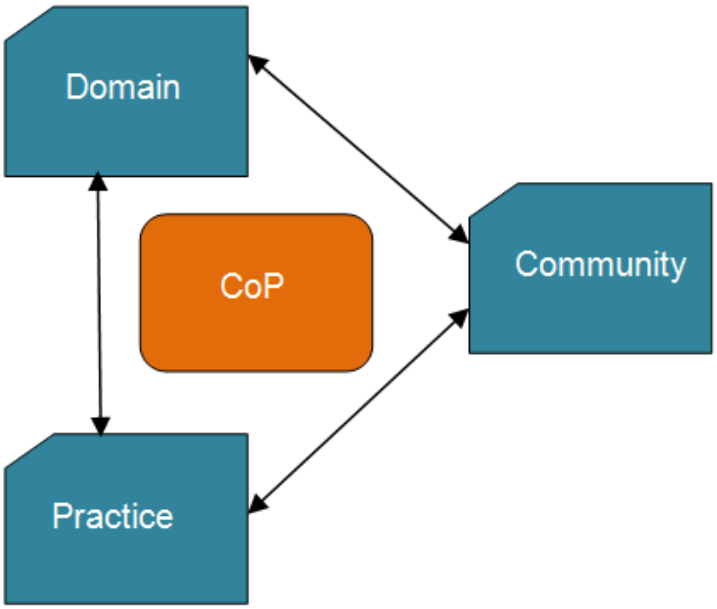

Figure 1. Conceptual framework of a community of practice. The model theorizes that it is the participant's interaction with each element that empowers the paradigm.

The *domain* is a clearly defined shared interest that binds the members together; "membership therefore implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people" (Wenger, 2006, p. 1). This

shared competence is marked by the shared practice created by, and indicative of, the community. The *practice* refers to the “shared repertoire of resources: experiences, stories, tools, [and] ways of addressing recurring problems” that the practitioners have developed over time and through sustained interaction and which they utilize in their (professional) lives (Wenger, 2006, p. 2). The *community* consists of practitioners who have bonded due to their shared interest (domain). The community is representative of the joint activities, discussions, assistance, and shared information that occurs amongst the members. It is marked by the relationships and interactions that allow the participants to learn from each other and by the creation of *practices* that differentiates the participants from other people and even from other similar domains (Wenger, 1998; 2006). CoPs do not exist without the presence and the iterative interaction of the domain, its practices, and its community.

Communities of practice can be further defined and examined through five requisite dimensions (Wenger, 1998):

- purposeful mutual engagement amongst the members,
- joint enterprise (the domain/problem space which defines the CoP),
- shared repertoire of tools, skill sets, vocabulary, etc. that arises as a result of mutual engagement,
- sense of community wherein members form "strong personal interrelationships" (Murillo, 2011) that are not (necessarily) grounded in friendship/affection (Wenger, 1998), and
- learning and/or identity acquisition, though the CoP may not recognize such as its "official" goal (Hoadley & Kilner, 2005).

In educational contexts, the CoP model expresses formal education not as “a self-contained, closed world in which students acquire knowledge to be applied outside [of school], but a part of a broader learning system” wherein the classroom “is not the primary learning event;” rather, “it is life itself that is the main learning event” (Wenger, 2006, p. 5). Schools, then, have an obligation to structure learning environments that facilitate “learning that happens in the world” (Wenger, 2006, p. 5). Consistent with constructivist views of learning, the individual cannot be separated from the learning experience (Wenger, 1998). It is this emphasis on community-based learning and problem solving, along with the collaborative and iterative development of practice within the boundaries of a specific domain, which guided the development of the online graduate course-based CoP environment.

Overview of Methodology

Teddlie and Tashakkori (2009) described the generation of a study’s research question(s) as a focal point wherein activities that “precede the emergence of the question” funnel to the point of the stated research questions and then funnel out into the activities driven by those research questions (p. 129). The research questions generated through this process for this study indicated a correlational design was in order; the research model is illustrated in Figure 2. Correlational research is indicated when the researcher seeks to determine the strength and direction of relationships among variables (Gall, Gall, & Borg, 2007).

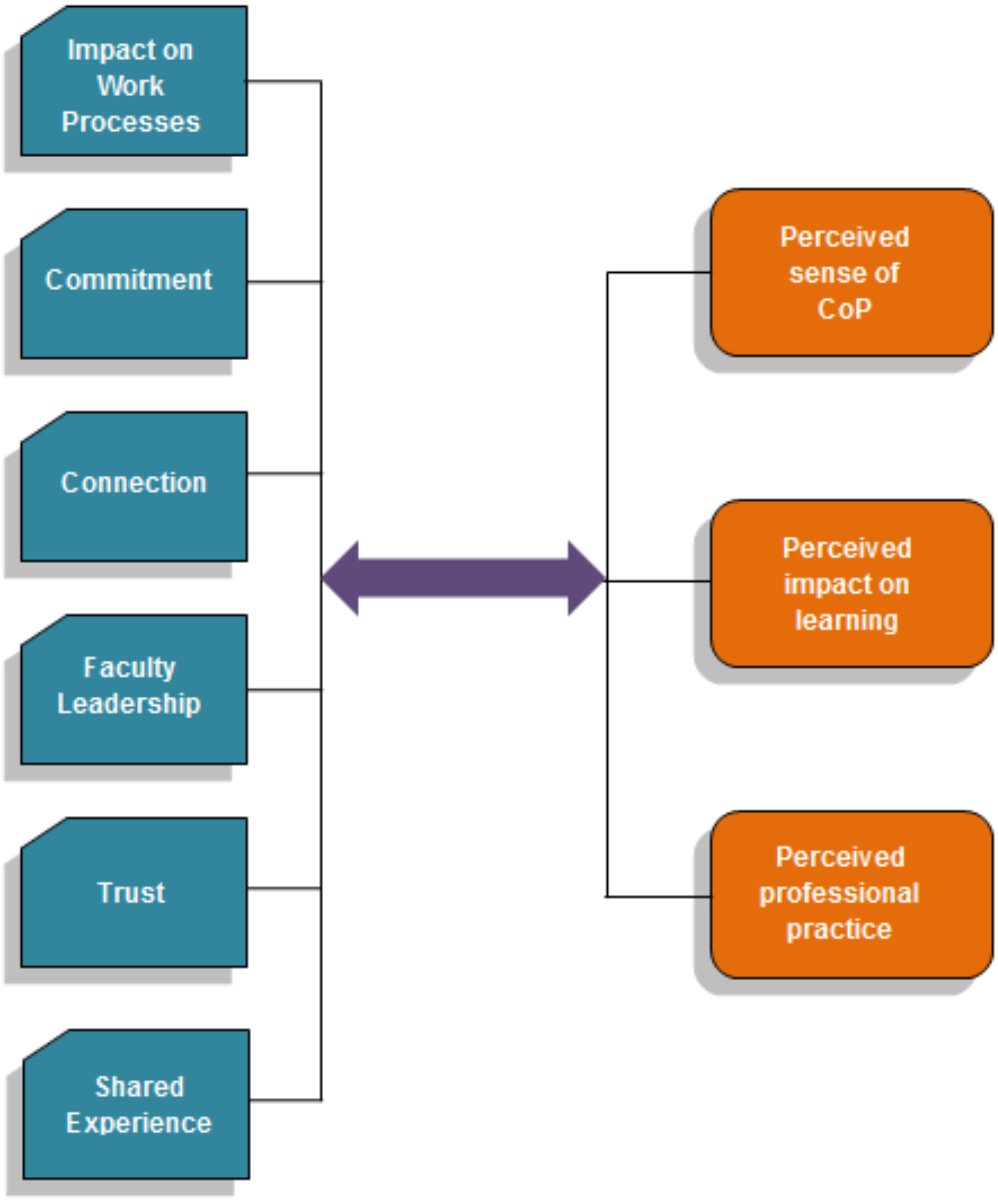

Figure 2. Conceptual framework of an online graduate course community of practice. The CoP environment was explored through characteristics defining its effectiveness as well as student perceptions of membership and value.

Unlike regression studies, wherein the objective is to predict scores, events, and behaviors (Hinkle, Wiersma, & Jurs, 2003), correlational studies "attempt to *understand* or *explain* the nature of a phenomenon for purposes of testing or developing theories" (Licht, 1995, p. 21, emphasis in original). This allows correlational research to be both

confirmatory and exploratory in nature (Teddlie & Tashakkori, 2009). The objective of this study was to begin to determine the degree to which CoP characteristics shown to describe CoPs in field settings also explained CoP effectiveness in an online graduate classroom environment, as well as to reveal the impact of these characteristics upon perceived content learning and perceived exposure to the profession.

Data were collected through closed, Likert-style survey questions. Because this study was examining multivariate relationships, a canonical correlation analysis (CCA) was used to determine the degree and direction of relationships among the predictor variables (shared experience, sense of commitment, community leadership, sense of connection, impact on skill, and trust) and the criterion variables (perceived membership in an online course-based CoP, perceived value on content learning, and perceived exposure to the library profession). A commonality analysis also was conducted to provide additional clarity of the contributions to the various relationships.

Study Significance

While this study was targeted toward online and distance educational settings, the results should be of benefit to anyone utilizing online learning in formal and informal blended and online environments. Reports indicate that online learning is a growing phenomenon with the ability to reshape educational practices as people know them, particularly in the realm of graduate and organizational education (Peltier et al., 2007). For programs to remain competitive in the quality of their online offerings, it is important that educators understand how to create online environments that harness the creative, collaborative, and mentoring power created by individuals seeking to solve specific information needs within a particular domain.

Though there exists an abundance of literature and research examining learning communities in the academic setting, and while CoPs have been utilized and studied extensively as an organization knowledge management model (McDermott & Archibald, 2010; Wenger et al., 2002) and have provided a theoretical basis for doctoral community learning processes (Green, 2006; Pyhalto, Stubb, & Lonka, 2009) and even course design (Yukawa, 2010b), these research efforts did not explore the impact of the students themselves upon the opportunity to take a course environment and create an area in which they empower themselves to become professionals in their field. This study begins to fill that gap by exploring the experiences of students gaining membership in library science through their formation of a CoP environment.

Limitations

The case chosen for examination in this mixed methods study was a required core course for the degree of master's in library science. Though the sample was diverse in levels of experience, ethnicity, and age, results cannot be generalized to all library science students and certainly not to all online graduate courses. However, the study design and implementation are replicable, and readers should find this study and its results useful in designing and fostering their own CoP environment in an online course.

Summary

Research indicates graduate programs are concerned not only with academic learning, but also with imparting a degree of professional knowledge upon their

students. CoPs are learning and information networks wherein members not only share knowledge, but also create, revise, and transfer that knowledge to current and future participants (Seaman, 2008). The formation of a sense of identity within the community's domain is a critical component of CoP participation (Barab, et al., 2002; Lave & Wenger, 1991; Wenger, 1998). Traditionally, CoPs were thought to be "spontaneous" entities that worked best when organizations took a "hands-off" approach to their existence (Lave & Wenger, 1991; Wenger, 1998). However, research soon indicated that to harness the power of a CoP as a learning community and a means to manage long-term organizational memory, organizations (i.e., management, or in the case of this research, administrators, departmental graduate programs, and teachers) have a "critical role" (Dubé, et al., 2005, p. 146) to play in the success of these communities (Bourhis & Dubé, 2010; Brown & Duguid, 2000; Dubé, et al., 2005; McDermott, 2001; McDermott & Archibald, 2010; Snyder, et al., 2003-04; Wenger, et al., 2002). By definition, then, a CoP would appear to be an excellent learning framework from which to develop interactive aspects of a graduate course.

However, few studies have examined the role of CoPs within the classroom, particularly as an element of the online graduate classroom. This multivariate correlational study aimed to begin to fill that gap by exploring the ability to successfully foster a community-of-practice (CoP) environment within an online, graduate course. The research model provided a framework for examining the relationships of CoP variables and their perceived benefits in an online graduate course which exhibited CoP characteristics. This study was the first to examine a CoP as an online course-based

entity supporting both the scholarly (i.e., academic) and professional development of its members.

The remaining paper is structured as follows: Chapter 2 consists of a literature review examining learning communities, exploring the development of the CoP as (online) learning theory, and describing current trends in library science education which are geared toward “professionalizing” the student. The literature review situates this current study within the related research streams. Chapter 3 details the research methodology and structure, including sample selection, survey development, study implementation, and data analysis approach. Chapter 4 explains the results of the data analysis, including descriptive statistics and degree and direction of discovered relationships. Finally, chapter 5 presents the findings, draws conclusions from the study, and offers recommendations for further research.

CHAPTER 2

LITERATURE REVIEW

Introduction to the Literature Review

Distance education has a long tradition, moving from mail-based correspondence courses to computer-based training to fully online, Internet-based courses (M. G. Moore, 2007a; Schlosser & Simonson, 2010). Research efforts have sought to develop learning and design models to capitalize on the strengths and benefits of these programs while mitigating what might be the most troublesome aspect of online education: feelings of isolation and a disconnect from the learning environment (McInnerney & Roberts, 2004). Communication and interaction are key factors in the success of a distance education course (Brindley, Walti, & Blaschke, 2009), to the point that "interaction" has grown beyond human-human (as described by Moore in 1973) to include student-content interaction and student-technology interaction (Jain, 2009).

Recent attention on communication and interaction in online learning is firmly grounded in constructivist epistemology (Rovai, Wighting, & Lucking, 2004). Epistemology is the study of knowledge and justified belief and how these constructs develop and manifest themselves (Steup, 2010). In a broader sense, epistemology studies "issues having to do with the creation and dissemination of knowledge in particular areas of inquiry" (Steup, 2010). Constructivist epistemology "rests on the assumption that people construct meaning actively within situated contexts of social interaction, involving a complex range of factors such as language, history and ideology" (Levy, 2003). It is this shared language, understanding, and values that allow students to use their classroom interactions to learn not only the content, but also the

practices that allow successful communication; as a result, constructivism informs many learning theories and is a dominant structure in online learning models (Akyol, Ice, Garrison, & Mitchell, 2010; Arbaugh, 2004; Balaji & Chakrabarti, 2010; Benson & Samarawickrema, 2009; DeBacker, Crowson, Beesley, Thoma, & Hestevold, 2008; Frick, Chadha, Watson, Wang, & Green, 2009; Lobel, Neubauer, & Swedburg, 2005; Rockinson-Szapkiw, 2009; Stodel, Thompson, & MacDonald, 2006; Tu & McIsaac, 2002). Research indicates that students are more successful when they feel comfortable in their learning environment, they feel a connection to the content and other students, and -- perhaps most importantly -- they feel they are supported by their instructor and the academic institution (Jain, 2009; Kang & Kang, 2008; Russo & Benson, 2003; Song, Singleton, Hill, & Koh, 2004; K. Swan, Shea, Hiltz, & Goldman, 2005).

Graduate programs, particularly masters programs, are geared toward creating critical thinkers and innovators in the discipline (Smeby, 2007). These programs recognize the importance of learning communities and faculty interaction on student academic success and satisfaction, but their emphasis on professionalization means they also need to create environments that allow for mentoring, collaboration, and other student-support interventions that can boost program quality (Wendler et al., 2010). It is this tension of creating a learning community that meets the extended needs of graduate students that guided this research. This study stemmed from observation of an online graduate course environment that exhibited the emergent properties of a community of practice (CoP) and my premise that fostering a CoP environment in online graduate courses not only could cultivate more robust learning, but also could provide

access to the tacit knowledge critical for entering the professional domain. In this respect, a CoP also could further graduate program goals of creating scholars and professionals. As well, students' perceptions of value from course-related tasks and opportunities have been shown to be an important predictor of “learning competence and academic achievement in both traditional and online contexts” (Artino & McCoach, 2008, p. 279). Thus, the objective of this study was to explore the CoP framework as a model for fostering online graduate learning communities at the classroom level which would enhance student growth related to a course and discipline's concepts, practices, values, and skills.

The remainder of this literature review provides theoretical grounding for this study by examining the role of community in learning, the importance of interaction in the educational experience (especially within the online learning environment), and the use and importance of CoPs for fostering not only learning and information acquisition, but also a sense of identity with the group (i.e., profession). Here, the social constructivist underpinnings of the CoP framework are explored and situated amongst similar learning models. Focus then turns to the CoP model as a method for leveraging the power of learning communities to enhance and extend both formal and informal learning environments. This section reviews the constructs and variables necessary to foster a successful CoP, and it examines the elements characteristic of what Cadiz et al. (2009) describe as a member’s “experienced community of practice.” Next, a CoP’s value as a model for professional learning and information sharing briefly is reviewed. Finally, the impact of members’ shared experiences is examined, and the aspect of “membership” is addressed. The literature review also places the present research

context within the current trends and practices in library science education, whose goal is to assist students in professionalization through practicums, internships, mentoring, and the like. The literature review concludes with a brief summary and restatement of this study's place in the related scholarly research.

Learning Communities

Interaction and student support are key to online and distributed learning (Anderson & Kuskis, 2007; Bajt, 2009; J. D. Baker, 2004; E. Baran & Correia, 2009; M. G. Moore, 1973, 1993). Because of the "asynchronous nature of online communication and the potential for disconnectedness" in these courses and programs, researchers have turned close attention to the virtual learning environment within which students interact and learn (Garrison, 2007). Research indicates student "impressions of the environment in which they operate are vital" (Clayton, 2007). For example, both individual and group performances are impacted significantly by students' reactions to and perceptions of the environment (Fraser, 1998), and achievement is enhanced "in those environments which students feel comfortable within and positive about" (Clayton, 2007; Waldrip & Fisher, 2003).

McMillan and Chavis (1986) defined community as ‘‘a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9), while Rovai (2002c) described the construct as a group "of learners who share knowledge, values, and goals" while experiencing a sense of community (p. 322). Rovai (2002c) distilled a number of factors indicative of a strong learning community, be it online or face to face: (a) connection to each other and to the instructor, (b)

demonstration of "the immediate communication behaviors that reduce social and psychological distance between people," (c) sharing of "common interests and values," (d) behaviors of trust and helpfulness, (e) (virtual) conversations and two-way communications, and (f) "common learning objectives" (p. 322). Garrison (2007) also argued that a learning community "requires intellectual focus (i.e., open and purposeful communication) and respect" (p. 63). Community involves more than shared interests and goals, it also includes trust, commitment, and a personal belief that one’s involvement matters.

In order for online students to develop a strong sense of community, it is crucial that the learner feels part of an environment where his or her contributions "add to a common knowledge pool and where a community spirit is fostered through social interactions" (Rovai & Wighting, 2005). Research using the community of inquiry (CoI) framework (Garrison, Anderson, & Archer, 2000) indicates a successful online learning experience must not only include this focus, but also must exhibit the learner's subsequent cognitive participation. The CoI, a framework for guiding the development and assessment of online learning communities, conceptualizes online learning best occurs within an environment constructed through the interaction of teaching, social, and cognitive presences. Teaching presence is operationalized through dimensions of course design, interaction facilitation, and direct interaction; social presence is characterized by effective communication, open communication, and group cohesion; and cognitive presence is distinguished by the phases of practical inquiry: triggering event, exploration, integration, and resolution/application. While the level of each presence will be dependent upon the course (Akyol et al., 2010; Arbaugh et al., 2010;

Arbaugh, 2008; Garrison, Cleveland-Innes, & Fung, 2010; Nagel & Kotzé, 2010) and the interaction requirements of its student members (Arbaugh et al., 2010; Benson & Samarawickrema, 2009; Jain, 2009; M. G. Moore, 1973, 1993), research using the CoI framework supports the premise that each construct must be present for optimum learning to occur within the online environment. In general, the studies on learning communities indicate that, as might be expected, it is a combination of factors that describes an effective learning environment: interaction by and with the members (Does it include the teacher? Does it foster an environment of open sharing?), course structure (Does it facilitate community development?), and content design (Does it stimulate the participants and show value to them?). Identifying and addressing the facets comprising these three primary areas is key to creating successful learning communities.

Research also indicates significant differences may exist in levels of experienced classroom community. For example, when validating his Classroom Community Scale, Rovai (2002b) noted that 375 graduate students in 28 different online courses exhibited a wide variance of community between courses. As course design and pedagogy were not controlled for in the study, Rovai (2002b) hypothesized that classroom community is sensitive to either or both of those factors. He then called for further research to identify the "course design and pedagogy-related variables that promote stronger sense of community in online courses" (Rovai, 2002b, p. 208). Studies of member perceptions of the three CoI presences (teaching, social, and cognitive) across varying disciplines also indicate differences. Lowenthal, Lowenthal, and White (2009), for instance, studied experienced community by graduate students through the lens of the CoI framework

across business, education, humanities, and computer information science disciplines at a private Catholic university. Perceptions of the community varied, though not statistically so, across the disciplines. The participants were part of an accelerated learning program in which online courses last 8 weeks, which indicated the time factor, in particular, should be studied more closely in community formation (Akyol & Garrison, 2008).

Distance education research has long shown that successful learning does not require the traditional face-to-face classroom environment (Arbaugh, 2004), and researchers recognize that geographical proximity also is not an absolute requirement for a learning community to develop (Rovai, Wighting, Baker, & Grooms, 2009). For example, Rheingold (1993), in his early influential work on virtual communities, described these virtual groups as "social aggregations that emerge from the [Inter]Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" (p. 5). Other research also indicates that a sense of community can be created in an asynchronous online environment. Rovai (2002b) surveyed 314 graduate students participating in asynchronous online courses to determine sense of community and perceived cognitive learning. Results indicated a significant positive relationship exists between students' perceived sense of classroom community and their perceived cognitive learning. The importance of a sense of community was affirmed in a study by Cameron, Morgan, Williams, and Kostelecky (2009), who looked at community in terms of group formation for class projects. While students did not particularly feel a sense of community while

working on their group task, they did indicate that social activities and required tasks related to "presence-building" were important in the classroom.

Other studies have examined community formation in terms of characteristic factors. For example, the interview phase in Outzts' (2006) study on sense of community in online courses revealed five main factors inherent within courses that students rated as having a high sense of community: "good teacher characteristics, strong student connection related to assignments, a change in personal perspective, quality learning, and satisfaction" (p. 291). Furthermore, students described courses with a high sense of community as having engaged and supportive teachers, ongoing interaction with their peers and teaching team (as with discussion and group activities), a sense of belonging and of personally knowing each other, *and* the perception of themselves as a "group of scholars" (Ouzts, 2006, p. 292).

Interaction and Online Learning

Closely related to learning communities is the concept of interaction. Moore's influential theory of transactional distance reconceptualizes distance as a pedagogical occurrence comprised primarily of elements of interaction, course structure, student autonomy (Benson & Samarawickrema, 2009; M. G. Moore, 1973, 1993). Distance -- which is physiological, as opposed to geographical (M. G. Moore, 2007b; Stein, Wanstreet, & Clavin, 2009) -- is bridged when course design (structure), dialogue (interaction and communication), and student control over learning (student autonomy) are balanced appropriately for the course and its members (M. G. Moore & Kearsley, 2004; Stein et al., 2009). Later studies have explored the relationships of these constituents. While the role of student autonomy and structure have not always

correlated to learning outcomes or predicted perceived learning (Chen & Willits, 1998; Chen, 2001), dialogue (interaction) consistently remains a critical factor for successful distance education, particularly in the online environment (Anderson, 2003), and closer examination of the interaction construct revealed several manifestations: student-teacher interaction, student-student interaction, student-content interaction and student-technology interaction (Zhang, 2003).

Other research has sought to examine the effects of interaction via the teacher's behaviors, the student's feelings of social presence, and the cognitive mental modeling that occurs during learning. As mentioned previously, the CoI framework explores interaction in terms of educational community dimensions of teaching, social, and cognitive presences. Though these modes of facilitating interaction have been studied independently from each other and shown to be significant predictors of an effective educational environment (Akyol, Garrison, & Ozden, 2009), the CoI framework posits these components are highly interrelated and not only must be experienced together (albeit at varying levels dependent upon context), but also studied together, as well. When a community of inquiry frames the social context of learning, critical thinking is encouraged (Lipman, 2003; Resnick, 1991) through student opportunities to negotiate meaning and challenge beliefs (Ramsden, 1988; Wenger, 1998). In other words, the dimensions of community, individual, and learning come together to create an optimum educational experience.

However, interacting successfully in the online environment requires that "a whole new communication process has to be learned. It is not simply a process of shifting from speaking and listening to reading and writing” (Mann, 2003, p. 119). Based

upon Mann's (2003) findings that individual, work, and group identities require greater effort to be established in the online environment, MacDonald and Thompson (2005) argued that the "ability to connect and dialogue with others influences if, and how, a sense of community emerges" and that it appeared "that being able to dialogue meaningfully in the online environment is a pre-requisite for building community" (p. 11). Building a community rich with member interaction, then, requires purposeful designing of the online environment and requires an active facilitating role by the teaching staff (MacDonald & Thompson, 2005; McInnerney & Roberts, 2004). A case study by Stein, Wanstreet, and Calvin (2009) indicated the role of instructors is particularly important in helping learners, particularly new online learners, "develop identities as learners and work in that dialogic space" that forms the online community (p. 305).

Even though numerous studies point to the importance and value of interaction within the online classroom (Hamuy & Galaz, 2010; Lowenthal & Dunlap, 2010; Morris, 2010; B. K. Walker, 2008), research also supports the intuitive hypothesis that the amount of interaction will vary amongst disciplines. For example, Jain, Cochenour, and Jain (2009) performed an interdisciplinary analysis of interaction in 39 online courses spread amongst Education (10 classes), Business (10 classes), Arts and Sciences (10 classes), and Health Sciences (9 classes). In their study, interaction was defined as the "comments or questions made to the formal instructional discussion board by the learner addressing other learner(s)" (p. 3649). The relationship between discipline and interaction was significant, and differences in discipline accounted for 22% of the difference in interaction. The results suggest interaction will vary across disciplines and, thus, researchers should explain interactivity in light of the discipline in which it occurs.

While interaction is critical, the balance of student-content, student-student, and student-teacher will fluctuate based not only upon discipline (Anderson, 2003; Arbaugh, 2008), but also upon the individual student (Arbaugh, 2004), as "each institution, discipline, region, and user group will develop unique cultural practices and expectations related to their need for and use of interaction" (Anderson, 2003, p. 141).

Some research indicates that, in actuality, online discussion allows for more student collaboration than does a face-to-face environment (Lobel et al., 2005; Peltier et al., 2007), and such interaction is a strong predictor of student learning and satisfaction (Arbaugh, 2002; Dawson, 2006). For example, by examining student behaviors in light of Rovai's (2002b) Classroom Community Scale (which examines community in terms of members' sense of trust, responsibility, connectedness, and interdependence), Dawson (2006) found a positive relationship between frequency of communication and sense of community. In their meta-analysis of the electronic group brainstorming literature, DeRosa, Smith, and Hantula (2007) discovered that online groups were more productive and satisfied with the experience than were their face-to-face counterparts. And, Lobel, Neubauer, and Swedburg (2005) found that online, non-turn-taking students created more communications than did their turn-taking face-to-face counterparts. Both student-teacher and student-student interaction was higher for the online group than for the face-to-face group. Furthermore, student-student communication increased above that of student-teacher interaction. What Lobel et al. (2005) found was that online discussion allowed the group entity to be the "center of the network," whereas with face-to-face discussion, it was “the instructor who becomes the center." The researchers considered this phenomenon to be a "group-centered," rather than "authority-centered,"

pattern of interaction that shifts the value of the community discourse from being teacher-centered to group-centered. These studies illustrate it is "the extent to which class participants emphasize and invite interaction" that drives "successful course experiences" (Arbaugh, 2002). Using the lens of Gibb's (1964) theory of group development, Lobel, Neubauer, and Swedburg (2005) explained that "openness and translucence are seen as factors that facilitate the trust formation needed to risk" the self-disclosure behaviors conducive to learning wherein such "appropriate self-disclosure, feedback, and discovery take place" (discussion section). Furthermore, It is through design, guidance, and encouragement that teachers can help encourage such an environment.

Communities of Practice

Previously, a CoP was defined as a model for learning and information acquisition wherein members not only share knowledge; but also they create, organize, revise, and pass on that knowledge to other members of the community (M. Seaman, 2008). Wenger (1998) developed the model through his research on information and learning behaviors practiced by insurance claims processors. What he found was that these individuals created supportive communities which were grounded in a common problem/subject and marked by objects such as specialized vocabulary, formal and tacit knowledge, and both invention and re-invention of relevant practices, including tools and procedures, and which were based upon a voluntary and fluid participatory relationship (Wenger, 1998). Many CoPs may exist -- on varying levels -- within the realm of one field/discipline, one social group, one organization, even one department. For example, a university might include administrative-oriented CoPs (Hung, Chee,

Hedberg, & Seng, 2005), faculty-based CoPs (Jung Won & Brush, 2009), and student CoPs operating from a cohort perspective (Green, 2006). And, individuals simultaneously can be members of any number of CoPs (Lave & Wenger, 1991). A CoP situated within an online course should be expected, then, not only to meet the information needs of the member, but also to begin the individual's development of an identity within the practitioners' CoP. The course-based CoP – which itself could be considered a legitimate peripheral participant of the professional CoP – will link to that professional CoP, but in most cases will not offer full membership. This is in part because many CoPs involve "initiation rites" such as obtaining certain credentials or passing certain rituals (Lemke, 1997).

In applied practice, many corporations typically foster CoPs as a knowledge management space and technique for preserving tacit knowledge useful for employees in their day-to-day work practices (Bourhis & Dubé, 2010). "Recognizing the tacit and collective dimensions of work" allows related learning – those 'on the job' tricks and skills learned through the 'school of hard knocks' – to be considered “a social process built around informed participation: People need information to do their work, but it is only through working that they get the information they need" (Brown & Gray, 1995). Organizational CoPs attempt to harness this learning power in order to preserve and perpetuate that ephemeral knowledge (Bourhis & Dubé, 2010). At their heart, however, CoPs are about learning (Wenger, 1998). A CoP manifests itself through a group of people who share a concern, problem, or topic (the domain) and who find value through interacting (the community) in order to better understand the formal and tacit knowledge (the practice) driving their joint enterprise (Wenger, 1998; Wenger, et al., 2002). CoPs

are situational and rooted in the practice that helps define them (Lai, Pratt, Anderson, & Stigter, 2006), and learning is achieved "through a combination of social engagement and collaborative working in an authentic practice environment" (Andrew et al., 2009). The purpose of such a learning environment, then, is not only "learning about," but also "learning to be" (B. Moore, 2008, p. 592).

As can be seen with other constructivist learning models, the community forms the core of the learning function (DeVaney, Adams, & Elliott, 2008). Barab and Duffy (2000) synthesized research from anthropology, education, and sociology to propose the following features as being characteristic of communities:

> a common cultural and historical heritage, including shared goals, negotiated meanings, and practices; an interdependent system, in that individuals are becoming a part of something larger than themselves; and a reproduction cycle, through which newcomers can become old timers and through which the community can maintain itself. (2000, p. 36)

As with other communities, it is a member's interaction – the need to share, to learn, to affirm – that drives the existence of a CoP.

The interaction that drives a CoP's existence also is the basis of its power: Members "become informally bound by the value that they find in learning together" and find strength in "knowing colleagues who understand each other's perspectives" (Wenger, et al., 2002, p. 5). Wenger, McDermott, and Snyder (2002) described the power of community membership thusly: Over time, members "develop a unique perspective on their topic as well as a body of common knowledge, practices, and approaches. They also develop personal relationships and established ways of interacting. They may even develop a common sense of identity. They become a community of practice" (p. 5).

Fostering a CoP

Though research on CoPs began through anthropological study on their spontaneous emergence in response to specific information needs of a particular group (Lave & Wenger, 1991), it soon became clear that these entities could be cultivated (Wenger et al., 2002; Wenger, 1998), making them powerful tools for learning and for information management (McDermott & Archibald, 2010; Wenger & Snyder, 2000). In its "natural" state, a CoP experiences a life cycle in which it initiates, grows, and ends based upon the participation of its members (Wenger et al., 2002). Its existence is driven by the information needs of the individual, which are met through negotiation of meaning and the perceived value of the individual's experience (Levy, 2003; Nagy & Burch, 2009; Verburg & Andriessen, 2006). Understanding how to design for these communities is key to harnessing their potential (Shacham & Od-Cohen, 2009; Tobbell, O’Donnell, & Zammit, 2010), and careful fostering of a CoP can mediate not only its development, but also its persistence (Bourhis & Dubé, 2010).

While Wenger's (1998) theoretical definition of a CoP was groundbreaking, it was difficult to intentionally implement. To assist the transition from theory to practice, Wenger and colleagues (Wenger et al., 2002) offered seven principles to guide designing for a CoP and for cultivating its characteristic "aliveness":

1. Design for evolution.
2. Open a dialogue between inside and outside perspectives.
3. Invite different levels of participation.
4. Develop both public and private community spaces.
5. Focus on value.

6. Combine familiarity and excitement.
7. Create a rhythm for the community.

When leaders – be that management, educators, or the members themselves – intentionally foster a CoP with such guidelines in mind, they can both enhance and perpetuate tacit and structured learning (Brown & Duguid, 2000; McDermott & Archibald, 2010).

Similar virtual community-building characteristics were introduced when online communication and virtual teams were still young. For example, when Cothrel and Williams (1999) studied 15 different online communities from three large corporations, they sought to answer questions still echoed by researchers such as Dubé et al. (2005), Bourhis and Dubé (2010), and McDermott and Archibald (2010), namely: How can one determine if these communities, with their varying purposes and goals, are successful? And, what characteristics are indicative of successful communities? What Cothrel and Williams (1999) argued is similar to the factors already described as important in CoP formation, namely that “to achieve their purpose, all communities must first meet one basic requirement: they must engage and involve members” (p. 4). Cothrel and Williams (1999) further asserted that such interaction is indicative of something else, that “some kind of value is being created for members” (p. 4). Though their study did not distinguish CoPs from other forms of community, Cothrel and Williams’ (1999) findings indicate three key characteristics of communities: While 1) leadership involving subject matter experts and a strong participant core can help keep the community focused, active, and growing, 2) members also must feel free to discuss and negotiate the meaning and

practices that encompass the community, and 3) this level of open communication is enhanced when participants claim a sense of "ownership" of their community.

McDermott (2001) categorized key factors for starting and supporting CoPs as four challenges that involve management (external support and communal leadership), community (membership engagement), technical (providing “access”), and personal (domain relevance for the individual). The management challenge

> is to communicate that the organization truly values sharing knowledge. The community challenge is to create real value for community members and insure that the community shares cutting edge thinking, rather than sophisticated copying. The technical challenge is to design human and information systems that not only make information available but help community members think together. And the personal challenge is to be open to the ideas of others and maintain a thirst for developing the community’s practice. (McDermott, 2001)

These four areas, McDermott argued, must be addressed before a CoP can be successful.

Dubé, Bourhis, and Jacob (2005) studied the launching of 18 virtual CoPs in 14 organizations to determine key structural factors for success. The researchers measured performance along constructs inherent to all CoPs: "actual existence," as determined by a "basic identity defined around a leader and a core group of members," and "health," which was defined as progression marked by "participation and activity" (p. 152). Similar to McDermott’s (2001) four key challenges areas, what Dubé et al. (2005) determined from data analysis, focus groups, and member interviews was that 1) formal organizational support (i.e., the ‘management’ challenge), 2) environment (i.e., the ‘community’ challenge), and 3) relevance to members' work (i.e., the ‘personal’ challenge) were the structural characteristics "most likely to explain the success or failure of a CoP at the launching stage" (p. 145).

More recent research on formal support for CoPs confirms Dubé et al.'s (2005) findings. For example, in their study examining management activities that can support virtual CoPs, Bourhis and Dubé (2010) found that three particular administrative practices most impacted the success of eight different online CoPs: "taking ongoing actions to develop a knowledge-sharing culture, providing adequate resources to the [online] CoPs, and monitoring the leadership of the community in order to address any occurring problems" (p. 175). The researchers concluded that virtual CoPs "should be implemented in an organizational environment that is not hostile to knowledge sharing; the theme used to assemble the community around should be highly relevant to its members' daily work; [and] the [virtual] CoP should be integrated into the organization's formal structure (Bourhis & Dubé, 2010, p. 176).

When the findings of these two implementation studies are interpreted for the online classroom, an interesting model emerges. Dubé et al.'s (2005) elements of organizational support (i.e., administrative issues), environment, and personal relevance also can be described as faculty support (such as instructional design and professor interaction), class environment, and individual learning. The findings from Bourhis and Dubé's (2010) study on management practices that can enhance the successful germination of a CoP environment further define the managerial role of the faculty. In the online classroom, "ongoing actions" to support the environment might be facilitated administratively through community evaluation surveys (such as that conducted by Hemmasi & Csanda, 2009). "Adequate resources" could be seen to refer to the content of the course, *but*, in terms of community, it also can be viewed as providing students with purposeful opportunity and means to participate in the online environment. And,

“monitoring the leadership of the community” might encompass not only the professor’s own presence within the class, but also the mentoring and training of teaching assistants and additional staff as to the goals, purposes, and expectations surrounding the environment. What arises from this research on fostering a successful CoP in an organizational context speaks directly to factors that educators also know to be true for cultivating a successful learning environment: Faculty interaction (as designers and participants of their courses) and student engagement (with the content *and* each other) are prerequisites for the individual’s internal intellectual conflicts that results in changes to his/her mental models … that results, in other words, in learning.

The CoP Experience

In a CoP, learning is a holistic process that involves not only an expanded knowledge base, but also a change in the individual’s identity within the group as s/he negotiates the practice – the “repertoire of tools, methods, and skills,” including “innovation activities” (Wenger, 1998, p. 18) – that characterizes the domain. It was such a holistic view of a member's participation within a CoP that guided research on member experience similar to that of both Cadiz, Sawyer, and Griffith (2009) and Hemmasi and Csanda (2009). As part of an effort to enhance “research on the organizational knowledge transfer ecosystem” (p. 1051), Cadiz et al. (2009) created two instruments to measure absorptive capacity – “the ability of an organizational unit to use past experiences to increase the ability to learn and apply new knowledge” (p. 1036) – and experienced CoP. An individual's "experienced community of practice" was defined as "the extent to which a person is engaged with the given practice community" (p. 1035). Based upon Wenger's (1998) definition, the literature describing previous CoP

research, and the researchers' own extensive pilot testing, the researchers determined four factors of CoP membership with strong explanatory power: open communication, shared vocabulary, remembering previous lessons, and learning from each other.

Open communication is grounded in trust -- the freedom to express one's position and to ask questions, the security that someone will respond, the confidence that one's interaction is considered valuable by the community (Cadiz et al., 2009). Both trust and the open communication it facilitates can be considered characteristic of all forms of community interaction, as illustrated in studies by Crossman and Lee-Kelley (Crossman & Lee-Kelley, 2004) , Dow (2008), Garrison, Cleveland-Innes, and Fung. (2010), Hemmasi and Csanda (2009), Goertzen and Kristjánsson (2007), Rovai (Rovai, 2002c), and others. The concept of *shared vocabulary* is a particularly important factor that marks communication within a CoP while also delineating it from other forms of community (Wenger, et al., 2002). In other words, this shared vocabulary helps define what is meant to be in the profession or domain. Understanding the terminology and "jargon" belonging to the domain and community also acts to mediate one's identity with the group (Caspi & Blau, 2008). *Remembering previous lessons* (Cadiz, et al., 2009) encompasses the facets of member identity and CoP self-perpetuation which occurs through the function of maintaining the group's knowledge, best practices, lessons, and tools in order to share this information as needed and to pass it along to new members (Buckley & Du Toit, 2009; Chang, Chen, & Li, 2008; Tobbell et al., 2010). Finally, *learning from each other* (Cadiz, et al., 2009) refers to the act of participating in CoPs in order to learn the tacit and formal knowledge of the domain space, to solve particular context-based problems, and to create information networks relevant to the domain

(Evans & Wensley, 2009; Guldberg & Mackness, 2009). These personal goals are accomplished by learning through interaction with other CoP members (Cousin & Deepwell, 2005; Wenger & Snyder, 2000). In validation through field testing against “satisfaction with opportunities to share knowledge and satisfaction with finding knowledge” through participation in the CoP, all of these factors were statistically significant.

Like Cadiz et al. (2009), Hemmasi and Csanda (2009) also sought to extend empirical quantitative research on characteristics of CoP effectiveness. In their study, however, the CoP experience was examined by exploring member participation in terms of characteristics that contribute to the overall effectiveness of the community. Specifically, Hemmasi and Csanda (2009) sought to determine the CoP’s impact on a member's job performance, the effect of community leadership upon experience quality, the overall satisfaction of community participation, and the role member "ownership" and accountability play upon community effectiveness. Based upon their analysis of past studies of CoPs in varying organizational contexts, Hemmasi and Csanda (2009) sought to determine the predictive power of trust, interpersonal connectedness, community commitment, leadership strength, perceived job impact, perceived community effectiveness, and overall satisfaction with the community experience. They found these variables to be reliable, with Cronbach's alpha inter-item consistency coefficients ranging from "a low of .72 for trust in community members to a high of .91 for perceived community's job impact" (p. 270).

The survey was used to explore the network of CoPs fostered by the State Farm Insurance Companies as part of knowledge management initiative to facilitate increased

and more rapid sharing and connectivity of the company's decentralized offices (Hemmasi & Csanda, 2009). The research model in this study posited member trust, perceived leadership strength, member connectedness, and member commitment would directly mediate perceived job impact (i.e., "relevance") and perceived community effectiveness. Leadership strength, commitment, and connectedness/identity accounted for 61.5% of the perceived impact variable's variance. Sixty percent of the variance in community effectiveness was predicted most strongly by perceived job impact and feelings of connectedness to the group and other members. Leadership strength also was positively correlated with perceived effectiveness. As was predicted in Hemmasi and Csanda's (2009) research model, in terms of overall satisfaction with the CoP experience, perceived connectedness, positive job impact, and community effectiveness were direct predictors of the variable. Interestingly, however, commitment (measured in terms of participation levels and activities such as purposeful information sharing) did not predict perceived effectiveness. Hemmasi and Csanda (2009) noted that comments from open-ended survey items indicated that "the greatest challenge [of membership] appeared to be finding the time needed to fully participate in community activities" (p. 275), which may have mediated the impact of the commitment variable. They also suggested that "the more significant the direct job-related value gained from engagement in community activities, the more inclined members will be to make time for such activities" (p. 275).

Similar mediators reappeared in Guldberg and Mackness' (2009) study of CoP participation, as well. The researchers studied participation in terms of dimensions that either enabled or constrained participant experiences. They found five key dimensions

mediated interaction: emotion; technology (including number of technologies used, access issues, and individual technical competence); connection to the community; level of understanding of the community's norms; and learning tensions resulting as participants strive to balance, for example, theory and practice or action and reflection.

Studies such as these reinforce the base theoretical assumption underlying a CoP: Purposeful interaction situated around a specific domain – what Hoadley and Kilner (2005) referred to as “connection” – is the driving force of a CoP.. In an online CoP, without such interaction; its accompanying practices, language, and tools; and the context within which the community resides, it becomes little more than a “document repository” (Hoadley & Kilner, 2005).

Shared Experiences and Identity

Participant connection provides the mode from which learning, information seeking, and problem solving emerges. This sharing of “personal histories and journeys” weaves a narrative which contextualizes “professional and practice development. Novices can mix with experts, academics with practitioners and mentors with the mentored” (Andrew et al., 2009, p. 608), and this sharing and negotiation of past, present, and experience aids in factoring the member's sense of professional identity (Wenger, 1998). A CoP acts to engage its members in the "process of being active participants in the practices of social communities and constructing identities in relation to these communities" (Wenger, 1998, p. 4). Motivation to belong to and participate within a CoP stems from the individual's desire to develop a sense of identity and belonging (Andrew, et al., 2009). Because learning and identity are inseparable, "there are no clear boundaries between the development of knowledgeable skills and

the development of identities; both arise as individuals participate and both become central to the community of practice" (Barab & Duffy, 2000, p. 29).

By sharing experiences, collaborating to solve problems, and utilizing the community as a source of information, a CoP allows members to learn "not just what and how to carry out a set of practices but the meaning" of that performance within the parameters of the cultural system – the community (2000, p. 47). The very existence of a CoP is based upon its “joint enterprise” (Wenger, 1998), or problem space, which necessitates sharing of tactics, techniques, tips, and tools as a function of CoP membership (B. Baran & Cagiltay, 2010; Smith & Bath, 2006). It is this sharing, and the resultant mental mapping, that reinforces a member’s professional identity and connection with the community (Barab et al., 2002; A. M. R. Correia, Paulos, & Mesquita, 2010).

This contextualized interaction focuses "on the construction of whole persons" (Barab & Duffy, 2000, p. 29), going beyond that of "learning about" a topic or subject. This emphasis on the “situatedness” of both cognition and identity holds the perspective that "it is not only meanings that are produced but entire identities that are shaped by and shape" an individual's experiences (p. 67). In such a "situated social practice" (Lave, 1997), an individual's "learning, thinking, and knowing" result from interaction in, and construction of, the world (Barab & Duffy, 2000). In a CoP, then, where members come together to learn and to share the structured and tacit practices of their domain (A. Cox, 2005), the interaction is constructed of "all of the components – individual, content, and context" (Barab & Duffy, 2000, p. 29). Members bring to the CoP varying levels of expertise, knowledge, and resources (Roth, 1998), and identity is formed as

new members learn "through interactions with other new members and more experienced peers" (Zimitat, 2007, p. 322). Concurrently, these "more experienced peers" and practitioners continue to learn and reinforce their identities through "teaching" the new members (Zimitat, 2007).

Such incremental learning is indicative of the movement of the learner's current state of knowledge toward that of expert (Zimitat, 2007) – across what Vygotsky termed the zone of proximal development, defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 68). The identity being developed through CoP participation is one of "contributing member of the community who uses and values the content being taught" as opposed to one, for example, of "student in school" (Barab & Duffy, 2000, p. 34). In graduate education, which should blur the lines of theory and practice, a course-based CoP should move learning and inquiry beyond performance (e.g., completing assignments) to extend to meaningful actions, actions that Lemke (1997) explained "have relations of meaning to one another in terms of some cultural system" (p. 43). In the case of this research, those actions relate to the profession of librarian. It is participation in this manner that prevents the activity from being an end unto itself and allows learners to begin to develop a sense of identity in their work in society and their field (Barab & Duffy, 2000). Because a primary goal of graduate programs is to create professionals capable and confident of stewarding their professions into the future (Denecke, 2006; G. E. Walker et al., 2008; Wendler et al., 2010), it is logical to assume that the opportunity to discuss real-world

work issues would benefit both working professionals and non-professional students alike. The student sharing the issue benefits from the experience of the working members of the class, while the inexperienced members are exposed to real issues and provided the opportunity to brainstorm on solutions.

Membership and Peripheral Participation

Membership and participation in a CoP exists along a continuum grounded in, and mediated by, factors such as level of experience, personal perceived value, and socio-political climate. For example, Wenger, McDermott, and Snyder (2002) described four degrees of community participation: core (which includes the CoP coordinator), active, peripheral, and outsider (e.g., interested non-member). In terms of a corporate CoP, the researchers noted that the core and active dimensions generally encompass only 10 to 15% of the entire community, respectively, while the remainder of the members participates to a peripheral degree. These dimensions are visualized in Figure 3 and are an important component when planning for a CoP because they help to judge a CoP's health. This view accounts for members that might not have the time to physically or frequently participate though they are attentive to the community's flow; and in terms of a course-based CoP, conceptualizing participation as a level of degree also could provide for the role of the teaching team as full (core) participants within the community.

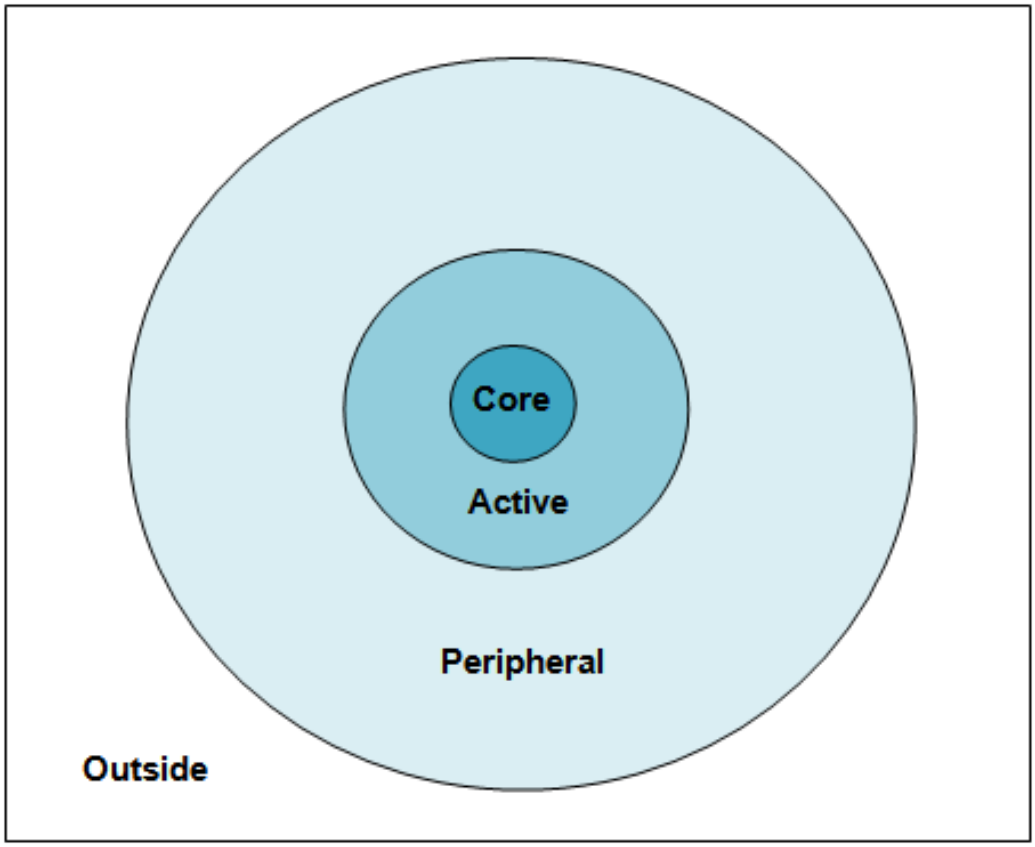

Figure 3. Degrees of participation within a community of practice. The majority of CoP participants are considered peripheral members.

Within all communities (and classrooms), there will exist individuals that are not actively involved (Beckett, Amaro-Jimenez, & Beckett, 2010; Bourhis & Dubé, 2010). This does not mean that these individuals are not deriving benefit from the community (Wenger, et al., 2002). Just because these lurkers, or "peripheral" participants (Wenger, 1998), are passive “does not mean that they are not deriving some benefit from studying the interactions of others" (Andrew et al., 2009, p. 610). And, "even failing to learn what is expected in a given situation usually involves learning something else instead" (Wenger, 1998, p. 8). Peripheral participation refers not only to a member's level of interaction, but also to the power of that participation (Lave & Wenger, 1991). Novice members do not have the knowledge to participate fully (i.e., ‘legitimately’) in the

community, which places them in a state of partial participation. As well, for both novice and expert members, peripheral participation is not a negative construct (Lave & Wenger, 1991): The dynamics of a CoP may mean particular events, actions, or states of knowledge are unrelated or irrelevant to a given member at a given state in his/her development.

Peripheral participation, then, is more than a state of membership; it is an empowering activity that allows "access to sources for understanding through growing involvement," even as it intersects the organization of the CoP and the control of its resources (Lave & Wenger, 1991, p. 37). Whether non-participation becomes a peripheral or marginalized state "depends on relations of participation that render non-participation either enabling or problematic" (Wenger, 1998, p. 167). For example, newcomers "may be on an inbound trajectory that is construed to everyone to include full participation in its future" (1998, p. 166) even though the new members are not actively contributing at the onset. However, non-participation also can be the result of marginalization (Lave & Wenger, 1991), resulting in a potential peripheral trajectory that impedes – or even prevents – learning. Sources of marginality, whether real or imagined, include gender (e.g., one or two men in a course filled with women), age gaps (e.g., one or two mature students in a class of young adults), religious views, work ethic, and any other aspect that specifically informs a CoP (Wenger, 1998).

Guldberg and Mackness (2009) found that the knowledge gap between novice and experienced members can impede participation, particularly when leadership is weak and/or the community is not focused, as was also seen in Dubé et al.'s (2005) research. However, members also may choose non-participation as a strategy to

maintain a self-imposed distance from the community (Wenger, 1998). And, while it might be construed as "disengagement and boredom," non-participation may provide an individual with a sense of "freedom and privacy" (Wenger, 1998, p. 170), particularly in the case of new members who might find the new experience overwhelming (Guldberg & Mackness, 2009). In the case of both professionals (Guldberg & Mackness, 2009) and online education students (Peltier et al., 2007), non-participation or lurking may be a survival strategy to balance academic and/or work/personal life overload.

What is relevant in this research is the fact that "for learning purposes, a community can offer peripheral forms of participation that are considered legitimate without fulfilling all the conditions of full membership (Wenger, 1998, p. 137). In a CoP, learning is tied to competence in the community, the "shared repertoire" (Wenger, 1998) that makes a member an expert in the community's practices (Putz & Arnold, 2001). The key caveat – the aspect that makes peripheral participation ‘legitimate’ – is that even peripheral membership requires "some learning along the three dimensions of competence of practice" (Wenger, 1998, p. 137). That is, membership is marked by the ability to engage mutually with other members; by the member's understanding of the CoP which results in a sense of responsibility for and commitment to the CoP; and by the member's knowledge of the community's repertoire of practice such that s/he can not only engage in it, but also recognize it in historical contexts (Wenger, 1998). As a result, learning via participation is both a matter of competence and experience (Perkins et al., 2007).

Lynch (2008) emphasized that “the objectives of all professional schools are to educate and train present and future practitioners in the profession and to advance knowledge relevant to the practice of the profession” (2008, p. 950). The American Library Association, the Association of College and Research Libraries, and other agencies have set standards of core competencies for librarians, and studies have looked at what students should know when they graduate (e.g., Gerolimos, 2009). Research indicates library and information science (LIS) instructors use a variety of methods to help students to bridge the theory-to-practice gap. Common program-based efforts include internships (Ferrer-Vinent & Sobel, 2011) and mentoring (Sugimoto, 2012), while class-based efforts include hands-on exercises and assignments and observation tasks (Adkins & Erdelez, 2006; O’Connor, 2011).

Other studies explore LIS education in terms of practices that will strengthen the student’s practical knowledge and connection with the profession. Common systems include internships and practicums (Ferrer-Vinent & Sobel, 2011), service-learning (Most, 2011), and mentoring, though mentoring often is discussed in conjunction with internships and with new-hire training (Henrich & Attebury, 2010). These studies help address ongoing concerns of disconnect between librarianship as a profession and librarianship as a field.

Perhaps the most prevalent method for integrating library education with professional practice is found in the practicum experience offered – and in some cases, required – by library science programs. This internship component in library science programs “provide a combination of training and on-the-job experience in various areas of librarianship” (Ferrer-Vinent & Sobel, 2011, p. 365). In addition to providing an

opportunity for students to explore a specific type of library, the practicum experience also typically provides for “significant interaction with other librarians and staff at the practicum library” (p. 365). With an eye toward program evaluation, Ferrer-Vincent and Sobel (2011) surveyed past practicum students and the participants’ librarian supervisors to determine the benefits of the practicum program. Though the response base was small – 10 past students – analysis of survey results indicated that participants found value in their experience even though in most cases it did not match their eventual area of work. Even more telling is that while “mentoring” was not dealt with in the survey, several participants mentioned the concept as being an important aspect of their experience – whether the mentor relationship was formal or informal. For example, one participant noted that s/he did not have a mentored relationship in the practicum experience but recognized its potential in the internship and wished it had occurred.

Mentoring within the LIS program by advisors, doctoral committees, and student peers is another out-of-class experience that can help students to traverse the degree program and the subsequent job search. In her study exploring the mentorship role of advisor and doctoral committee, Sugimoto (2012) found that doctoral students used both formal and informal meetings with each other as opportunities for support, collaboration, and information seeking. LIS students found value in informal peer mentoring in which they could “bounce around ideas” (ID217, as quoted in Sugmoto, 2012, p. 11.) And, both faculty and students commented on the positive supportive impact of a “close knit” peer community. While the focus of this study was on LIS doctoral education, these findings also mirror more general learning community

research that stresses the importance of student and faculty interaction, engagement, and support that moves beyond content-centered exchanges (Haworth & Conrad, 1997; Park & Choi, 2009; Wendler et al., 2010). Advisors seemed to describe themselves more broadly as mentors, while committee members tended to focus their mentoring experience upon the dissertation experience itself. Even peer mentoring revolved around research, teaching, and career advice – along with suggestions from more senior students of how to navigate the dissertation process.

Course-based efforts to help students gain professional knowledge and experience also exist. These content-based studies often examine skill sets and professionalization in terms of a specific area – for example, academic librarianship (Bailey, Jr., 2010) and reference services (Adkins & Erdelez, 2006). In addition to their specific goals, such studies also provide value by pointing out areas of specific weakness and suggesting future research. Reference education research such as that by Adkins and Erdelez (2006) and, more recently, O'Connor (2011), is particularly relevant to this study.

Adkins and Erdelez (2006) used a mixed-methods approach to examine teaching methods for source instruction. Forty respondents from the 48 American Library Association (ALA)-accredited programs surveyed described a total of 61 courses taught. Based upon the analysis of six quantitative and six qualitative survey items, Adkins and Erdelez (2006) found that source instruction primarily occurs through discussion and by students' hands-on activities, though these activities might not occur within the classroom. Hands-on assignments were categorized generally as 1) reference-question exercises completed in part through comparing two or more sources and 2) evaluation

of sources using “professionally established criteria” for comparison (p. 55). Though library observation assignments are common in the core reference course (O’Connor, 2011), in Adkins and Erdelez’s (2006) study, only one instructor cited their use as a source instruction support method.

O’Connor’s (2011) approach to studying the current state of reference education was to analyze 74 unique syllabi for reference courses in 55 ALA-accredited institutions in the US and Canada. The courses focused on four broad areas: sources, the reference process, reference services, and history and development (including, but not limited to, ethics and trends). As part of the curriculum survey, assignment activities were examined in terms of course outcomes. The majority of outcomes were met through reference problem sets, source evaluations, and a reference observation exercise. O’Connor found that though changes to the curriculum were occurring, basic components were remaining relatively stable. For example, “discussions of search strategy, reference source types and evaluation, and the reference interview” continued to form the core curriculum (p. 333). What is more telling, though, is that while instructors recognized a “great need to add new content in response to the fast-changing information environment” (p. 333), they were unsure how to incorporate this content into an already full curriculum. Specifically, instructors were not sure which current content should be removed to accommodate the newer topics and elements.

These studies indicate a need for course-based structural components that are fluid enough to allow instructors and students to direct learning and professional development in new topics while also providing students currently working in the field to further enhance their education based on their professional needs. When facilitated by

the ‘mentoring’ leadership of the teaching team, the member-driven interaction of a CoP holds the potential of allowing each course section to respond specifically to the professional needs of the students and the changing face of librarianship. Recently, Yukawa (2010a, 2010b) explored the benefits of utilizing a CoP approach to implement course content in the blended learning environment. Yukawa (2010a) created a model for LIS education grounded in the CoP framework. Her approach grounded learning processes and outcomes through the dualities that Wenger (1998) argued mediate community-based learning: participation and reification, the designed and the emergent, the local and the global, and identification and negotiability (2010a). The initial application of the model in a redesigned implementation of Yukawa’s section of the blended Reference and Online Services course indicated that students not only acquired the target professional practices (i.e., the course goals), but also they identified their “communal” course-based activities as beneficial to their learning experience (2010a).

A subsequent application of Yukawa’s (2010b) model in additional courses also showed positive results. Students described themselves as engaged, and their survey responses indicated their participation was aligned around similar goals (domain and practice). While learning along CoP tenets seemed to occur and matched the majority of learning objectives articulated in Yukawa’s syllabi, evidence of learning as a professional and of forming a sense of identity with the field was inconclusive. This may be a result of questions being geared toward course-based concepts, and it may have been influenced by the relatively small number of participants (34, representative of three courses) (2010b). However, one interesting aspect from Yukawa’s model was that

students experienced and highly valued the collaborative environment which evolved from the learning model. Collaboration was not a formal concept or practice in the course syllabi, yet students in all three courses valued the experience as a professional tool. Overall, using the CoP model to frame the practice- and theory-based course objectives appeared to have “positive effects on the learning process” among students in Yukawa’s three graduate-level LIS courses (2010b, p. 126).

What begins to emerge from research surrounding LIS education is the tension between content learning and professionalization, and how the educational program can help bridge that gap. Inherent in this tension is the question of how instructors can utilize their independent classrooms to help foster such a culture of professional learning, particularly when the class is online and brings together students not only from around the country, but also potentially from around the world. A CoP offers a theoretical framework from which to foster a learning environment that allows the students to drive their professional growth and identity through mentoring, information sharing, and interaction (both with content and each other), allowing a personalized, student-driven learning experience.

Summary

Communication and interaction are key factors in the success of a distance education course (Brindley et al., 2009). Research indicates that the concept of "interaction" has grown beyond human-human (as described by M. G. Moore, 1973) to include student-content interaction and student-technology interaction (Jain, 2009). Constructivist and social learning theories discuss learning interaction in terms of a community (Rovai, 2004). A learning community, then, can be viewed as a group "of

learners who share knowledge, values, and goals" while experiencing a sense of community (Rovai, 2002c, p. 322). In order for online students to develop a strong sense of community, it is crucial that the learner feels part of a learning community where his or her contributions "add to a common knowledge pool and where a community spirit is fostered through social interactions" (Rovai & Wighting, 2005, p. 100). Students describe courses with a high sense of community as having engaged and supportive teachers, ongoing interaction with their peers and teaching team (as with discussion and group activities), a sense of belonging and of personally knowing each other, and a sense of considering themselves as a "group of scholars" (Ouzts, 2006, p. 292).

CoPs are one form of learning community whose specialized focus makes it a promising framework for online graduate course instructional design. Previously, a CoP was defined as a model for learning and information acquisition wherein members not only share knowledge, but also create, organize, revise, and pass on that knowledge to other members of the community (M. Seaman, 2008). Understanding how to design for these communities is key to harnessing their potential (Shacham & Od-Cohen, 2009; Tobbell et al., 2010), and careful nurturing of a CoP can mediate not only its development, but also its persistence (Bourhis & Dubé, 2010).

The literature reveals the numerous tensions and factors existing within an individual's membership in a CoP. The primary focus in this review was upon the characteristics indicative of a successful CoP experience. In research, such factors have been shown to predicate effective communities which have been intentionally fostered (e.g., Bourhis & Dubé, 2010; Green, 2006; McDermott & Archibald, 2010;

Pyhalto et al., 2009; Wisker et al., 2007). The function of a CoP is (specialized) learning: The knowledge embodied within a CoP is found within the "skills, understanding, and relationships of its members as well as in the tools, documents, and processes that embody every aspect of this knowledge" (Wenger et al., 2002, p. 11). In other words, a CoP is grounded in the reciprocal sharing, modification, and re-assimilation of practices inherent to the community's purpose, and these experiences provide the substance from which members realize value. In an online graduate course such professional practices can be shared by faculty and working student alike, and this voluntary sharing is perhaps the most defining factor in a course-based CoP.

Disciplines such as library science make for fertile testing ground of the premise that an online course-based environment in which students perceive themselves as members of a CoP will enhance those students' sense of perceived learning and professional identity. Professional agencies such as the American Library Association, the Association of College and Research Libraries, and others have set standards of core competencies for librarians, and accredited programs are required to illustrate how this knowledge and accompanying skill sets are manifested throughout the student's education. Thus, helping students to bridge the theory-to-practice gap is a critical emphasis of library programs. Internships, practicums, service learning, and mentoring are common learning systems (Ferrer-Vinent & Sobel, 2011; Most, 2011), but at the course-based level, human-human based systems for interactively developing a professional identity are scarce. Rather, professionalization efforts in courses are often grounded in the content and focus on skill sets (Bailey, Jr., 2010). For example, source instruction often uses student hands-on activities (whether in or outside of the

classroom) such as reference-question exercises and source evaluations (Adkins & Erdelez, 2006). Library observation assignments also are a common method for enhancing professional connection to the field (O'Connor, 2011). However, these course-based methods do not allow for the professional interaction, connection, and camaraderie that mark identity formation (Lave & Wenger, 1991; Merriam et al., 2003; Wenger, 2006). A class community fostered on CoP principles could allow the organic, dynamic growth of professionalization grounded not only in the relevancy of the course content but also in the individual students' needs.

CHAPTER 3

METHODS

Introduction to the Research Methods

The goal of this research was a) to determine if characteristics defining traditional communities of practice (CoPs) also correlated to an online graduate course environment and b) how those characteristics related to perceptions of value and exposure to the profession. The assumption underlying this study was that a CoP framework could provide a learning model which supports both learning and professional development in online graduate courses. To evaluate these relationships, I surveyed students who participated in an online graduate course which exhibited traits of a CoP environment, specifically, the Fall 2010 online core Introduction to Information Access and Retrieval (IIAR) course. This graduate course was a requirement for obtaining the degree of master of science with an emphasis in library science. Students who participated in the combined multiple sections of one professor's offering of the IIAR course were asked to evaluate elements of the course environment constituting the online learning community.

The CoP environment in the online classroom was explored directly and indirectly using a multivariate correlational design. Students were asked directly to consider their experience in the course culture in conjunction with their understanding of the definition and purpose of a CoP and to determine if the course environment fostered a CoP, if the course environment enhanced their learning experience, and if the experience in the course environment enhanced their identity with the profession. The CoP environment also was examined indirectly in terms of characteristics shown to

describe an effective CoP implementation, namely: shared experience, sense of commitment, community leadership, sense of connection, and trust.

In the remainder of this chapter, I describe the research design, the research context, and the data collection and analysis procedures. The research design section provides the rationale for the use and the structure of the multivariate correlational design. The research context section provides a description of the structure of the IIAR class online environment. The data collection and analysis section provides results from the pilot study, a description of the population and sample, a description of the data collection instrument, the procedures for recruiting participants and for collecting data, and the analysis methods used to explore the research questions. This section also describes assumptions and the methods taken to ensure validity.

Research Design

A study's research questions are the fundamental guide from which to make methodological choices in the study: "research methods should *follow* research questions in a way that offers the best chance to obtain useful answers" (R. B. Johnson & Onwuegbuzie, 2004, pp. 17–18, italics in original). The questions guiding correlational research are concerned with the relationships between particular independent variables and other dependent variables. Such a design is indicated when the researcher wishes to better understand a phenomenon like a CoP by beginning to identify the factors with which it co-occurs (Licht, 1995).

This study followed a non-experimental, multivariate correlational design. Multivariate statistical methods allow researchers to examine relationships between two or more variables sets. While bivariate correlation tests the relationship between two

variables, and multiple correlation (such as multiple regression) measures how well a criterion variable can be predicted using a linear function of a set of predictor variables (or vice versa), multivariate correlational methods allow the researcher to examine relationships between multiple predictor variables and multiple criterion variables. In other words, bivariate correlation examines a one-to-one (i.e., linear) relationship, multiple correlation examines a many-to-one relationships, and multivariate correlation examines many-to-many relationships. Before the advent of computational software, multivariate analysis was completed by performing multiple univariate tests on the individual dependent variables using the same independent data set (Sherry & Henson, 2005; Thompson, 2000). However, newer software and computing power options now allow for increased use of multivariate analysis techniques (Hair, Jr, Black, Babin, & Anderson, 2009a).

Multivariate methods are useful because they “best honor the nature of the reality that most researchers want to study” in that they allow for a reality where “most effects have multiple causes and most causes have multiple effects” (Thompson, 2000, pp. 285–86). Because the objective of this research was to examine not only CoP characteristics in an online graduate course, but also the value and sense of professional connection students perceived from the environment, a multivariate design and analysis method was merited. As well, multivariate tests minimize Type I errors because “they allow for simultaneous comparisons among the variables rather than requiring many statistical tests be conducted” (Sherry & Henson, 2005, p. 38). Type I errors, also called false positives, occur when a researcher rejects a true null hypothesis

and falsely claims there is a relationship in the population (B. Johnson & Christensen, 2008).

Canonical correlation analysis (CCA) is a multivariate statistical model which allows a researcher to analyze relationships within and among two variable sets (generally referred to as the predictor and criterion variables, but causal relationships must be very carefully inferred in CCA as it is a *correlational*, not *causal*, analysis method) (Hair, Jr et al., 2009a). This method allows the researcher to "evaluate the degree that two variable sets are related to each other and then determine how the specific variables function in the multivariate relationship" (Nimon, Henson, & Gates, 2010, p. 704). In a way, CCA is similar to multiple regression: multiple regression allows the researcher to explore the relationships between multiple independent variables and a SINGLE dependent variable (or vice versa – the point is that multiple regression examines a many-to-one or one-to-many relationship). CCA can be considered to "expand" multiple regression in that it allows the researcher to examine relationships between multiple independent (i.e., predictor) AND multiple dependent (i.e., criterion) variables. However, it must be emphasized again that CCA is a correlational, not causal, model, even though the independent variables typically are noted as "predictor" variables in this form of analysis.

CCA functions by creating a canonical variate for the possible relationships between each variable in both the predictor and criterion variable set. Each canonical variate is a linear combination that represents "the optimally weighted sum of two or more variables" which are formed for both the dependent and independent variables in each possible variable relationship (Hair, Jr et al., 2009a, p. 5). There will be as many

variates “as there are variables in the smaller variable set” (Sherry & Henson, 2005, p. 40). For example, in the case of this research, there were five predictor variables and three criterion variables. Thus, a CCA analysis would create three canonical variates.

Sherry and Henson (2005) explained that “CCA examines the correlation between a synthetic criterion and synthetic predictor variable that are weighted based on the relationships between the variables with the sets” (p. 39). These relationships are generated as linear combinations amongst the predictor and criterion variables which have the maximum correlation to each other after the previous function’s variance has been removed (Tabachnick & Fidell, 2012). Thus, “the first function creates the two synthetic variables so that they are as strongly correlated as possible given the scores on the observed variables” (Sherry & Henson, 2005, p. 39). The next function takes the residual variance remaining and creates two more synthetic variables that are as strongly correlated as possible within that variance and under the condition that “these new synthetic variables are perfectly uncorrelated with both of the synthetic variables in the first function” (p. 40). This process repeats until the variance is explained or until there are as many variate functions as there are variables in the smaller of the original variable sets (recall that in this study, that would be three variate function sets). The general research design for this study can be conceptualized as shown in Figure 4.

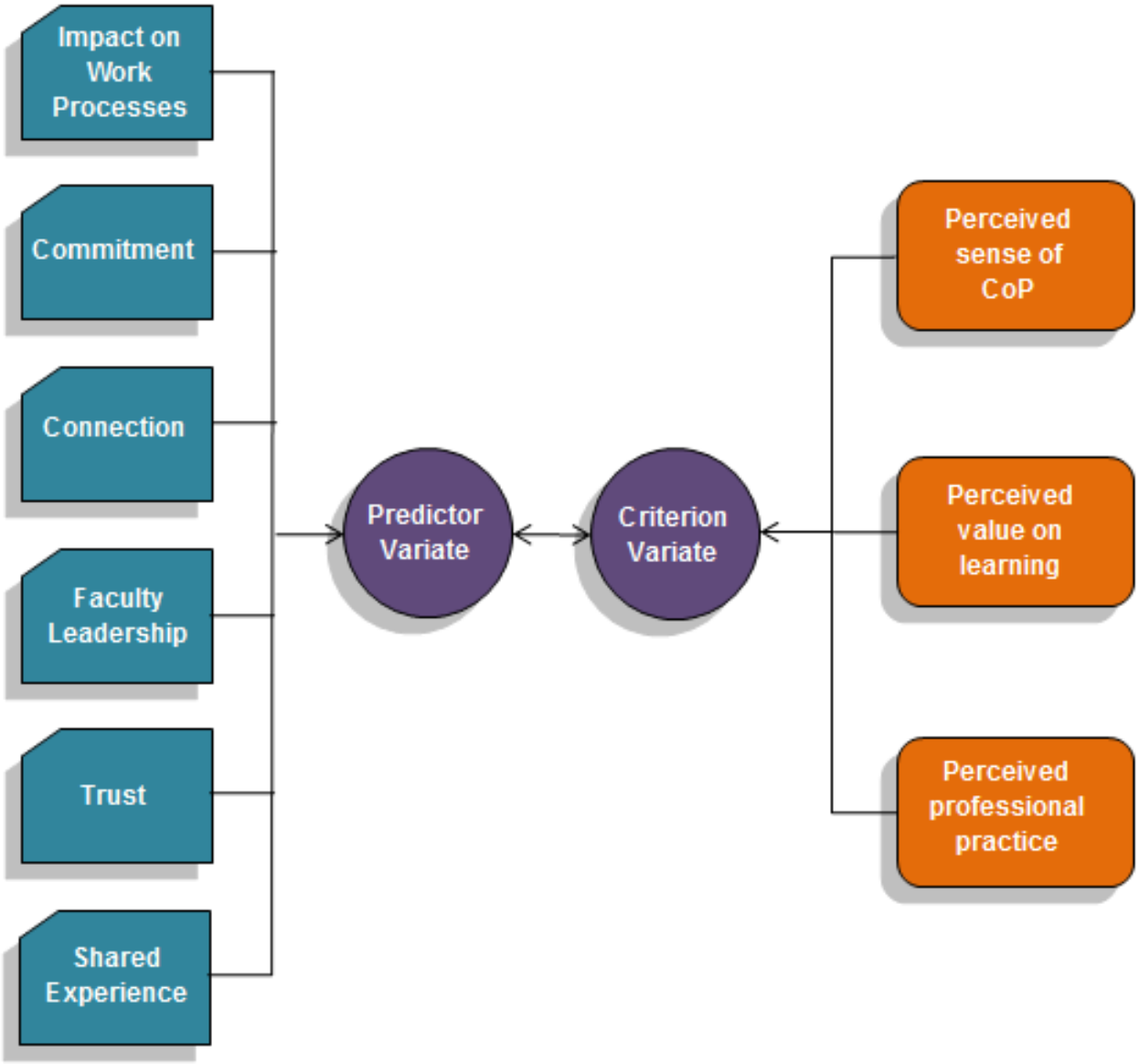

Figure 4. Representation of the first function of the canonical correlation analysis of the research design. In the actual analysis, the process will determine the appropriate combination of both predictor variables (to comprise the predictor variate) and criterion variables (to comprise the criterion variate) which will create the strongest correlational relationship for the first function. The remaining two variable sets and variance will be considered in each consecutive canonical function, respectively.

The data for this design was collected through a survey employing a Likert-style questionnaire of 44 forced-response items (38 CoP-related items and 6 demographic items). Each predictor variable was captured through a Likert-scale of four to seven

items. Three Likert-styled perception-driven items captured data pertaining to the criterion variables.

Research Context

The CoP framework provided a well-researched and substantiated model from which to initiate a professional, inquiry-based learning environment. The online course evaluated in this research was an established course whose class community exhibited CoP characteristics in which members (both faculty and student) could share experiences, solicit professional insights, and discuss real-world problems to learn professional practices apart from required content-based discussion assignments. During the fall 2010 term, the Department of Library and Information Sciences enrolled 1180 students in the LIS program. The IIAR course studied here generally enrolled a combined population of 100 to 150 students. Though IIAR was a required course, it could be taken at any time in the student's course sequence. Typically, students took this course during the first third of their program coursework; however, students following the school librarian curriculum took the IIAR course during their last semester.

The course and degree were offered by the University of North Texas (UNT), a large research university situated in the southwestern region of the United States. The University offered the IIAR course in both an online (with an introductory on-campus component) and face-to-face format; however, the professor of the course surveyed in this study taught this course only as the blended online offering. In this particular blended model, known as the 'Web Institute,' students came to campus to participate in one- to four-day, all day sessions at the beginning of the course semester. These on-campus days, scheduled from 8 am to 5 pm, allowed the professors to acclimate the

students with the online learning environment while also providing students with the opportunity to engage with each other in a face-to-face atmosphere. The Web Institute component of this IIAR course lasted for three days. The online delivery platform was Blackboard Vista, and this professor's IIAR course was offered only in the fall semester of each year.

Population and Sample

The population studied in this research was the graduate students who completed the fall 2010 offering of the IIAR course. The course grade book indicated 168 students completed the course (N = 168). Simple random sampling of the population was employed to obtain participants for the study. Because each member of the course was subjected to the CoP-fostered environment, each individual could be considered a purposive sample of the population.

Environmental Structure of the Course

Because the IIAR course was a large, required course comprised of combined sections, it was afforded several teaching assistants to facilitate teaching content, grading assignments, and interacting with the students. Each IIAR faculty member in the course held library science degree accredited by the American Library Association (or its equivalent) or was working towards a PhD in Information Science. Most currently also were practicing librarians. I had been working as a doctoral teaching assistant in the IIAR course for six years. I held grading responsibilities for two years, with current responsibilities at the time of this study revolving around course development and

implementation, satisfaction assessment, technical troubleshooting and training, and oversight for student issue resolution.

The professor and teaching team facilitated the CoP environment primarily through the Blackboard Vista discussion board tool, though they also utilized in-course email and the University-integrated third-party Horizon Wimba Live Classroom tool to facilitate communication and information sharing. The discussion area was divided into two primary categories:

- a main area (i.e., Blackboard Vista discussion category) supporting the course and
- a groups area (category) supporting individual student engagement with, and discussion of, the course content.

The discussion forum framework detailed below had been utilized since the course's online inception in 2002.

The professor introduced the class to the discussion forum layout via information in an "introduction to the course" document that led and directed the student's first engagement with the course. The purpose and use of each board was described, along with a section encouraging students to utilize the boards, rather than email, to ask questions and to trouble-shoot course-related issues. It was emphasized that responses and support can occur quicker through the open discussion forum as opposed to private email, and students were encouraged to support one another by answering questions and providing comments. In addition to providing this detailed overview of the course’s environmental structure, an opening post was placed into each board which either

introduced the overall course environment (as in the Main board) or explained the purpose of, and expected use of, the board.

*Main category***.** The Main discussion forum category contained individual topical boards that were related to course content, environment, and interaction. These boards fulfilled support functions related to content and technology, provided a social area for introductions, and offered an information sharing area to foster camaraderie and professional growth. These topical boards could be amended as necessary to fit a specific context, but the core set of boards utilized in this learning environment, as well as the professor's other online courses, was a main board, assignment/peer help board, chat board, tech support board, faculty contact board, student introductions board, and faculty-only board (which was not visible to the students).

With the exception of the faculty-only board, the boards in the Main discussion area were visible and accessible to all students and faculty members. The class business/main board was used primarily by the faculty for distributing course-related information (e.g., reminders, guest-speaker announcements, course access issues, etc.) and university-related information (e.g., courseware upgrades, library access issues, related special events, etc.). The opening post in this board not only introduced the general discussion area structure, but also provided additional course information and set the general tone which would be projected by the faculty throughout the semester.

The assignment/peer help board supported course and assignment related questions. In the introduction to the course document, the professor stated that “as a peer help board, questions may be answered by peers as well as faculty and teaching

assistants.” Regarding help requests pertaining to specific assignments, students were encouraged to assist each other with tips and hints toward the answer but to NOT give direct responses.

The course technical questions board (i.e., tech board) was a specialized area where students (and faculty) could post questions and problems about course-related technology. Studies support the intuitive hypothesis that providing technical support within the course itself can enhance students' positive feelings about their online course experience, even in the advent of unpleasant technical difficulties (Sandler, 2010). In the introduction to the course document, the tech board was described in general terms as being the location "for all technical questions and problems" and was "for use by everyone." The opening posts in the tech board provided several items of information, each of which was categorized in its own respective thread and included

- courseware problems, such as broken links and access issues;
- general technical problems, such as error messages when attempting to use tools; or
- basic direction for utilizing the html editor for creating formatted posts.

Next in the list of topical boards was the social chat board, which the professor entitled “casual chat, news, rants and raves” and which will be referred to from henceforth as the casual chat board. This board acted as an area for socializing with each other (student-student as well as student-faculty and faculty-student), information seeking, and information sharing. The course introduction document described the board as an optional area "for all discussion not directly related to course business." In terms of socializing, students could use the board to share quotes, sports scores, fun

trivia, and personal information. Students used this board to seek information from (primarily) their peers in terms of course reviews, interview tips, and job-related assistance. Students also used the casual chat board to share a variety of information, as illustrated by post headings such as "a simple way to remember some of the evaluation criteria," “Amazon and censoring stand," and "Helpful APA style website." The opening post was casual in tone and encouraged freedom in posting both practical and fun content.

The faculty contact board was where each faculty/teaching assistant member introduced her/himself with a brief biographical-type blurb; posted general times when the individual would be checking the course (e.g., "I will check in every day, Monday through Friday."); provided additional contact information, if desired (e.g., an email address outside of the course-based email correspondence tool); and uploaded a picture. The course professor provided a post introducing both herself and the board. Postings by the additional faculty members typically included a brief biographical sketch, including current/past work experience, time on the teaching team, research interests, etc.

The profiles, pictures, and intros board was described in the course introduction document as a place "for students to introduce themselves to their faculty and classmates." It was emphasized that participation in this board was optional, though students were encouraged to share a bit about themselves and to post a picture. At least one faculty member replied to each student’s introductory post.

The faculty chat board was not visible to the students. The opening post was directed at the teaching team and described the board as a private forum available to

the faculty in order to discuss and remain current on course-related issues and problems. The conceptual structure of the main discussion area is illustrated in Figure 5.

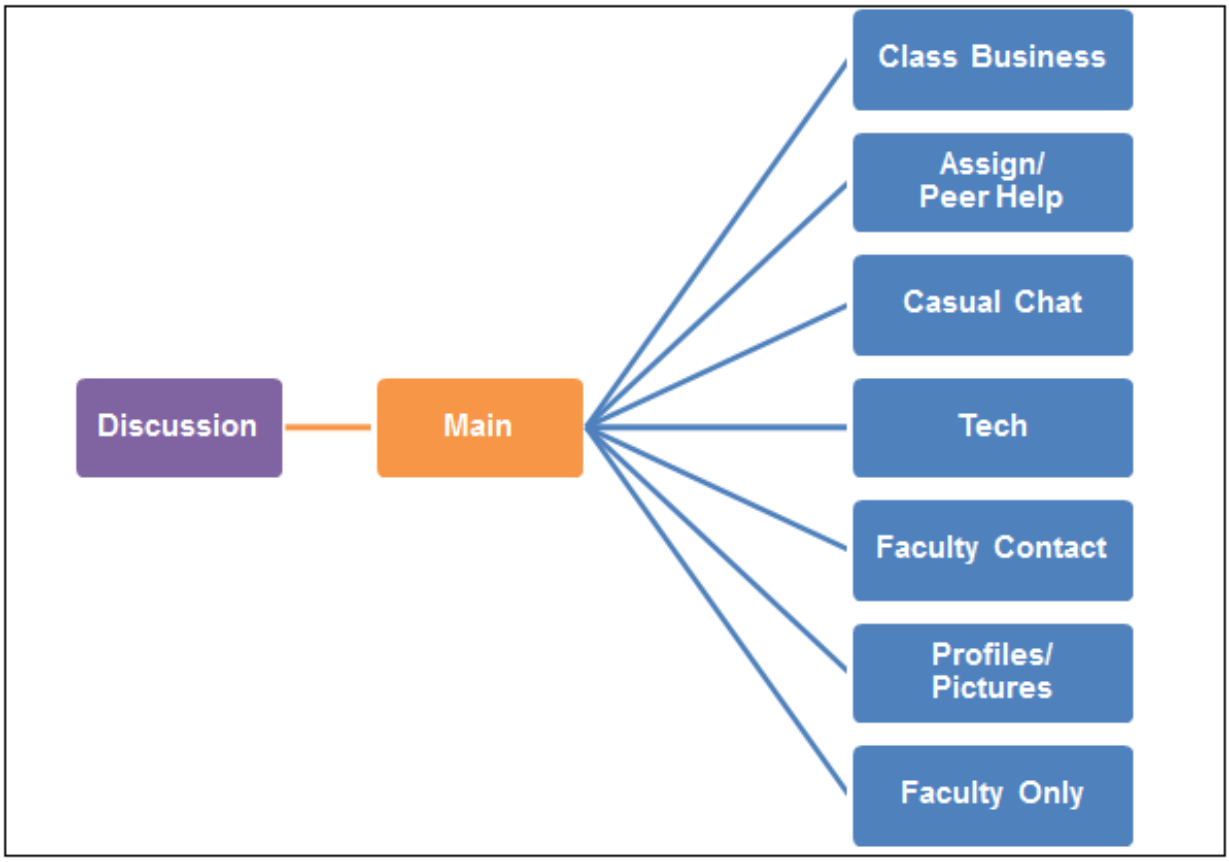

Figure 5. Conceptual structure of the 'Main' category discussion area.

Groups category. The second categorical section in the community environment contained the group-based discussion boards into which students were assigned. The conceptual structure of this discussion area is illustrated in Figure 6.These faculty-guided boards supported student discussion of specific assigned course content as well as the ensuing threads stimulated by student posts. In the introduction to the course document, the professor explained these discussion areas were where students groups would interact as instructed in the "talking points" for each weekly module. As well, students were advised that they would be assigned to a group to which they would

remain a member throughout the semester. Social constructivism posits individual learning occurs as the person engages with the material/problem space, interacts with others' conceptualizations as a mode of inquiry and assimilation, and integrates that experience within his/her own mental models (Wenger, 1998).

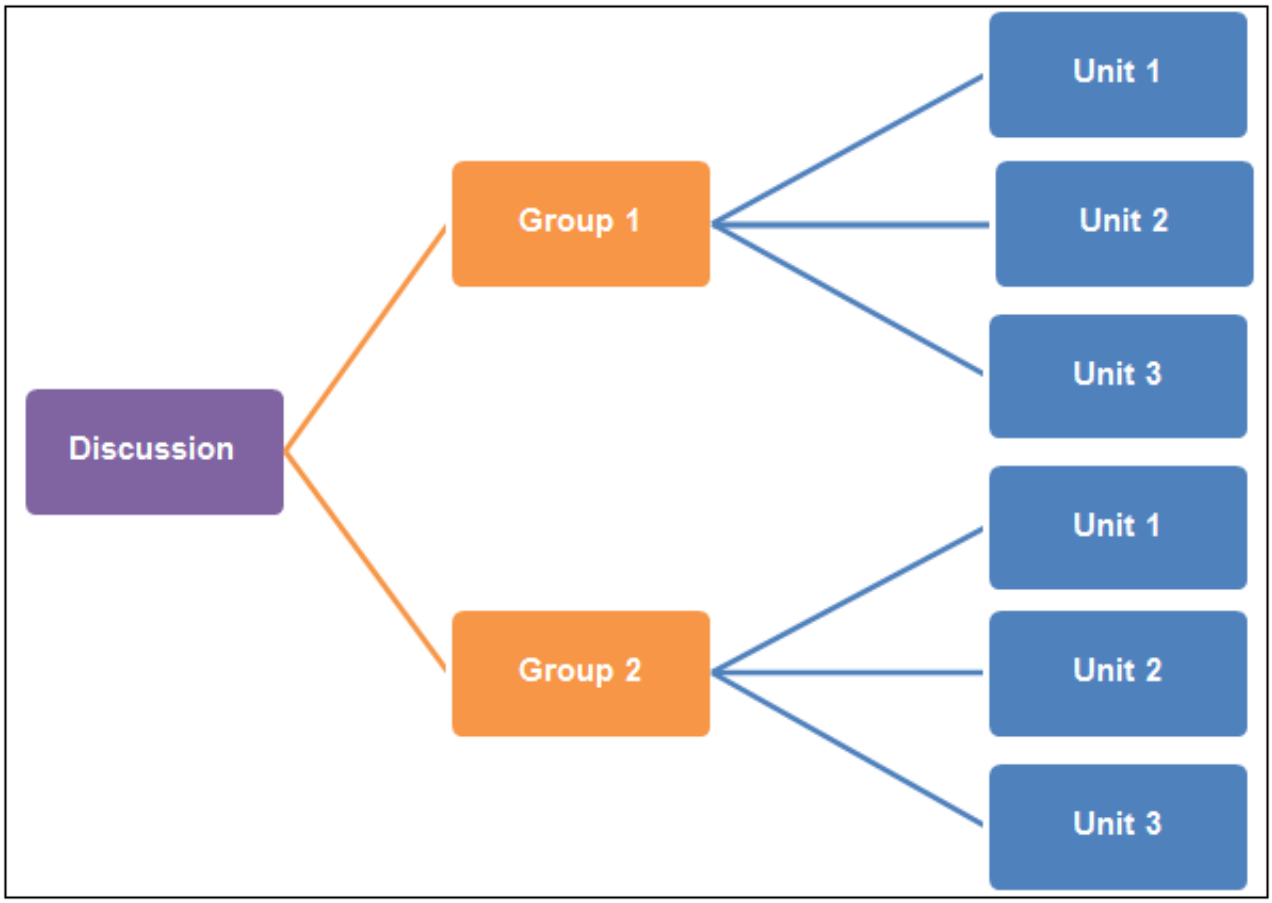

Figure 6. Conceptual structure of the ‘Group’ category discussion area.

Because deep learning is supported by interaction within smaller groups (Wong, 2004), the professor aimed for group sizes of 15-18 students each, depending upon the semester's enrollment and the available teaching team. The number of groups created was driven by course enrollment. Depending upon the level of required interaction (i.e., "posts") and complexity of the subject, the professor might choose to increase or

decrease this number. Group boards were set to be visible only to the group members (each board is visible by default to all faculty members); it was assumed this helped to keep the course easier for students to manage and navigate by removing the visibility of extraneous boards not relevant to them. Each group was created as its own category, and within each category, the discussion threads were further organized by unit, to follow the course's physical structure of the course content and to provide a sense of accomplishment as the course progressed by "closing" a module and unit.

The group boards were given distinctive names, as opposed to the generic nomenclature of 'Group 1,' 'Group 2,' etc. In this IIAR course, the professor used names of noted information science and library science figures to label the group boards. Within the opening post of a respective group's board, the professor provided a brief informative biographical blurb about the importance of the board's namesake to the library and information science field. A second post provided a listing of the faculty group leader and each student member. For example, then, a student might be assigned to a category labeled as the Boole group. Within that group, the opening post would describe George Boole's impact on the area of Boolean logic in library science.

Placing students into these "discussion groups" served a two-fold purpose: First, the small number of participants allowed and encouraged students to, in addition to posting their required activities, also review and perhaps respond to their fellow group-mates' statements and comments. In other words, the learning group size (along with the monitoring, responsiveness, and guidance of the faculty group leader) was designed to foster context-based interaction.

The second purpose served by placing students into smaller discussion groups concerned grading. Managing student assessment by a group model supported work in a multiple teaching assistant/grader environment by allowing a specific individual to be responsible for grading a group throughout the semester. Managing student assessment by group also theoretically supported grading consistency across a student's course experience because one individual was be responsible for evaluating the student's interaction, participation, and course work.

In summary, the discussion and communicative environment in the course was structured to encourage open and free questioning and information sharing, along with providing areas for obtaining pertinent information and support. The two main discussion categories – characterized in the course as 'main' and 'groups' – facilitated course-related discussion and activity while also creating a more intimate environment in which to reflect upon the content. Students were free to use these areas for sharing ideas, requesting help, and posting information.

Data Collection

This study was approved by the University of North Texas Institutional Review Board and utilized data collected under this permission. The data was gathered during the fall 2010 implementation of the IIAR course. Of the 168 students in the course, 109 returned completed surveys, for a response rate of 64.88%.

Collection Instrument

I utilized a survey instrument to capture demographics, the participant's CoP experience as determined though defining variables, and the participant's perceived

impact of the course culture as a CoP environment. Conceptually, the data collected and variables being measured could be grouped into three descriptive categories: demographics, constructs indicative of a CoP experience, and constructs measuring perceptions of the course culture; the survey structure is illustrated in Table 1.

Table 1

Structure of the Data Collection Instrument

Category	Goal	Number of Questions
Demographics	Capture participant profile	6 forced response
Experienced CoP	Determine degree to which participant experienced a CoP environment	35 forced Likert response
Course Culture as CoP Environment	Observe degree and perceived impact of course culture as a CoP environment	3 forced Likert response

With the exception of demographics, all study variables were measured using a 5-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. The survey consisted of 44 forced-choice response items. Demographics consisted of 6 items, experienced CoP was comprised of 35 items, and course culture as a CoP was explored through 3 items.

Demographics. After participants accepted the consent form, demographics were collected. Participants were asked to complete questions regarding age, gender, degree being sought, discipline, number of online courses previously attempted, and time in program when the IIAR course was taken. All demographic items other than discipline were provided as selection items; discipline was posed as a fill in the blank response.

Participants indicated degree being sought by selecting from the following options: Master's, PhD, GAC, or non-degree seeking. Age data was captured as a selection item from a group of ranges: 18-24, 25-31, 32-38, 39-45, 46-52, 53-65, and over 65.

*Experienced CoP constructs***.** As indicated in the literature review, a CoP exists through the interactions and personal growth of its members: Mutual engagement, joint enterprise, and shared repertoire form the conceptual structure which comprises a CoP (Wenger, 1998). Membership in a CoP is a synergistic experience that is best explored by observing the variables which manifest this interaction (Cadiz et al., 2009). Hemmasi and Csanda (2009) constructed and implemented a survey to examine a member's CoP experience through the independent variables of trust, connectedness, commitment, and leadership strength. The researchers theorized these variables would predict the variables of perceived personal impact (i.e., value) and perceived overall general effectiveness of the community. These two variables, in turn, were expected to predict overall satisfaction with community experience. Results showed a good fit of the model as a measure of experienced CoP, with Cronbach's alpha inter-item consistency coefficients ranging from "a low of 0.72 for trust in community members to a high of 0.91 for perceived community's job impact" (Hemmasi & Csanda, 2009, p. 270).

The Hemmasi and Csanda (2009) survey items describing the variables of trust, connectedness, commitment, leadership strength, and perceived impact were used by permission in this study to determine degree of experienced CoP (see Appendix A for a copy of the permission email from Dr. Hemmasi). To supplement these variables for this study, I developed items to better evaluate the course-based CoP experience. These items were grounded in the literature and were validated with practitioners and

educators via the pilot study. The variables and their identifying constructs are described below.

Trust was measured using the same five items as found in the Hemmasi and Csanda (2009) survey. The construct was operationalized with items dealing with reciprocal trust, honesty, and comfort in being open regarding one's opinions – including negative ones. Connection to the community and other members was captured through seven items involving issues of attitude toward the community, relationship formation, and identity construction (Hemmasi & Csanda, 2009). In addition to the four items used by Hemmasi & Csanda (2009), three additional items were designed to capture social (Caspi & Blau, 2008; Dow, 2008) and professional (Smeby, 2007; Yukawa, 2010b) presence. Sense of commitment was measured by the seven items taken from the Hemmasi and Csanda (2009) instrument to measure this same construct. The items examined issues such as amount and attitude toward participation, willingness to voluntarily share practices and information within the community, and willingness to participate even when it competed with other work.

Community leadership was assessed using six items which explore role modeling, promptness, encouragement, social presence, and respect. Four of these items were adapted from the Hemmasi and Csanda (2009) survey, and two items (regarding social presence and respect towards students) were taken from persistent variables in the teaching presence literature (Anderson, Rourke, Garrison, & Archer, 2001; Arbaugh & Hwang, 2006; Díaz, Swan, Ice, & Kupczynski, 2010; Garrison et al., 2000, 2010; Shea et al., 2003; Stodel et al., 2006). It is particularly interesting to note that the community leadership variables developed by Hemmasi and Csanda (2009)

appear to map closely to the Community of Inquiry's teaching presence construct (Arbaugh et al., 2008; K. P. Swan et al., 2008) and to other course community literature that examines the role of the teacher in the online classroom (Y. Lee & Choi, 2011; Marks, Sibley, & Arbaugh, 2005; McClure Wasko & Faraj, 2005; Ni & Aust, 2008; Spinks, 2008; Woods & Baker, 2004). Perceived impact on learning skills was measured according to the six items from the Hemmasi and Csanda (2009) survey. The items examined issues concerning information acquisition and use, changes to work processes, and changes to personal innovativeness.

Because of the formal nature and structure of the CoP being examined by Hemmasi and Csanda (2009), those researchers did not study overtly the aspect of sharing work experiences. However, this aspect of mutual engagement is critical not only to the growth of a member's professional identity, but also to the development of a shared repertoire that helps to define the community (Beckett et al., 2010; A. M. R. Correia et al., 2010; Hodgkinson-Williams, Slay, & Siebörger, 2008; Schwen & Hara, 2003; Wenger, 1998). Shared experience, then, was assessed by four items that dealt with degree to which students shared their real-world work experiences with the class, the voluntary sharing of professional information (job postings, resources, etc.), the impact such shared experiences had upon a member's own perceived professional development, and the level to which students engaged in brainstorming to assist with professional problem-solving. Emphasis was placed upon the sharing of experience and practices related to a professional context, as research indicates that "in the workplace, the work itself constitutes the most important locus of learning" (Conrad, 2008, p. 3). These items were constructed from the literature on learning community development

(see, for example, Keegan, 1996; M. G. Moore, 2007b; Rovai, 2004; Smith & Bath, 2006; Xiaojing, Magjuka, Bonk, & Seung-hee, 2007) and particularly were informed by items in the cognitive presence scale in the Community of Inquiry Survey instrument (Arbaugh et al., 2008). They further were validated by eight academic and public librarians who also taught graduate library science courses and by volunteer past course participants. Table 2 presents items examining a member's experienced CoP.

Table 2

Survey Items Exploring Community of Practice Characteristics.

Variable	Item
Impact on Work Processes	1. This course community has enabled me to get information and ideas that I would not have received otherwise. 2. This course community has positively impacted my ability to share and gain knowledge. 3. I have been able to come up with new ways of doing things in my work due to ideas shared in the course community. 4. I consider this course community as valuable in improving my learning. 5. Being involved in this course community has changed my work processes in a positive manner. 6. I have become more innovative as a result of being involved in the course community.

(table continues)

Table 2 *(continued).*

Variable	Item

	7. I willingly devote time to the course community even when it competes with my work.
	8. I feel good about my level of involvement in the course community.
	9. I have actually shared best practice(s) with others in the course community.
Commitment	10. I actively contribute to knowledge sharing in the course community.
	11. I play an active part in the course community.
	12. I have participated less than I should have in the course community.
	13. I am willing to share ideas with the course community even if I don’t get the credit.
	14. I have new contacts as a result of this course community.
	15. I now feel more connected to people doing similar work across the country.
	16. I feel that I have interests and goals that are similar to other members of my course community.
Connection	17. I have positive feelings toward members of my course community.
	18. I feel I "know" some members in this course community. **
	19. The course community makes me feel as much like a colleague as I do a student.**
	20. I feel I am part of a larger group responsible for my discipline's body of knowledge. **
	21. The instructor team established good relationships among the community members.
	22. The instructor team encourages members to actively participate in the community.
Faculty Leadership	23. The instructor team is a good role model for collaboration and sharing.
	24. The instructor team responded to questions in a timely fashion.**
	25. I feel I "know" my instructor team.**
	26. The teaching team valued my contributions.**

(table continues)

Table 2 *(continued).*

Variable	Item
Trust	27. I trust most community members. 28. I feel the other community members do not trust me. 29. Based on my personal experiences, I believe others in my community communicate honestly with me. 30. I feel comfortable sharing my opinions and ideas with community members. 31. I feel comfortable sharing my frustrations and negative feelings with other community members.
Shared Experience	32. Members share their related real-world experiences in this class.**. 33. The work experiences shared by others help me learn the profession.** 34. Members brainstorm to help other members solve their shared real-world work problems.** 35. Members share value-added information related to the profession (e.g., "best practices," tips, jobs, resources, etc.).**

Note. Starred (**) items were derived from the literature and validated via the pilot study.

Perceived sense of a CoP was examined by providing participants with an extensive definition of a CoP and then asking them to rank their class culture experience in terms of that definition. In formal situations, members are aware of their membership and participation within a CoP, making possible direct study of the community's effectiveness (Bishop, Bouchlaghem, Glass, & Matsumoto, 2008; Galipeau, 2009; Henrich & Attebury, 2010). However, in the online learning environment being observed in this study, students were not overtly aware of this special learning environment. Thus, for evaluation purposes, the phrase "community of practice" was overtly defined, and students were asked to determine the level to which they perceived the course environment to be structured as such. The CoP definition was presented to participants as follows:

A "community of practice" is defined as an environment wherein members "learn the ropes" of a profession, or aspect(s) of a profession, by sharing and assimilating knowledge. As well, members feel they are practitioners joined "to solve problems, share ideas, set standards, build tools, and develop relationships with peers" (Snyder, Wenger, & Briggs, 2003-4).

CoPs are composed of a community, its domain, and its practice. Community involves the relationships and interactions of the participants and includes levels of trust, belonging, and sharing. A domain refers to the topic/issue around which the community is centered. The domain also is defined in terms of the members' sense of professional identity with the topic. Finally, practice "consists of a repertoire of tools, methods, and skills -- as well as learning and innovation activities" related to the domain (Lai, Pratt, Anderson, & Stigter, 2006).

The knowledge learned and shared in a CoP may be explicit (e.g., "These are the guidelines we follow.") or tacit (e.g., "This is how we really do it."). Participation in the community is voluntary, and some members may participate more than others. A CoP is marked by different levels of member experience: Some members have more domain experience than others, and these more experienced members often provide examples from their past experiences to help develop "best practices" regarding a topic or problem.

Participants were asked to use the above definition to respond to this statement:

Based upon my experiences in the course, and given the above definition, I feel the course culture fostered a community of practice.

Perceived value on content learning as mediated by the CoP environment was assessed by asking participants to evaluate their learning in terms of the perceived CoP experience. Specifically, participants ranked their experience according to this statement:

The course culture enriched my learning experience.

Finally, perceived professional experience was assessed by asking students to rank the level to which the course culture enhanced their understanding of the "real" profession by responding to this statement:

The course culture enhanced my understanding of the "real" profession.

These three criterion statements were posed at the end of the survey in order to capture students' general overall perceptions of the effectiveness of the environment itself, regardless of terminology.

Pilot Study

To ensure integrity of the data collection method and alleviate potential pitfalls, before administering the final survey, a pilot study was conducted (Gitlin & Lyons, 2008). The sample consisted of 10 like volunteer participants – past graduates and current LIS students who had taken the IIAR course during the 2005 to 2010 time period. While completing the data collection survey, these participants also reviewed the questions for purposes of clarity and reliability. Discussion with the participants indicated wording was straightforward, supporting the supposition that like participants also would understand the directions, questions, and statements (Rubin & Babbie, 2009). Responses from two potential outliers indicated that one participant read only for clarity and chose a standard 'neutral' response for all questions. His data was removed from the descriptive statistics for the pilot study. Discussion with the second respondent with several skewed responses indicated he understood the questions and was responding based upon his perceived experience in the course. This participant's responses remained in the descriptive statistics. Sample standard deviation for each question (n = 7) ranged from .441 to 1.202. Standard error for each question ranged from .147 to .412. When considered with the explanatory responses from individual participants, these results implied precision within the question set in terms of clarity (Cohen, 1988) and supported the assumption that a like sample of participants would understand the survey. Based upon these results, the final survey was administered.

Reliability and Validity

Content validity for the instrument was assessed by experts in LIS education and reference service practices (B. Johnson & Christensen, 2008). Seven practicing librarians who also had taught the core IIAR course at UNT reviewed the question set. Construct validity, the degree to which the dimensions (i.e., scales) measure what they are intended to measure (Creswell & Plano Clark, 2011), was evaluated through factor analysis. Hemmasi and Csanda (2009) validated their scales after gathering data and found that for each case, “a single factor accounted for a high percentage (ranging from a low of 48% for trust to a high of 77% for leadership quality) of the combined variance of the items comprising the scale.

However, unidimensionality of a scale’s construct is a difficult – though important – assumption to validate, and there is no standard approach for assessing sufficient unidimensionality (Lai et al., 2006; Slocum-Gori & Zumbo, 2011). As well, an additional construct – shared experience – was added to this survey, and additional items were added to the Sense of Connection and Community Leadership scales. Thus, I used several methods to satisfy construct validity: exploratory factor analysis loadings (correlation coefficient over .3, Hair, Jr et al., 2009a; Tabachnick & Fidell, 2001), Kaiser-Meyer-Olkin measure of sampling adequacy, Bartlett’s test of sphericity, and scree plot. Because it was expected that the items and constructs would be correlated with each other, an oblique (promax) rotation was performed in order to compare the results (UCLA: Statistical Consulting Group, 2013). Principal axis factoring (PAF) was used for extraction as opposed to principal components analysis (PCA) in order to examine the shared variance of the variables as opposed to the total variance (Tabachnick & Fidell,

2001; Williams, Onsman, & Brown, 2010). While a PCA would provide a practical summary of the data set by extracting “maximum variance,” the PAF focuses on covariance and is a better choice when the constructs are expected to produce scores on the DVs (predictor variables) (Tabachnick & Fidell, 2001).

Reliability refers to the degree that a survey produces stable and consistent results. That is, reliability is a measure of the instrument’s ability to produce similar results over time and in different settings. Because this was an exploratory study using a new instrument, traditional test/retest data was not available. However, the internal consistency reliability method provides an estimate of reliability for a given test administration by examining how well each item in the scale measures the specific trait (Gall et al., 2007). Cronbach's alpha (Cronbach’s *a*) analysis tests for homogeneity – “the degree to which the different items measure the same construct or trait”) (B. Johnson & Christensen, 2008, p. 154). It uses an average inter-item correlation approach to calculate reliability by calculating the correlation coefficient for each pair of items in the scale and then averaging these correlation coefficients to calculate the alpha coefficient. Cronbach’s *a* can be used with measures for which there is no right nor wrong answers – such as a perception scale (Key, 2002). A Cronbach’s *a* coefficient of .7 or greater is considered to be “reliable” in basic research (Nunnally, 1978). The internal consistency reliability method was used to assess reliability in this study.

Recruitment and the Collection Procedure

Participants were recruited within the IIAR course via a personal post and in-class email (see Appendix B for text). Data for this study was collected by providing a

link to an online survey questionnaire; I embedded the survey link in the solicitation post and in-course email. The first frame of the survey required that participants read and agree to the research participation consent form before entering the survey proper. An option to print the consent form also was provided; the consent form can be viewed in full in Appendix C. The survey ran for two weeks from November 24 through December 1, 2010.

Data Analysis

Analysis Methods

The survey items measured the effectiveness of the CoP environment as based upon specific characteristics (i.e., predictor variables). That is, relationships between the predictor and criterion variables were explored. Descriptive statistical analyses -- mean, standard deviation, and variance – first were conducted to examine the distribution and general trends of the data. Data then was analyzed using CCA in order to support theoretical explanation for the research questions. CCA helps researchers “attempt to understand or explain the nature of a phenomenon for purposes of testing or developing theories” (Licht, 1995, p. 21) and is indicated when it is likely that variable sets would be “causally related to one another” or would have “other causative factors in common” (p. 33). In this study, existence of an online graduate CoP environment was explored in terms of its relation to factors previously shown to predict a successful CoP experience in a corporate field setting (Hemmasi & Csanda, 2009) and to factors expected to mediate such an experience as based upon previous research (e.g., Cadiz et al., 2009; Cambridge, Kaplan, & Suter, 2005; Serrat, 2008; Zimitat, 2007).

The CCA analysis for the survey results was performed using the Statistical Package for the Social Sciences for Windows (SPSS), version 21. SPSS did not provide an automated CCA analysis function, but macros allowed the user to conduct CCA. In terms of procedure, Thompson (1987) described three “common fallacious interpretation practices” with CCA: “1) interpreting structure coefficients while ignoring function coefficients; 2) interpreting redundancy coefficients; and 3) failing to employ commonality analysis” (p. 1). Commonality analysis extends CCA by providing “additional examination of the canonical variate by using the variables in a *given* canonical set to partition the variance of canonical variates produced from the *other* canonical set (Nimon et al., 2010, p. 708, emphasis in original). Partitioning the canonical variate produces both unique and common effects, where “unique effects represent the amount of variance that is unique to an observed variable” and “common effects identify the amount of variance that is common to groups of variables” (Nimon & Reio, Jr., 2011). This is useful because correlated variables in a canonical set can make interpretation more difficult, and identifying the unique contribution each variable and that of all their possible combinations better explains their effects (Kraha, Turner, Nimon, Zientek, & Henson, 2012). Thus, in addition to analyzing the CCA, a Commonality analysis also was conducted in order to more deeply investigate significant canonical variates.

Assumptions

As a member of the general linear model group of analyses, certain assumptions must be met when applying CCA: Data were examined for linearity, multivariate normality, homoscedasticity (the degree that score variance of the criterion variables

was the same as that of the predictor variables), and lack of multicollinearity (meaning predictor variables had no or very little correlation) (Hair, Jr et al., 2009a; Kraha et al., 2012; Licht, 1995). Linearity and homoscedasticity were assessed visually using a scatterplot. Unfortunately, at the time of this study, tests for multivariate normality were not readily available, so the guideline was to examine each variable for univariate normality (Hair, Jr et al., 2009a). Normality was assessed by calculating mean (*M*), standard deviation (*SD*), kurtosis, and skewness. However, univariate normality does not prove multivariate normality because multivariate normality requires normalcy for all combination of variables (Harrington, 2011). Harrington noted that it is generally accepted "to assess multivariate normality by assessing normality of the distribution of residuals" for each variable as when predicted by the other variables (p. 3). Henson (1999) has illustrated how Thompson's MULTINOR technique can be used to assess multivariate normality. This approach likewise was followed to test for normality in this study. Multicollinearity is difficult to diagnose, and was assessed using the SPSS bivariate correlations command (Harrington, 2011; Tabachnick & Fidell, 2001).

Statistical power always is of concern in analysis methods, and that includes CCA (Tabachnick & Fidell, 2012). Software for calculating appropriate sample sizes for desired power and effect sizes in CCA does not yet exist, but both Tabachnick and Fidell (2001) and Hair, Black, Babin, and Anderson (2009b) recommended at least 10 cases for each variable (with larger ratios being desired). The sample from this study (*n* = 111) resulted in 13.63 cases per variable, above that recommended case number.

Summary

In this chapter, the research design, the research context, the data collection instrument and procedures, and the data analysis methods were described. The study followed a multivariate correlational design as indicated by the research objectives. CCA was the analysis method chosen to analyze the relationships within and among the predictor and criterion variable data sets. The IIAR course evaluated in this study was selected because the environment exhibited CoP characteristics and because, as a required core course, it would offer a better distribution of the LIS population at UNT. The survey instrument captured demographic data and responses to 44 forced-choice, 5-point Likert scale items which assessed the predictor and criterion variables. Reliability, validity, and statistical assumptions also were addressed.

CHAPTER 4

RESULTS

Introduction

The objectives of this study were to: 1) Explore the degree to which characteristics indicative of effective communities of practice (CoPs) also would describe a member's experience within an online course-base CoP environment. 2) Evaluate the extent that students find educational value in courses in which they perceive a CoP environment to be present. 3) Determine if students would feel they have been introduced to professional experiences through interacting within the course culture. The research context was an Introduction to Information Access and Retrieval (IIAR) course whose course culture illustrated properties and characteristics indicative of a CoP environment. Results are reported in this chapter. The environment was assessed using a 5-point, Likert-style survey delivered online.

The Data Assessment Procedures section describes the data input processes and the calculation procedures. It also reports demographic and descriptive analysis results. The Statistical Assumptions section provides results on the issue of multivariate normality. Finally, the Data Analysis Results section provides results from the canonical correlation analysis (CCA).

Data Assessment Procedures

All data first were screened for anomalies and were cataloged in the codebook (i.e., data dictionary). There were no missing data as all items were forced response.

Range for each predictor scale item was 109 – 545. Each independent item range was 1 – 5.

Descriptive Analysis

Demographics. Demographic data revealed that of the 168 students enrolled in the course, 109 participants completed the survey, for a return rate of 64.9%. Of those 109 who completed the survey, 91 (83.5 %) were female and 18 (16.5%) were male. The Library and Information Science (LIS) student population (master's program, *n* = 1046) in 2010 was 862 (82.41%) female and 184 (17.59%) male. Thus, the gender ratio of the participants was equitable to that of the LIS master's program in 2010. Age ranged from 21 to 64, with a mean age of 36.43. The majority of the participants had entered the program with one bachelor degree: 62 (56.9%) held a bachelor of arts, 25 (22.9%) held a bachelor of science, and 5 (4.6%) held a bachelor of business administration, for a total of 92 (84.40%) of the 109 participants holding a bachelor degree. Three participants (2.8%) held two bachelor degrees (no one held more than two bachelor degrees). Thirteen (11.9%) held a master's degree, and only one participant (.9%) reported currently holding a doctor of philosophy. All participants except for one were working toward the MS in library science from UNT; this other individual indicated she was seeking full time admission status.

Most of the participants had previously completed online courses. Of the 109 participants, 73 (67.0%) indicated they previously had completed 4 or more online courses, 1 (.9%) had completed 3, 9 (8.3%) had completed 2, and 3 (2.8%) had completed 1. Twenty-three (21.1%) had never completed an online course before taking the IIAR course. The participants in this study were taking a range of online courses

during the semester in which they took this IIAR course: 23 (21.1%) were taking just the one IIAR course (the reader is reminded that participants were to include the IIAR course in their response to this question), 68 (62.4%) were taking 2 online courses, and 16 (14.7%) were taking 3 online courses. Because the IIAR course was a 4-hour core course, students strongly were encouraged not to take more than 3 courses when also completing the IIAR. However, 2 (1.8%) of the participants in this study were taking 4 or more online courses concurrently with the IIAR. (The reader also is reminded that this question looked only at online courses; it did not capture data for face-to-face courses taught. It is possible a few of these students also were taking a face-to-face course on campus during this time, as well.) The participants also were at varying points in their degree program when they took this IIAR course: 47 (43.1%) were in the 1st semester of their studies, 18 (16.5%) were in the 2nd semester, 14 (12.8%) were in their 3rd semester, 12 (11.0%) were in their 4th semester, 7 (6.4%) were in their 5th semester, and 11 (10.1%) were in their 6th or greater semester (the reader is reminded that participants were asked to include summer semesters in their response).

Survey items. There were no missing responses to the items, as the Likert questions were forced response; thus, there were 109 responses for each survey item. Responses for two items – one assessing commitment and one exploring trust – were reverse coded. The absolute minimum score an item could receive was 109 (1*109). The absolute maximum score an item could receive was 545 (5*109). Table 3 presents a frequency itemization of responses for each predictor and criterion item.

Table 3

Summed Responses to Individual Predictor and Criterion Survey Items

Variable Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Impact					
i1. This course community has enabled me to get information and ideas I would not have received otherwise.	52	50	4	3	0
i2. This course community has positively impacted my ability to share and gain knowledge.	54	47	4	3	1
i3. I have been able to come up with new ways of doing things in my work due to ideas shared in the course community.	41	41	48	9	0
i4. I consider this course community as valuable in improving my learning.	64	39	3	3	0
i5. Being involved in this course community has changed my work processes in a positive manner.	34	50	20	3	2
i6. I have become more innovative as a result of being involved in the course community.	28	44	19	17	1
Commitment					
c1. I willingly devote time to the course community even when it competes with my work.	21	60	10	17	1

(table continues)

Table 3 *(continued).*

Variable Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
c2. I feel good about my level of involvement in the course community.	20	62	17	10	0
c3. I have actually shared best practice(s) with others in the course community.	21	56	15	15	2
c4. I actively contribute to knowledge sharing in the course community.	20	65	10	12	2
c5. I play an active part in the course community.	19	54	16	18	2
c6. I have participated less than I should have in the course community. (reverse coded)	19	43	19	22	6
c7. I am willing to share ideas with the course community even if I don't get the credit.	25	74	8	2	0
Connection					
c1. I have new contacts as a result of this course community.	18	51	14	25	1
c2. I now feel more connected to people doing similar work across the country.	22	45	20	20	2
c3. I feel that I have interests and goals that are similar to other members of my course community.	35	58	8	6	2
c4. I have positive feelings toward members of my course community.	38	58	11	2	0

(table continues)

Table 3 *(continued).*

Variable Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
c5. I feel I "know" some members in this course community. **	16	61	12	18	2
c6. The course community makes me feel as much like a colleague as I do a student.**	20	53	19	15	2
c7. I feel I am part of a larger group responsible for my discipline's body of knowledge. **	33	55	15	5	1
Faculty Leadership					
f1. The instructor team established good relationships among the community members.	65	35	6	1	2
f2. The instructor team encourages members to actively participate in the community.	67	36	5	1	0
f3. The instructor team is a good role model for collaboration and sharing.	72	33	4	0	0
f4. The instructor team responded to questions in a timely fashion.**	78	27	4	0	0
f5. I feel I "know" my instructor team.**	43	48	8	10	0
f6. The teaching team valued my contributions.**	47	43	14	4	1

(table continues)

Table 3 *(continued)*.

Variable Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Trust					
t1. I trust most community members.	20	37	20	2	0
t2. I feel the other community members do not trust me. (reverse coded)	37	51	19	0	2
t3. Based on my personal experiences, I believe others in my community communicate honestly with me.	24	75	9	1	0
t4. I feel comfortable sharing my opinions and ideas with community members.	23	77	8	1	0
t5. I feel comfortable sharing my frustrations and negative feelings with other community members.	11	42	32	19	5
Shared Experience					
s1. Members share their related real-world experiences in this class.**	58	46	3	2	0
s2. The work experiences shared by others help me learn the profession.**	48	50	9	1	1
s3. Members brainstorm to help other members solve their shared real-world work problems.**	31	55	13	9	1

(table continues)

Table 3 *(continued).*

Variable Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
s4. Members share value-added information related to the profession (e.g., "best practices," tips, jobs, resources, etc.).**	45	54	8	2	0
CoP Culture					
Based upon my experiences in the course, and given the above definition, I feel the course culture fostered a community of practice.	48	49	10	1	1
Value on Learning					
The course culture enriched my learning experience.	50	18	6	4	1
Exposure to Profession					
The course culture enhanced my understanding of the "real" profession.	36	58	10	4	1

**Questions developed from literature. All others with permission from Hemmasi and Csanda,(2009), with wording adjusted to reflect course rather than industry environment.

Based upon their perceptions of individual characteristics describing a CoP environment, most participants described the community as a CoP. Items selected as “agree” or “strongly agree” for each variable ranked as follows: impact on work processes, 83.18%; commitment to community, 73.26%; connection, 79.79%; faculty leadership, 90.83%; shared experience, 88.76%; and trust, 72.84%. Selections marked as “agree” or “strongly agree” comprised 80.44% of the responses. This was in agreement with responses gauging the course environment in terms of a concrete

definition of a CoP, where 88.99% of participants selected “agree” or “strongly agree.” The overall positive response to the CoP descriptive variables also was in agreement with perceived exposure to the profession, where 86.24% of participants agreed or strongly agreed that they better understood their profession. Aggregated positive responses dropped to 62.39% when participants ranked the impact of the course environment on their overall content learning. Table 4 presents an aggregated view of the proportion for each response category for each predictor scale and for each criterion item.

Table 4

Aggregated Proportions of Responses to Individual Predictor and Criterion Survey Items

Variable	Responses by Percent				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Predictors					
Impact on work processes	45.50	45.17	16.33	6.33	.67
Commitment to Community	20.71	59.14	13.57	13.71	1.86
Connection with Members	26.00	54.43	14.14	13.00	1.43
Faculty Leadership	62.00	37.00	6.83	2.67	.50
Shared Experience	45.50	51.25	8.25	3.50	.50
Trust	23.00	56.40	17.60	4.60	1.40
Criterion					
Experienced CoP	44.04	44.95	9.18	.92	.92
Value on Learning	45.87	15.51	5.51	3.67	.92
Exposure to Profession	33.03	53.21	9.18	3.67	.92

Validity and Reliability of the Survey Instrument

Construct validity for the survey scales was assessed through factor analysis, as described in the Methods chapter. Ideally, this analysis would have been performed prior to administering the data collection tool. Two issues pre-empted that approach for this study: First, the population of this study could be considered a “case” (Creswell, 2007) because it was the unique course environment of this particular course which was the subject of examination in this study. Thus, there was not an additional population from which to draw a sample in order to perform preliminary construct validity. Rather, construct validity was addressed after the data was collected, with the initial strength of the original scales’ validation procedures and inter-item correlation coefficients used as support for this approach (Hemmasi & Csanda, 2009). Second, the course itself was in the process of change: It was being reduced from a 4-hour offering to a 3-hour course, and the online course platform was moving to a new learning management system. Both of these changes could – and in terms of the technological change, most probably would – create additional burdens on both the students and the faculty which could mediate the experience for both groups. In order to describe the dynamics of the established structure, it was necessary to capture data during that last iteration of the course in its current format.

The pattern matrix of the first factor analysis returned 5 variables, with only impact on learning processes, commitment, leadership, and trust returning decisive loadings. Two of the shared experience items loaded on impact on learning, and the connection to community variable was defined by 3 of its 7 items, with the remainder items (Items 3 and 7) loading on other variables (at acceptable but low correlations of

.37 and .43) or not correlating strongly enough to be considered in the matrix (Items 4 and 6). Even though the questions concerning shared experiences had produced a Cronbach's alpha of .79 for their respective scale, Items 1, 2, and 4 cross-loaded on the impact dimension. Thus, all four shared experience items were removed, as were Items 3, 4, 6, and 7 of the connection to community scale.

The factor analysis was run again, and produced the 5 factors of impact on learning, commitment to community, connection to community, faculty leadership, and trust. Item 3 of the commitment scale did not load with a correlation greater than .3, so this item was removed from consideration in the CCA. As well, Item 5 in the faculty leadership scale did not produce a coefficient greater than .3, and it also was removed from consideration in the CCA. All variables were represented in the pattern matrix with loadings greater than .3 with ranges as follows: impact on learning, .746 - .940; commitment to community, .371 - .925; connection to community, .710 - .795; faculty leadership, .653 - .822; and trust, .312 - .601. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .854, Bartlett's Test of Sphericity was significant. The scree plot, however, produced a questionable 6th factor. An additional analysis using the 6-factor model indicated one item each from the impact, leadership, and trust scales also correlated moderately to this 6th factor. I assessed these items on merit of "interpretability and scientific utility" to determine if they should be removed or included (Tabachnick & Fidell, 2001, p. 583). The impact item in question (Item 6) also correlated very highly (.859) with the impact factor, so it was retained. This item concerned perceived new innovative strategies as a result of the community environment. The leadership item (Item 1) also correlated highly (.606) with the leadership factor. The item

concerned the faculty establishing good relationships with the community. This item also was retained. The trust item (Item 5) considered sharing negative feelings and frustrations with the community. Item 4 considered sharing ideas and opinions with the community and correlated with the trust factor with a coefficient of .626. In light of the separate focus of these similar questions, both items were retained. Table 5 presents the resulting variables and the respective scale items which were used in the CCA.

Table 5

Variables and Associated Items Produced by the Factor Analysis

Variable	Item Number and Question Text
Impact on Learning Processes	1. This course community has enabled me to get information and ideas that I would not have received otherwise.
	2. This course community has positively impacted my ability to share and gain knowledge.
	3. I have been able to come up with new ways of doing things in my work due to ideas shared in the course community.
	4. I consider this course community as valuable in improving my learning.
	5. Being involved in this course community has changed my work processes in a positive manner.
	6. I have become more innovative as a result of being involved in the course community.

(table continues)

Table 5 *(continued).*

Variable	Item Number and Question Text
Commitment to Community	1. I willingly devote time to the course community even when it competes with my work.
	2. I feel good about my level of involvement in the course community.
	4. I actively contribute to knowledge sharing in the course community.
	5. I play an active part in the course community.
Connection to Community	1. I have new contacts as a result of this course community.
	2. I now feel more connected to people doing similar work across the country.
	5. I feel I "know" some members in this course community.*
Faculty Leadership	1. The instructor team established good relationships among the community members.
	2. The instructor team encourages members to actively participate in the community.
	3. The instructor team is a good role model for collaboration and sharing.
	4. The instructor team responded to questions in a timely fashion.*
	6. The teaching team valued my contributions.*

(table continues)

Table 5 *(continued).*

Variable	Item Number and Question Text
Trust	1. I trust most community members. 2. I feel the other community members do not trust me. 3. Based on my personal experiences, I believe others in my community communicate honestly with me. 4. I feel comfortable sharing my opinions and ideas with community members. 5. I feel comfortable sharing my frustrations and negative feelings with other community members.

Note. These items were used in the canonical correlation analysis. Items marked with * were added to the Hemmasi & Csanda (2009) survey as developed through the literature review.

Reliability of the survey was addressed through the internal consistency reliability method (Gall et al., 2007) using Cronbach's *a* analysis to test for homogeneity. The revised set of scales produced a Cronbach's *a* of .923. Each variable scale produced coefficients as follows: impact on learning, .904; commitment to community, .849; connection to community, .798; faculty leadership, .860; and trust, .707. Based upon adjustments to meet reliability and validity assumptions, the research model was revised as illustrated in Figure 7.

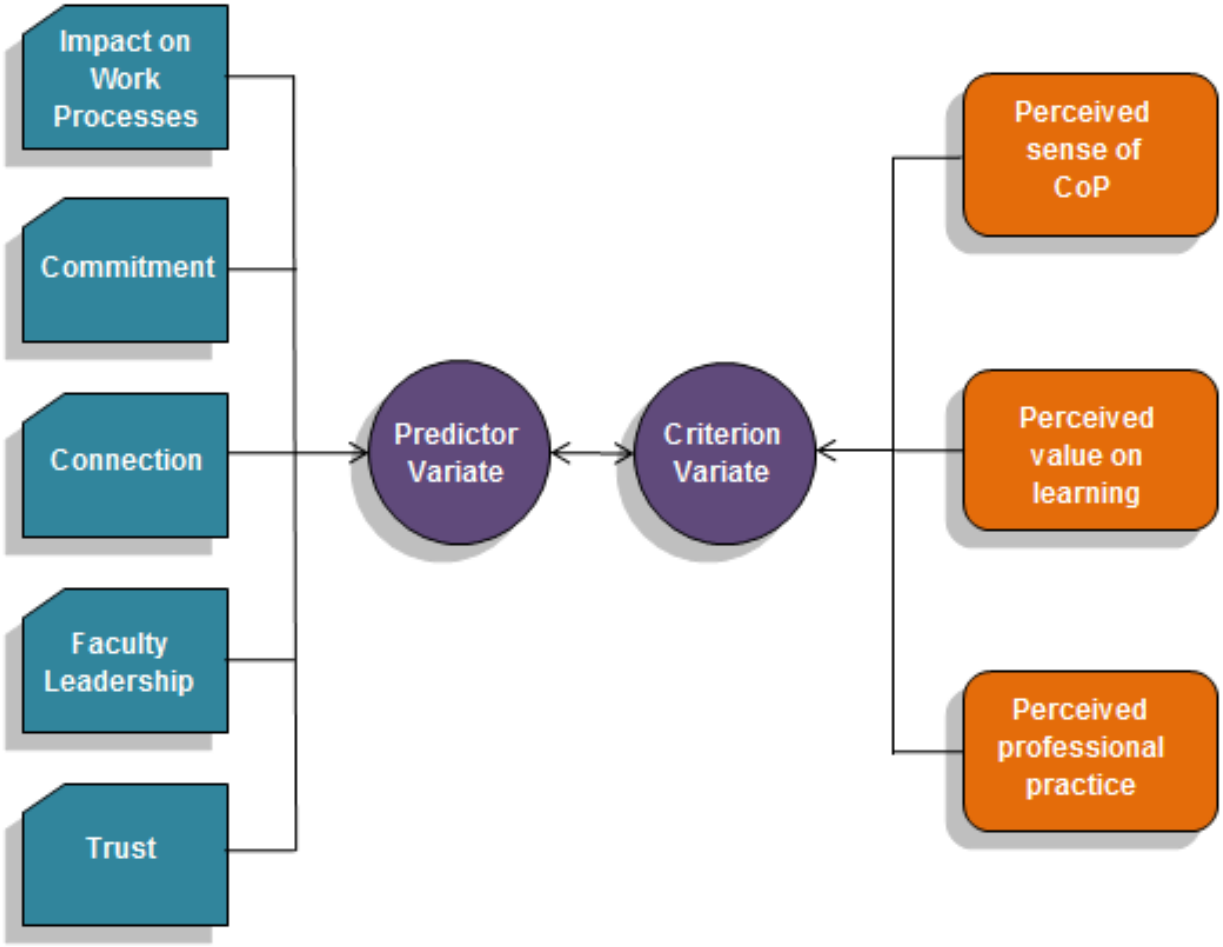

Figure 7. Revised research model as subjected to the canonical correlation analysis. The analysis used the predictor and criterion variates to create the most highly correlated combinations of variables in order to explain the relationships.

Statistical Assumptions

Even though general linear model analyses are robust to variances in data normality (Hair, Jr et al., 2009b), it is important to assess the data for distribution trends. Norman (2010) illustrated that studies consistently show that "parametric statistics are robust with respect to violations" of assumptions to sample sizing, normal distribution, or ordinal data types. In this study it was the variable composite that was of interest and which would be analyzed in the CCA; therefore, the ordinal Likert items for each scale

were transformed to create an interval composite indicator (index) variable. Creating a composite scale variable (index) from scale items must be done with caution because the transformation assumes each item carries equal weight in the relationship (Starkweather, 2012). However, when items comprising ordinal data scales are shown to be intercorrelated and valid, they can be combined to form indexes and treated as interval data (Allen & Seaman, 2007). As discussed in the Validity and Reliability of the Survey Instrument section above, Cronbach's *a* for the items comprising the survey scales met these assumptions. Scale indexes were calculated, and these variables were used to conduct parametric analyses of the data.

Data distribution and trends then were assessed. Linearity and homoscedasticity were assessed visually using a scatterplot. At the time of this research, univariate normality tests for multivariate normality were not readily available, and the guideline was to examine each variable for univariate normality (Hair, Jr et al., 2009a). Normality was assessed by calculating mean (M), standard deviation (SD), kurtosis, and skewness. Multivariate normality was assessed as illustrated by Henson (1999) by calculating the Mahalanobis distance for each data case and reviewing the plotted results.

Data Transformation

Using the procedure described by Pallant (2001), indexes were calculated from the items for each scale. The Statistical Package for the Social Sciences (SPSS) syntax for the transformation of the Impact variable was:

```
COMPUTE tIMPACT=IMPACT1 + IMPACT2 + IMPACT3 + IMPACT4 +
IMPACT5 + IMPACT6.
VARIABLE LABELS  tIMPACT 'Total impact'.
```

EXECUTE.

tIMPACT became the name for the new composite variable and IMPACT1, IMPACT2, etc. were the variables to comprise the index. Subsequent transformations followed this syntax, replacing the tIMPACT variable name with a relevant designation and replacing the scale items as relevant for each scale. Descriptive and distribution calculations were calculated on each new scale to ensure the values were appropriate, and the new variables were added to the codebook (Pallant, 2001).

Univariate Normality

The descriptive statistics used as part of the data screening process also aided in assessing normality. Skew indicates the degree to which mean scores deviate from the median value and is a measure of the symmetry of the scores. A score of 0 would indicate no skew in the data – something rarely found in social sciences research (Pallant, 2001). The mean (*M*) responses to the measures in this study indicated they tended to be slightly negatively skewed, meaning the left tail was slightly longer than the right tail. Examining calculated skewness supported that evaluation. Kurtosis indicates the shape of the central peak (i.e., whether it is taller and more peaked or flatter with a broader peak). A normal distribution has a kurtosis of 0. Histograms and kurtosis calculations indicated that in general, score distribution was acceptable, with the shapes ranging from slightly to moderately leptokurtic. Standard deviation (*SD*) describes the distribution of the data by explaining how much the scores “spread out” from the mean. The small *SD* for each variable indicated the bulk of the scores clustered around each variable’s the mean. Descriptive and distributional statistics are reported in Table 6.

Table 6

Descriptives for Survey Data

	Statistic						
Variable	*n*	*M*	*SD*	*Min*	*Max*	*Skewness*	*Kurtosis*
Impact	109	25.07	4.17	12	30	-.79	.30
Commitment	109	15.06	3.11	6	20	-.62	.04
Connection	109	10.80	2.62	4	15	-.46	-.49
Faculty Leadership	109	22.52	2.77	15	20	-.96	-.08
Trust	109	19.62	2.56	12	25	-.08	.41

Note. n = population sample; *M* = mean; *SD* = standard deviation; *Min* = minimum score; *Max* = maximum score.

Linearity and Homoscedasticity

Q-Q plots were analyzed to assess data linearity. A Q-Q plot is a plot of the "percentiles (or quintiles) of a standard normal distribution against the corresponding percentiles of the observed data" (Katenka, 2010, p. 1). Q-Q plots indicated distribution of scores for each variable was near normal, with a positive slope. Homoscedasticity was assessed by examining P-P plots and scatterplots of the predictor variables against each criterion variable. With the exception of 4 outliers (2 with the COP criterion variable, 1 with the VALUE criterion variable, and 1 with the EXP criterion variable), the predictor variable scores formed a relatively straight line against each criterion variable, and normality was tenable.

Multivariate Normality

Multivariate normality was assessed using the MULTINOR SPSS procedure and presented by Henson (1999), which creates scatterplots for the Mahalanobis distances

and the paired chi-squared values for each data case, and as standardized for current SPSS programs by Cox (2010). Sample size and variable names were replaced to reflect those used in this study, as presented below:

```
COMPUTE y=$casenum.
PRINT FORMATS y(F5).
EXECUTE.

DATASET ACTIVATE DataSet1.
REGRESSION
    /MISSING LISTWISE
    /STATISTICS COEFF OUTS R ANOVA
    /CRITERIA=PIN(.05) POUT(.10)
    /NOORIGIN
    /DEPENDENT y
    /METHOD=ENTER timpact teffort tconnect tfac ttrust cop value exp
    /SAVE MAHAL.

SORT CASES BY MAH_1.
EXECUTE .

LIST VARIABLES=y MAH_1
    /FORMAT=NUMBERED.

LOOP #i=1 to 109.
COMPUTE p=($casenum-.5)/109.
COMPUTE chisq=idf.chisq(p,10).
END LOOP.

PRINT FORMATS p chisq (F8.5).
LIST VARIABLES=y p MAH_1 chisq
    /FORMAT=NUMBERED.

GRAPH
    /SCATTERPLOT(BIVAR)=MAH_1 WITH chisq
    /MISSING=LISTWISE.
```

As explained by Cox (2010), this syntax “calculated Mahalanobis distances for all cases and placed the D^2 values in ascending order. Then a percentile and related chi-square value was computed for each case. Finally, the Mahalanobis distances and paired chi-square values were plotted in a scatterplot” (p. 67), as illustrated in Figure 8. The plotted

scores formed a relatively straight line, and the assumption of multivariate normality was reasonable.

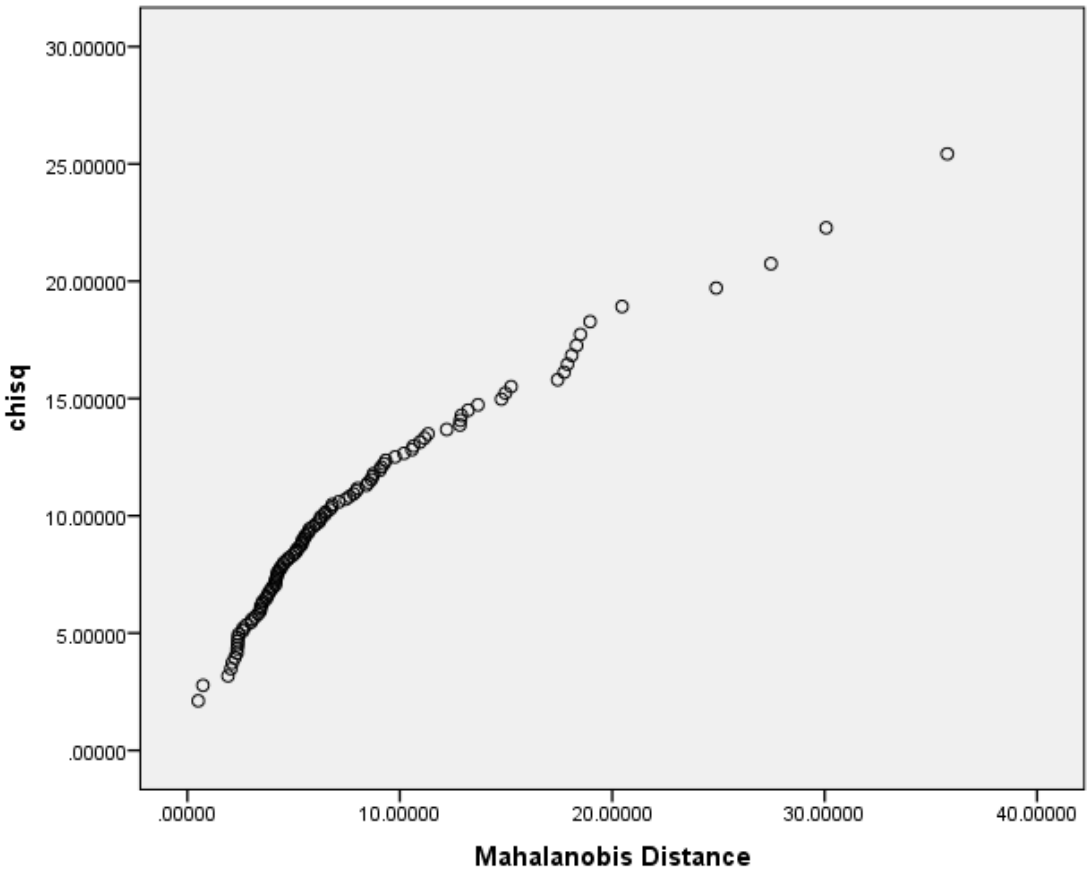

Figure 8. Chi-square by Mahalanobis distance for the 109 cases on all predictor and criterion variables.

Mutlicollinearity

Lack of multicollinearity was assessed by examining bivariate correlations of the predictor variables (i.e., the independent variables). Correlations were small, but some were significant. Thus, the presence of multicollinearity was assessed by examining the tolerance and variable inflation factor (VIF), two measures of collinearity provided in SPSS. The statistics are calculated by regressing each predictor variable against the other predictor variables (Argyrous, 2011). In other words, separate regressions were

conducted in which each predictor variable was treated as a criterion variable, which was regressed against the remaining predictor variables. The tolerance statistic "is an indication of the percent of variance in the predictor that cannot be accounted for by the other predictors; hence, very small values indicate that a predictor is redundant" (UCLA: Statistical Consulting Group, n.d.a). The VIF is calculated as *1/tolerance* and indicates "whether a predictor has a strong linear relationship with the other predictors" (Field, 2013, p. 325). Tolerance values less than .10 and VIF values greater than 10 may indicate multicollinearity (Argyrous, 2011; Field, 2013; UCLA: Statistical Consulting Group, n.d.a). Both the tolerance and the VIF statistics for the predictor variables in this study were within these guidelines, as illustrated in Table 7, and lack of multicollinearity was assumed.

Table 7

Collinearity Statistics Measured by Variable Inflation Factor (VIF)

Variable	Tolerance	VIF
Impact		
Commitment	.61	1.62
Connection	.71	1.40
Faculty Leadership	.61	1.63
Trust	.69	1.44
Commitment		
Impact	.70	1.43

(table continues)

Table 7 *(continued).*

Variable	Tolerance	VIF
Connection	.58	1.74
Faculty Leadership	.68	1.46
Trust	.53	1.91
Connection		
Impact	.52	1.91
Commitment	.75	1.34
Faculty Leadership	.51	1.97
Trust	.58	1.72
Faculty Leadership		
Impact	.70	1.43
Commitment	.57	1.75
Connection	.63	1.59
Trust	.68	1.47
Trust		
Impact	.50	2.01
Commitment	.58	1.74
Connection	.75	1.33
Faculty Leadership	.53	1.87

Note: Low tolerance values (<.1) and high VIF values (>10) indicate multicollinearity may be present. The values above indicate the variables meet the assumption of a lack of multicollinearity.

Data Analysis

A canonical correlation analysis (CCA) was conducted to assess the correlations between the five predictor variables (impact on work processes, commitment to the community (i.e., effort expended), connection to members, faculty leadership, and trust) and the three criterion variables (perceived CoP, perceived value on content learning, and perceived exposure to the profession). A commonality analysis also was conducted to further explore significant relationships among the canonical variates.

Results were interpreted as suggested by Thompson's (2000) two-stage hierarchical interpretation approach. The first step in interpreting the CCA was to determine "Do I have anything?" and was addressed by evaluating the full model, the canonical correlations for each of the three functions, and the cumulative effects of each function on the model. In other words, this stage allowed me to isolate notable effects by examining statistical significance, effect sizes, and replication evidence.

The next step was to determine "From where do the effects come?" and was addressed by analyzing the cross loadings and squared cross loadings of the variables in the canonical function (Hair, Jr et al., 2009a). A commonality analysis was conducted to supplement the results in this second step. In other words, this second stage allowed me to determine not only which variates (synthetic variable combinations) might have contributed to the effect, but also to partition the shared variance to determine the contribution of individual variables to the observed effect.

Evaluation of the Full Model

The full model yielded three canonical functions (recall the smaller criterion variable set contained three variables; thus, the maximum number of generated functions was three). This model evaluated "the shared variance between the predictor and criterion variables" across all three canonical functions (Sherry & Henson, 2005, p. 42). The CCA syntax produced the calculations of four multivariate tests of statistical significance, as shown in Table 8. For this study, statistical significance was evaluated according to the commonly used Wilks' lambda (λ) method (Nimon et al., 2010; Nimon & Reio, Jr., 2011; Sherry & Henson, 2005).

Table 8

Multivariate Tests of Significance (S = 3, M = 1/2, N = 49 1/2) for the Full Canonical Model

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig. of F
Pillais	.85597	8.22422	15.00	309.00	.000
Hotellings	2.73288	18.15847	15.00	299.00	.000
Wilks	.24224	12.49607	15.00	279.22	.000
Roys	.72109				

Note. Statistical significance was evaluated using the Wilks' lambda method.

The full model was significant, with a Wilks' lambda (λ) of .242, $F(15, 279.22) = 12.496$, $p < .001$. Wilks' λ "represents the variance unexplained by the model," (N. L. Cox, 2010, p. 69); therefore, 1 - .242 = .758 = R_c^2, the canonical coefficient. Interpreted like the R_2 in multiple regression, R_c^2 indicates "the proportion of variance shared between the variable sets across all functions" (Sherry & Henson, 2005, p. 42). However, studies consistently have shown that R_2 tends to overestimate effect size in the population (see, for example, Leach, 2006). Even though the sample base is the population for this case study research, I employed the Wherry-2 adjustment method discussed by Leach (2006) in order to calculate the adjusted R_c^2 :

$$1 – (N - 1 / N - v) (1 - R_c^2)$$

where N = the number of participants (109) and v = the number of variables in the function (8). The $(1 - R_c^2)$ equation serves to calculate the Wilks' λ for the function (.242); however, the SPSS CCA macro calculates this variable, so in the case of this

study, the (1 - R_c^2) equation was redundant. Thus, I used the adjusted formula to calculate the corrected R_c^2 :

$$1 - (N - 1 / N - v) \text{ (Wilks' } \lambda)$$

Corrected R_c^2 for Function 1 was .741. The full model, then, was both statistically significant and had a substantial effect size (Cohen, 1988), explaining about 74% of the variance shared among variable sets.

Next, each canonical function was evaluated. Table 9 illustrates the canonical correlation and squared canonical correlation for each function. The analysis yielded three functions with squared canonical correlations of .849, .318, and .183, respectively. The full model explained 74.1% of the shared variance between the predictor (CoP characteristics) and criterion (experienced CoP) variable sets. Function 1 accounted for 72.1% of that variance, and its high canonical correlation indicated the predictor variate and criterion variate were strongly positively correlated. Function 2 accounted for 10.1%, and Function 3 accounted for 3.34% of the variance observed in the full model. Based upon variance explained, Function 3 was sufficiently weak to warrant no further investigation (Sherry & Henson, 2005). The reader may notice that the sum of squared canonical correlations for the three functions (.856) was greater than the overall effect calculated from the full model (.741). This has to do with the orthogonal (unique) nature of each function. Functions 2 and 3 were not explaining the original observed variance; rather, they were explaining what was “left over” after Function 1 was extracted (Sherry & Henson, 2005, p. 42).

Table 9

Eigenvalues and Canonical Correlations for All Functions

Function	Eigenvalue	Canonical Correlation	Squared Correlation
1	2.5854	.8491	.7211
2	.1129	.3185	.1014
3	.0346	.1829	.0334

The dimension reduction analysis component of a CCA allowed me to test the ordered functions for significance (see Table 10). As noted above, the full model was statistically significant at .741, with Function 1 accounting for most of that variance (.721). Function 2 was not statistically significant, with Wilks' lambda (λ) of .869, $F(8, 204.00) = 1.862$, $p = .068$. The corrected canonical coefficient for Function 2 was .089 (again calculated using the adapted Wherry-2 method described above), indicating it explained only about 9% of the variance that remained ($N = 109$, $v = 6$). By default of the hierarchical nature of the CCA process, any functions following the first insignificant function also will be statistically insignificant. This was the case with Function 3, the only function tested in isolation, with Wilks' lambda (λ) of .967, $F(3, 103.00) = 1.188$, $p= .318$. The corrected canonical coefficient was .033 and explained about 3% of the remaining variance in the variable sets after Functions 1 and 2 were extracted. Given the effects of each function's canonical coefficient and their respective significance levels (Sherry & Henson, 2005), Function 2 also was removed from further analysis, and only the canonical results for Function 1 were considered noteworthy in the context of this study.

Table 10

Canonical Correlation Dimension Reduction Analysis

	Statistic				
Function	*Wilks' λ*	*F*	*Hypoth. DF*	*Error DF*	*Sig.*
1 to 3	.242	12.496	15	279.22	.000
2 to 3	.869	1.862	8	204.00	.068
3 to 3	.967	1.188	3	103.00	.318

Evaluation of the Canonical Function

The next step in interpretation was to determine "From where did the effects come?" and involved examining the relationships of the variables. Function 1's squared canonical correlation coefficient was .721, indicating its predictor set and criterion set explained 72% of the observed relationship between the two. Function 1 was analyzed primarily by interpreting the cross loadings and squared cross loadings of the variables in the canonical function (Hair, Jr et al., 2009a). As well, standardized canonical function coefficients, structure coefficients (r_s), squared structure coefficients (r_s^2), cross loadings, and squared cross loadings were consulted. Standardized canonical function coefficients are analogous to regression beta weights and are used in the CCA to form the variable predictor and criterion variable combinations into the two respective synthetic variable sets that comprise the function (Sherry & Henson, 2005). In other words, these were the strengths assigned to the variate in its part of the linear equation created to calculate the predictor variate. Examining the canonical weights helped me understand a variable's effect in the variate set. That is, the standardized canonical coefficient communicated how a one standard deviation change in the variable would

impact the variate to which it belongs (UCLA: Statistical Consulting Group, 2013). A negative canonical weight would indicate an inverse relationship with the other variables in the variate.

The structure coefficients are important “for deciding what variables are useful for the model” (Sherry & Henson, 2005, p. 44) and represented the bivariate correlation between an observed (original) variable (e.g., impact) and the canonical function score for that variable’s set (e.g., the entire predictor set to which impact belonged). In other words, structure coefficients examined the correlation of the original variable with the canonical (synthetic) variable. At the time of this study, there were no hard and fast rules regarding what constitutes a significant contribution to a synthetic variable; here, I followed the common convention in factor analysis to consider structure coefficients above .45 and communalities above 45% to indicate “variables with the highest use in the model” (Sherry & Henson, 2005, p. 44). The squared structure coefficient is analogous with r_2-type effect sizes and indicates the “proportion of variance an observed variable linearly shared with the synthetic variable generated from the observed variable’s set” (Sherry & Henson, 2005, p. 40). In other words, the squared structure coefficient represented the observed variable’s reproducible contribution to the variate in the function.

Canonical cross loadings explore relationship strength among the variables by directly correlating each observed variable with the *other* canonical variate. This allowed me to examine how variables were being combined to form relationships (UCLA: Statistical Consulting Group, n.d.a). Squaring the cross loading coefficients for each

variable allowed me to determine how much of the variance was explained by the opposite canonical variate (Hair, Jr et al., 2009b).

Because beta weights are susceptible to multicollinearity and can lead to incorrect conclusions as to the original variable's contribution to the linear model, some researchers suggested explaining relationships by interpreting the more stable structure coefficients (e.g., Nimon et al., 2010; Sherry & Henson, 2005). However, other researchers noted that, like beta weights, structure coefficients are susceptible to sampling variability and may be sample-specific (Hair, Jr et al., 2009a). Cross loadings "provide a more direct measure of the dependent-independent variable relationships" and are recommended as the first mode of analysis when possible (Hair, Jr et al., 2009a, p. 23). Thus, I used cross loadings and squared cross loadings as the primary method for interpretation, and assessed these conclusions in conjunction with structure coefficients, squared structure coefficients, and standardized weights.

Criterion variable effects. Table 11 presents the canonical analysis for Function 1. Standardized weights, structure coefficients, squared structure coefficients, cross loadings, and squared cross loadings are provided for both variable sets in Function 1. The cross loadings showed that value was highly correlated with the predictor variate (-.788) and CoP was moderately correlated (-.659). Exposure could be considered to be on the "low" side of moderate correlation (-.476). The squared cross loadings revealed that 62.1% of the variance in value and 43.4% of the variance in CoP was explained by the predictor variate, while only 22.7% of exposure was captured by it.

Table 11

Canonical Solution for Function 1

	Beta Weights	*Structure Coefficients*	*Squared Structure Coefficients*	*Cross Loadings*	*Squared Cross Loadings*
Predictor Variables					
Impact	-.656	-.941	.885	-.799	.638
Commitment	.062	-.604	.364	-.512	.262
Connection	-.236	-.669	.448	-.658	.433
Faculty Leadership	-.238	-.760	.578	-.646	.417
Trust	-.132	-.621	.385	-.527	.278
R_c^2			.721		
Criterion Variables					
CoP	-.368	-.776	.602	-.659	.434
Value	-.676	-.927	.860	-.788	.621
Exposure to Profession	-.156	-.560	.314	-.476	.227

Note.
R_c^2 = squared canonical correlation =.721.

The CoP characteristics variables (predictors) appeared to do a good job of explaining the variance shared by CoP and value but less so with exposure. These conclusions were supported primarily by the structure coefficients and the squared structure coefficients. Value and CoP were highly correlated with their criterion variate (-.927 and -.776, respectively. Exposure was moderately correlated with the criterion variate (-.560). The squared structure coefficients revealed value able to contribute about 86%, CoP able to contribute 60%, and exposure able to contribute 31% of the

observed criterion variate. The high within-sets correlations were indicative of the shared variance among the variables in their respective sets. The standardized canonical coefficients for these variables likewise had the larger coefficients, and the structure coefficients were all positively related to the predictor variables.

Predictor variable effects. Turning to the predictor variables, the results in Table 11 also revealed that impact had the highest correlation with the criterion variate (-.799), with connection and faculty leadership being moderately highly correlated (-.658 and -.646). Trust and commitment were moderately correlated with the predictor variate (-.527 and -.512, respectively). The squared cross loadings showed that 63.8% of the variance in impact was explained by the criterion variate. Function 1 explained 43.3% and 41.7% of the variance in connection and faculty leadership, respectively. Thus, the criterion variate seemed to do the best job explaining variance in impact, connection, and faculty leadership and was significantly less able to explain commitment and trust. Interpretation through the structure coefficients returned complimentary results: Impact (-.941) and faculty leadership (-.760) were highly correlated with their predictor variate. The remaining variables were moderately correlated with the predictor variate. Of note, commitment was negatively correlated with the other variables in the predictor set. However, its insignificant contribution toward the variance explained in the criterion variables precluded further conclusion as to suppression or negative interaction. The squared structure coefficients indicated impact able to contribute about 89% to the synthetic predictor variable, with faculty leadership and connection able to contribute about 58% and 45%, respectively, and trust and commitment able to contribute about 39% and 36%, in turn. Note that these high percentages indicated the variables were

sharing some variance (exhibited linear dependency) (Kraha et al., 2012), which is a common occurrence in generalized linear models (Reichwein Zientek & Thompson, 2006). The standardized canonical function coefficients also were consulted. Consistent with their structure coefficients, impact, faculty leadership, and connection likewise had the larger standardized function coefficients, followed by trust and commitment.

All of the cross loadings were positively related. Generally, the trends in the cross loadings, structure coefficients, and standardized (beta) weights were consistent. Impact was the strongest predictive contributor for explaining the criterion variate, followed by connection and faculty leadership. Value was the strongest criterion variable explaining the predictor variate, followed by CoP. In summary, the predictor variate was well represented by variance shared among the predictor variables. Impact, connection, and faculty leadership explained the most variance in the criterion variable. The criterion variate was best represented by value and CoP (respectively), with exposure making a secondary contribution.

In summary, the results of the CCA generally supported the theoretically expected relationships between characteristics of a CoP and a participant's perceptions about their experience. CoP characteristics (the predictor variables) and experienced CoP (the criterion variate) were positively correlated with themselves and each other (excepting the insignificant beta weight on commitment), meaning positive changes in these variables would likewise exert a positive effect on the other variables. Traditional CCA interpretation would conclude at this point, and results would be drawn. However, in light of the lack of clarity surrounding commitment, and because of the indication of

multicollinearity, a commonality analysis was conducted in order to provide additional clarification and support to the conclusions.

The commonality analysis was conducted on Function 1 and partitioned each canonical variate by the variables in the opposite variate and returned the unique and common (shared) contribution to the canonical effect (Nimon et al., 2010). Table 12 illustrates the partitioning of the Function 1 experienced CoP canonical variate (the *criterion* variables) by the variables representing CoP characteristics (the *predictor* variate). Each coefficient indicated how much variance was explained uniquely by one variable or in common by a combination of variables within the variate. Note that the sum of the commonality coefficients in the table equals the R_c^2 (.721) for Function 1. This is because this sum represents the squared correlation between the two variates comprising the function, and $r_{\text{predictor.criterion}}=r_{\text{criterion.predictor}}$ (Nimon et al., 2010; Nimon & Reio, Jr., 2011). The "% Total" column "represents the percentage of variance explained out of the canonical effect observed (much like a squared structure coefficient)" (Nimon et al., 2010, p. 715). The largest amount of explained variance of the predictor variate by the criterion variate was unique to impact, which explained 20.95% of the canonical function. Connection and faculty leadership explained 3.79% and 2.95%, respectively. Together, this unique variance accounted for .20 of the .721 canonical effect and explained 27.70% of the observed variance. Trust and commitment provided negligible amounts, explaining 1.19% and .22%, respectively.

Table 12

All Possible Subsets Commonality Analysis Partitioning of Function 1's Criterion Canonical Variate by the Predictor Variate

Unique and Common Effects	*Coefficient*	*% Total*
Unique to Impact	.1511	20.9526
Unique to Commitment	.0016	.2174
Unique to Connection	.0274	3.7943
Unique to Leadership	.0213	2.9489
Unique to Trust	.0086	1.1908
Common to Impact Commitment	.0028	.3932
Common to Impact Connection	.0352	4.8883
Common to Commitment Connection	-.0013	-.1767
Common to Impact Leadership	.0817	11.3302
Common to Commitment Leadership	-.0015	-.2140
Common to Connection Leadership	.0003	.0465
Common to Impact Trust	.0134	1.8580
Common to Commitment Trust	-.0005	-.0671
Common to Connection Trust	.0135	1.8687
Common to Leadership Trust	.0048	.6627
Common to Impact Commitment Connection	.0112	1.5486
Common to Impact Commitment Leadership	.0546	7.5779
Common to Impact Connection Leadership	.0166	2.3022
Common to Commitment Connection Leadership	.0021	.2943
Common to Impact Commitment Trust	.0031	.4354
Common to Impact Connection Trust	.0254	3.5219
Common to Commitment Connection Trust	.0002	.0265
Common to Impact Leadership Trust	.0238	3.3066

(table continues)

Table 12 *(continued).*

Unique and Common Effects	*Coefficient*	*% Total*
Common to Commitment Leadership Trust	.0008	.1171
Common to Connection Leadership Trust	.0034	.4711
Common to Impact Commitment Connection Leadership	.0403	5.5869
Common to Impact Commitment Connection Trust	.0125	1.7289
Common to Impact Commitment Leadership Trust	.0325	4.5035
Common to Impact Connection Leadership Trust	.0321	4.4497
Common to Commitment Connection Leadership Trust	.0024	.3316
Common to Impact Commitment Connection Leadership Trust	.1017	14.1041
Total	.7211	100.0000

I next examined common variance. It was first noted that three variable combinations were negative, that they all possessed very small coefficients, and that each involved the commitment variable. While negative commonalities generally indicate suppression effects, a suppressor typically presents as a variable possessing a "sufficiently nonzero standardized weight" in conjunction with a near-zero or very low structure coefficient (Kraha et al., 2012; Nimon et al., 2010, p. 714). Reichwein Zientek and Thompson (2006) noted that small negative values may reflect sampling error when a study's sample size was small. Given the negligible unique contribution by commitment (.0016), I assumed sampling error in these cases and, following Frederick's (1999) suggestion, interpreted these commonalities as zeros.

Of the remaining combinations, the variance shared in combination with impact explained the most additional variance. These combinations provided the most additional variance explained, ranging from ~4.50% to 14.40%. Each involved impact and either connection or faculty leadership. Most notable of these was the impact and faculty leadership combination, which contributed an additional 11.33% (see Table 12).

In total, these combinations provided an additional 52.44% explained variance for the criterion variate and accounted for .378 of the canonical function (.721). Though multicollinearity does not affect the explanatory power of the model, it can mask the true predictive power of a variable. The commonality analysis indicated where the collinearity lay and the extent to which it mediated the variable's contribution. In summary, multicollinearity effects in the predictor variables accounted for about 70.44% of the explained variance of the criterion variate (including the deletion of the opposing commitment effects), but both the modes of overlap (sharing) and their combined effects supported the original conclusion that impact, connection, and faculty leadership were the dominant contributors.

Table 13 illustrates the partitioning of the Function 1 CoP characteristics (predictor) variate by the experienced CoP (criterion) variable set. Value contributed the largest unique amount toward the predictor variate, explaining 31.44%. CoP uniquely explained of 9.42%. The reader should note, however, that while value provided .227 of the canonical function (.721), CoP provided only .067. Exposure contributed a unique contribution of only .0142 toward the canonical function (.721); this equated to 1.96%. The CoP / value and CoP / value / exposure combinations provided the largest amount of shared variance and explained 27.75% and 20.45%, respectively. In total, unique contributions explained 42.82% of the predictor variate, and significant shared combinations explained an additional 48.20%.

Table 13

All Possible Subsets Commonality Analysis Partitioning of

Function 1's Community of Practice Predictor Canonical Variate by the Criterion Variate

Unique and Common Effects	*Coefficient*	*% Total*
Unique to CoP	.0680	9.4243
Unique to Value	.2267	31.4350
Unique to Exposure	.0142	1.9630
Common to CoP Value	.2001	27.7513
Common to CoP Exposure	.0187	2.5900
Common to Value Exposure	.0460	6.3852
Common to CoP Value Exposure	.1475	20.4512
Total	.7211	100.0000

Table 14 presents an aggregated view by variable of the unique, common, and total effects of the canonical variate subsets which further supports the conclusions drawn from the predictor and criterion matrices shown in Table 12 and Table 13. The aggregated commonality coefficients illustrated that both the unique and total contributions of commitment and trust were not significant (.263 and .278, respectively), indicating that these variables did not play a meaningful role in explaining the variance in the criterion variate. Furthermore, the aggregated commonality effects for exposure (.226) further revealed this variable did not make a significant unique or common contribution in explaining the predictor variate.

Table 14

Commonality Coefficients of Canonical Variates (CV) Aggregated by Variable

Variable	*Unique*	*Common*	*Total*
CoP Characteristics CV			
Impact	.1511	.4870	.6381
Commitment	.0016	.2610	.2625
Connection	.0274	.2956	.3230
Leadership	.0213	.3957	.4169
Trust	.0086	.2691	.2777
Experienced CoP CV			
CoP	.0680	.3663	.4342
Value	.2267	.3936	.6203
Exposure	.0142	.2122	.2263

In summary, the commonality analysis supported the conclusions from the CCA. Impact, connection, and faculty leadership explained the largest amount of unique variance in the criterion variate. The largest proportion of shared variance explained also involved these three variables, and each combination included a contribution from impact. The unique influences made a contribution of .21 to the canonical effect, and they accounted for about 29% of the variance. This indicated multicollinearity effects in the predictor variables accounted for about 70% of the explained variance, but both the modes of overlap (sharing) and their combined effects supported the original conclusion that impact, connection, and faculty leadership were the dominant contributors. Results for the commonality analysis of the criterion variate's explanatory power also supported

the CCA. The total unique influences contributed .309 to the canonical effect (.721) and explained about 43% of the predictor variate variance. Multicollinearity effects accounted for about 57% of the criterion variate's power. Here, too, the overlap and mode of sharing were consistent with the CCA in that value was the dominant contributor, followed by CoP.

Summary

This chapter provided results from the statistical interpretation of the data describing the case at the center of this study, including demographic information, descriptive statistics, and data analyses using canonical correlation analysis and commonality analysis methods. Regarding the survey validity, though the items correlated moderately or better for their respective scales, the shared experience items failed to produce a definitive factor during analysis. Individual items in the shared experience scale cross-loaded moderately on both the shared experience construct and the impact variable. The shared experience scale was removed, as were three confounding items from the connection to community scale.

The additional factor analysis confirmed 5 factors. The individual items comprising these scales were found to be intercorrelated and valid; thus, because it was the variable composite that was of interest in this study and in order to treat the data as an interval (rather than ordinal) type in the subsequent analyses, the Likert items for each scale were transformed to create a corresponding composite indicator (index) variable. In the code book, these variables were noted with a "t" preceding their names in order to differentiate them from individual scale items; for example, the items

comprising the impact variable were converted to an index which then was identified as tIMPACT. The remaining scales were created and renamed thusly.

A CCA then was conducted using the following (converted) predictor variables: impact, commitment, connection, faculty leadership, trust. The three criterion variables also were converted to indices in order to treat them as interval data; because of their singular nature in each index, their names remained the same: CoP, value, and exposure. The entire model and first function were found to be statistically significant. Accordingly, all variables were retained in the model and analyzed as substantial contributors. Impact, connection, and faculty leadership were the primary contributors to the predictor variate (in that order), and they also provided the strongest explanatory power for the criterion variate (explaining 64%, 43%, and 42%, respectively). Value and CoP were the primary contributors to the criterion variate, with exposure providing a more modest contribution. Value and CoP also provided the strongest explanatory power for the predictor variate (explaining 62% and 43%, respectively), with exposure explaining comparatively less (23%). The relationships among the variables were positive, further supporting the general model.

Because the results exhibited multicollinearity, and in keeping with suggested interpretation practices for CCA, a commonality analysis was conducted to clarify the strength and primary contributors to the variate relationships. The conclusions drawn from the CCA were substantiated in the commonality analysis results. In summary, while the full model provided statistically significant explanatory power for the relationships among the observed variables, impact, faculty leadership, and connection were the strongest predictive contributors, with commitment and trust sharing a smaller

amount of variance in the predictor variate and exhibiting insignificant contributions to the predictor's explanatory power of the criterion variate. Value and CoP were the strongest contributors to the criterion variate, with exposure making a secondary contribution.

CHAPTER 5

DISCUSSION

Introduction

The goal of this research was to examine the value associated with an online graduate course learning environment which manifested community of practice (CoP) characteristics. Specifically, I sought to determine the CoP traits which most strongly related to an environment in which students perceived the course culture as a CoP and to establish which characteristics related to the learning and professional value associated with such an experience. The overall research objectives of this study were to: 1) Determine the degree to which empirically derived characteristics of effective professionally-based online CoP environments also would describe a graduate course-based CoP culture, and 2) Determine the degree that these characteristics related to students' perceptions of educational and/or professional value in that culture.

A canonical correlation analysis (CCA) was conducted in order to identify dimensions among the predictor variables (independent variables of impact on learning/work skills, commitment to the community, sense of connection with the community, faculty leadership impact on the community, and sense of trust within the community) and criterion variables (dependent variables of perceptions of the course culture as a CoP, educational value perceived from experiences in the course culture, and perceived exposure to the profession due to participation in the course culture). A commonality analysis was conducted to provide additional clarification to the results. Overall, the original model did a good job explaining relationships between an online

graduate class in library science which exhibited characteristics of a CoP and the perceptions of the participants. The research questions guiding this study were:

> *RQ1. To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences characterize a CoP experience within an online graduate course?*
>
> *RQ2: To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences relate to a student's perceived value on learning in an online course which exhibits a CoP environment?*
>
> *RQ3: To what extent do select characteristics of impact on work processes, commitment to the community, connection to members, faculty leadership, trust, and shared experiences relate to a student's perceived sense of professional experience in an online course which exhibits a CoP environment?*

These research questions acknowledged the integral relationships of characteristics that indicate both the presence and the impact of a CoP in an online course. This study sought to confirm and explore those relationships.

Multivariate design and methods honor the fact that relationships – especially among behavioral variables – are created and mediated by multiple causes. Thus, the findings from this study are discussed in accordance with this multivariate approach and affirm that connections between the predictor variables and the criterion variables must be considered in tandem, as opposed to examining direct and independent effects. This chapter progresses as follows: First, results from the analyses are examined. Next, conclusions as to the impact of this research are drawn. Finally, recommendations are suggested for further research focusing on CoPs as a model for graduate learning in online environments.

Discussion of Findings

Of the 109 participants who completed the survey, 91 (83.5 %) were female and 18 (16.5%) were male; the gender ratio of the participants was equitable to that of the library and information science (LIS) masters of science program. Age ranged from 21 to 64, with a mean age of 36.43. Three participants (2.8%) held 2 bachelor degrees (no one held more than 2 bachelor degrees). Thirteen (11.9%) held a master's degree, and only 1 participant (.9%) reported currently holding a doctor of philosophy. Most of the participants had previously completed online courses. Of the 109 participants, 73 (67.0%) indicated they previously had completed 4 or more online courses, while 23 (21.1%) had never completed an online course before taking the Introduction to Information Access and Retrieval (IIAR) course. The participants also were at varying points in their degree program when they took this IIAR course, but the majority (65, 59.6%) was in their first or second semester of course work.

The CCA revealed that the full model was significant function (R_c^2 = .741, p = .000). This model consisted of a predictor variate comprised of the impact, commitment, connection, faculty leadership, and trust variables and a criterion variate comprised of variables measuring students' sense of perceived CoP, perceived value on learning, and perceived exposure to the profession. Only the first function of the CCA was statistically and practically significant (R_c^2 = .721, p = .000). Impact, leadership, and connection provided the largest contributions to the predictor variate, explaining 89%, 58%, and 45%, respectively. As well, the criterion variate did the best job describing these three variables in the predictor variate, explaining 63.8% of the variance in impact, 43.3% of connection, and 41.7% of leadership. The criterion variate was

primarily explained by value (85%) and perceived CoP (60%), with exposure to the profession providing a smaller contribution (30%). Value explained the largest amount of variance for the predictor variate (62.1%), with perceived CoP explaining 43.4%.

As is typical with linear multivariate analyses, multicollinearity was present (Reichwein Zientek & Thompson, 2006). While multicollinearity does not change the explanatory power of the model, it can make it more difficult to determine from where and what variable combinations the effects arise. A commonality analysis thus was conducted to extract the unique and common (shared) effects of each variable in terms of its relationship to the other variate. The analysis revealed that impact provided 21.0% of the unique effects while connection and leadership explained 3.79% and 2.95%, respectively. These three variables were the dominant shared contributors, as well. Impact and either connection or leadership (or both) were components in every notable combination (sharing ~4.50% to 14.10%), explaining an additional 52.44% of the criterion variate. Value was the dominant contributor to the predictor's canonical effect, explaining 31.44%. Perceived CoP uniquely explained 9.42%, while exposure to the profession explained only 1.96%. Exposure to the profession's shared contribution was just .21 of the canonical effect (.721).

In summary, then, impact, faculty leadership, and connection to the community provided the strongest relationships to the criterion variate, with correlation coefficients of -.799, -.658, and -.646, respective. These variables were the dominant contributors explaining the criterion variate, able to describe 89%, 58%, and 45% respectively. In turn, the criterion variate also provided the largest explanatory for these individual predictor variables, as well, describing 63.8% of the variance in impact, 43.3% of the

variance in connection, and 41.7% of the variance in leadership. Commitment and trust did not appear to contribute significantly to their predictor variate, nor did they provide strong explanatory power of the criterion variate. Value and perceived CoP provided the strongest relationships to the predictor variate, with correlation coefficients of -.788 and -.659. Exposure to the profession made a “low moderate” contribution of -.476. These variables explained 62.21%, 43.4%, and 22.7% of the predictor variate, respectively. Multicollinearity effects in the predictor variables accounted for about 71% of their explanatory effect of the criterion variate, but both the modes of overlap (sharing) and their combined effects supported the original conclusion that impact, connection, and leadership were the dominant contributors explaining the criterion variate, which itself was explained predominantly by value and perceived CoP, with exposure to the profession providing a secondary contribution. Shared effects in the criterion variate contributed about 57% of the variate’s explanatory power toward the predictor variate.

Conclusions

Results from this study indicate that a CoP can be fostered in an online graduate course. Where students perceive a CoP, professors can expect to find a strong correlation among perceived impact on work processes, effective mentoring leadership, and a sense of connection with members of the community. Most participants (97, 89%) perceived the course culture to be a CoP, and they found value in that educational experience (98, 90%). As well, variables shown empirically to characterize a CoP generally also related indicators of a perceived CoP environment. CoP was measured by students’ perceptions of belonging to a CoP, and value measured perceptions of

educational value students associated with their experiences in the course culture. The collinearity between value and perceived CoP indicated these two variables were measuring the same underlying construct for defining a student's perceptions of a CoP experience. This means practitioners can expect students to find value in online learning communities wherein they also feel the course culture has manifested a CoP as indicated by the predictor characteristics which typify a CoP environment. Care should be taken, however, not to assume causality among the criterion or predictor variables. As well, even though 86% of participants felt their participation in the course culture contributed to their understanding of the profession, the exposure to the profession dimension was not well explained by the predictor variate. Exposure to the profession, thus, shared only a small amount of the criterion variate's overall variance as explained by the predictor variables.

The exposure to the profession variable, then, was not clearly substantiated by the predictor variate, and it explained a smaller relative proportion of the predictor variate (23%) than did value (62%) and perceived CoP (43%). This is problematic in regards to this study because without the sense of exposure to the profession being expressly interrelated with the CoP experience, it becomes more difficult to differentiate the course-based CoP actuality with that of a well-defined academic learning community. Barab and Duffy have illustrated how many such efforts at a course-based CoP fail to address this element. This lack of clarity could be due to the shared experiences variable being removed prior to the CCA due to excessive collinearity with other predictor variables (specifically, impact and connection). It also is possible that the variance in the perceived professional experiences variable was not fully captured as a

latent construct. This conclusion is supported by exposure to the profession's smaller proportional relationship with perceived CoP and value and statistically insignificant, yet practically relevant, relationship to the predictor variables. Exposure to the profession shared only 31% of the criterion variance, and the predictor variables explained only 23% of observed exposure to the profession's variance in the criterion set. Because shared experiences, connection to the community, and impact on work processes are closely related – at least in this CoP environment – this indicates more work needs to be done to clarify this dimension in an artificial classroom setting. Additional research is needed to clarify the presence of shared work-related experiences and collaboration in the online course environment and to better clarify this dimension from students' perceived impact on their work processes.

Impact, faculty leadership, and connection were the substantive contributors to predictor variate and also explained the most variance in the synthetic criterion experienced CoP variate. These findings are in keeping with previous studies on CoPs in industry and field settings, where improved work processes are a key participant motive for membership and where corporate-supported leadership helps to form the core community component (e.g., Cadiz et al., 2009; Hemmasi & Csanda, 2009; McDermott & Archibald, 2010; Wenger et al., 2002). These results also support learning community theory and models which have shown the importance of faculty participation and building a sense of personal connection in the online community as factors for a successful learning environment (e.g., Garrison & Arbaugh, 2007; Gunter, 2007).

The trust variable did not explain a significant amount of the criterion variance, even in its collinear capacity with the other predictor variables. Though trust is a key

theoretical construct in a CoP (Wenger, 1998), it could be that this online course environment did not develop that aspect of the online relationship. The practical nature of the course content might not have required or encouraged development of that dimension. That is, students may not have considered their relationships to others in the course as ones that required a level of trust or belonging. For example, sharing tips and requesting assistance to fulfill a fictitious reference request might not engender the sense of personal vulnerability that sharing a personal stance on a sensitive topic might.

That most participants had previously completed online courses tends to minimalize the possibility that the lack of power with the trust variable was due to general inexperience in the online course environment. Furthermore, individual results from the survey items characterizing trust indicate that about 73% of participants did perceive themselves to have a trusting relationship with others and that they were comfortable expressing themselves there. Because trust is an indicator of CoPs (Wenger, 1998) and of learning communities in general (Garrison, Anderson, & Archer, 2001; Rovai, 2002a), the discrepancy between raw responses and correlational findings indicates this variable requires additional research. It could be that this particular online environment, with its strong emphasis on practical skill development, did not require a strong element of trust for students still to find the environment to be a valuable contribution toward the learning experience. Future studies might explore the development of trust and in varying environments, as well as the weight it carries in contributing to perceived success and satisfaction in online learning environments.

The commitment predictor variable also neither shared a significant amount of the variance in the predictor variate, nor did it contribute a substantive effect to the

criterion variate. Interestingly, the insignificant contribution of this variable is in keeping with Hemmasi and Csanda's (2009) findings, as well – in their study of a CoP network fostered by State Farm Insurance Companies, commitment to the community did not predict perceived effectiveness of the CoP. The commitment dimension examined a participant's commitment to the community in terms of participation levels and purposeful information sharing. That the variable seems to play an insignificant role seems counterintuitive because in both spontaneous and fostered CoP environments, it is the benefit and value members garner from their voluntary participation that provides a significant catalyst for the persistence of the CoP. In the Hemmasi and Csanda (2009) study, participants reported in open-ended items that the greatest challenge of membership stemmed from finding time to fully participate in the community.

Time commitment might be a factor in the online course, as well. However, it may be that in the artificial boundaries of an online class, such personal commitment is not a relevant indicator of a course-based CoP. After all, Wenger has indicated that a core membership provides the majority of the functionality of a CoP and that most members participate only peripherally as they utilize the CoP to fulfill specific needs (Wenger et al., 2002). It may be that faculty leadership as mentors and role models of professional practice sufficiently comprise the core and active dimensions and subsume the importance of a student's personal commitment to maintaining the environment. The efforts of core leaders may be what mediated Hemmasi and Csanda's finding, as well. Furthermore, the limited duration of a course-based CoP might impact the effect of a student member's personal interaction in the community. Finally, Perkins et al. (2007) noted that learning through participation is mediated both by competence and

experience. In this context, it is reasonable that participant effort might be low when students do not have previous experiences from which to draw. Still, given that these give-and-take interactions are where shared professional experiences would occur and where information would be shared, constructed, and assimilated, it is logical that a certain degree of commitment to the community must exist in order for the remaining dimensions to manifest. Certainly, peripheral participants, in their roles of consumers, rather than creators, of information still may find value from the CoP environment, which supports the raw data. Additional research is warranted in order to clarify the role of personal commitment to a course-based CoP environment.

Recommendations for Further Research

The findings of this study must be considered with caution when extrapolating the results to other populations. As a case study of a specific implementation of an online Introduction to Information Access and Retrieval course, this research suggests that a CoP can be fostered in an online course environment. While the population of the course was representative of the general population of the department at the university, generalizations to other SLIS courses should be made with care. As well, the study should be replicated across different types of courses in varying graduate programs to determine both the success and the impact of fostering a CoP environment in graduate online courses. More precise mapping of the perceived benefits to a course's structural elements would benefit future course design efforts. Survey items and follow-up interviews or focus groups could facilitate these efforts.

In terms of the predictor variables, further research should include qualitative and quantitative efforts to clarify the dimension of shared professional experiences in the

online course environment. As with exposure to the profession, this construct attempts to capture a variable that is assumed and subsumed in a long-term CoP environment. This variable needs to be more clearly expressed in the survey in order to delineate it from the items describing the impact dimension and to ascertain its effect on participants' perceived exposure to the profession and to students' perceptions of a CoP experience as a whole. The role of individual commitment deserves additional attention and offers research opportunities, as well. Commitment appears not to mediate the value of the experience, yet a certain level is required in order to create and maintain a CoP environment. It may be that being integrated within the classroom masks students' perceptions of how much time they spend communicating in the environment or confounds student ability to differentiate between what is voluntary contribution to the community. While the balance remains unclear, core (i.e., faculty) leadership appears to play an integral role. Trust, which has been shown to be an integral component of any form of online learning community (Arbaugh et al., 2008; Rovai, 2002a), including a CoP (Wenger, 1998), did not appear to mediate student perceptions of value in this online course environment. Further research is needed to determine the degree that the subject of the course, as well as the level of the course, mediates the effect of trust on student perceived value.

In terms of the criterion variables, I considered perception of connecting to the larger professional community to be a key criterion for defining and evaluating a course-based CoP. This dimension was expected to help clarify student perceptions of CoP participation by indicating a clear relationship between the course culture, students' perceptions of a CoP, and the presence of a CoP (as opposed to a traditional learning

environment). Though the majority of the participants (94, 86.24%) indicated they felt a connection to the larger profession as a result of participating in the course culture, the predictor dimensions did not support this perception. This could directly relate to the lack of a clearly defined dimension describing the shared professional experiences variable. Even with this impediment, however, the perceived professional exposure variable still explained 23% of the predictor variate. This suggests the dimension was supported and that student perceptions of the learning community as a CoP were correct. However, further exploration is needed before explicit conclusions can be drawn.

Summary

The results of this research found relationships among specific CoP characteristics and student perceptions of membership in an online graduate course CoP environment in an Introduction to Information Access and Retrieval course. The CCA indicated a single relationship among the explored variables (i.e., Function 1 explained 72% of the observed relationship between the predictor and criterion variable set), as was supported by the lack of statistical significance and low practical significance (i.e., variance accounted for) in Functions 2 or 3. The strongest relationships occurred among impact on work processes, faculty leadership, and connection to the community (the predictor variables) and perceived experienced CoP, value on learning, and – to a lesser degree – experience with the profession. The strongest predictor variable was impact on work processes, and the strongest criterion variable was value on learning.

Overall, the results of this study indicate that the adjusted model is a good fit for describing the existence and value of a CoP within an online graduate course. While care must be taken in generalizing the findings from this case study, teachers and instructors still can use this model to design and evaluate online courses in which they wish to foster a CoP environment. Researchers can use these findings as a launch point for additional investigation, including replication studies or addressing the macro role of specific CoP characteristics on the efficacy and satisfaction in an online graduate course CoP.

In this research, characteristics empirically studied in field research as CoP predictors also demonstrated positive relationships with participant perceptions of a CoP environment in an online graduate course, and students not only recognized the environment as a CoP, but also they found educational and professional value from it. The overall significance of the model indicates teachers can nurture an environment wherein students will take the initiative to work with others to construct and acquire knowledge that creates a sense of professional connection with each other and with the profession overall. The results of this correlational study suggest further empirical research in implementing and assessing CoPs in online graduate courses is warranted.

APPENDIX A

HEMMASI PERMISSION CORRESPONDENCE

Re: Updated Information Request: Hemmasi & Csanda 2009 CoP Study

Hemmasi, Masoud [mhemmas@ilstu.edu]

Sent: Friday, August 23, 2013 7:15 PM

To:

Bone, Tonda

Cc: Figa, Elizabeth; Bone, Tonda

Hello Tonda,

Thank you for the update and congratulations on completing the dissertation research. Please feel free to use/report the scales and their constituent items in any way that best meets the needs of your dissertation project.

Best of Luck,

Masoud Hemmasi, Ph.D.

Emeritus Professor of Management & Quantitative Methods

Illinois State University

Normal, IL 61790

RE: Information Request: Hemmasi & Csanda 2009 CoP Study

Hemmasi, Masoud [mhemmas@ilstu.edu]

Sent: Monday, October 04, 2010 8:35 AM To: Bone, Tonda Attachments: Communities of Practice (V~1.doc (71 KB)

Hello Tonda, Please find attached the survey instrument that Carol Csanda and I used in our Communities of Practice project.

Masoud

Masoud Hemmasi, Ph.D. College of Business
Research Director and Professor of
Management & Quantitative Methods College
of Business Illinois State University Normal, IL
61790-5580

Phone: (309) 438-8765
Fax: (309) 438-8201

APPENDIX B

SOLICITATION EMAIL

Hello!

I am conducting a survey to examine the perceived impact that virtual interaction has upon one's educational experience in a graduate-level online core course. The goal is to examine how online course environments can impact a student's 1) sense of professional identity, 2) sense of belonging to a professional discipline, and 3) experience of professional practice.

This study has been approved by the UNT Institutional Review Board as meeting their standards for such research work. The survey is completely anonymous. It should take you no more than 20 minutes to complete the survey, and you will be free to exit the survey tool at any time.

While there is no foreseen direct benefit to you for completing this survey, sharing your thoughts and experiences can make a real difference in how participation events are implemented in future courses.

As well, I would be most grateful for your participation in this study.

Thank you for your consideration!!

[survey link inserted here]

Tonda

[In the LIS Village and LIS ListServ, the signature was:]

Tonda Bone
Doctoral Candidate, Information Science

APPENDIX C

PARTICIPANT CONSENT FORM

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

Title of Study: _____ Bridging the Theory-to-Practice Gap: Student-Perceived Effects of a Graduate Online Learning Environment Modeled on a Community of Practice Framework _____

Principal Investigator: _Tonda Bone_, University of North Texas (UNT) Department of _Interdisciplinary Information_.

Purpose of the Study: You are being asked to participate in a research study which examines your experiences in this online course. The goal is define an online community environment that not only reflects the events you have found to be most effective for your learning, but also creates a positive environment within which to explore and practice that new learning.

Study Procedures: You will be asked to complete a survey consisting of 34 agreement-type questions (i.e., 1=*totally disagree* and 5=*totally agree*). The survey should take about 20 minutes of your time.

Foreseeable Risks: No foreseeable risks are involved in this study.

Benefits to the Subjects or Others: This study is not expected to be of direct benefit to you, but by sharing your experience, your participation can directly impact community design principles for future online courses in this and other disciplines.

Procedures for Maintaining Confidentiality of Research Records: The confidentiality of your individual information will be maintained in any publications or presentations regarding this study. No identifying data is captured in this survey. Records will be kept on a secure University of North Texas server accessible via researcher password.

Questions about the Study: If you have any questions about the study, you may contact _Tonda Bone_ at telephone number __XXX-XXX-XXXX_.

Review for the Protection of Participants: This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-3940 with any questions regarding the rights of research subjects.

Research Participants' Rights:

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Tonda Bone has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

_____
Printed Name of Participant

_____ _____
Signature of Participant Date

For the Principal Investigator or Designee:

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

_____ _____
Signature of Principal Investigator or Designee Date

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