Fall 2015

Online Knowledge Sharing: Investigating the Community of Inquiry Framework and Its Effect on Knowledge Sharing Behavior in Online Learning Environments

Anne Doring

ONLINE KNOWLEDGE SHARING:

INVESTIGATING THE COMMUNITY OF INQUIRY FRAMEWORK AND ITS EFFECT ON KNOWLEDGE SHARING BEHAVIOR IN ONLINE LEARNING ENVIRONMENTS

A Dissertation

Submitted to the School of Education

Department of Instruction and Leadership in Education

Duquesne University

In partial fulfillment of the requirements for

the degree of Doctor of Education

By

Anne Doring

December 2015

ONLINE KNOWLEDGE SHARING:

INVESTIGATING THE COMMUNITY OF INQUIRY FRAMEWORK AND ITS EFFECT ON KNOWLEDGE SHARING BEHAVIOR IN ONLINE LEARNING ENVIRONMENTS

By

Anne Doring

Approved September 23, 2015

_____
Misook Heo, Ph.D.
Assistant Professor
School of Education, Department of Instructional Technology
Duquesne University
(Committee Chair)

_____
Sue Alman, Ph.D.,
Lecturer
School of Information
San Jose State University
(Committee Member)

_____
Gibbs Y. Kanyongo, Ph.D.
Assistant Professor
School of Education, Educational Foundations and Leadership
Duquesne University
(Committee Member)

ABSTRACT

ONLINE KNOWLEDGE SHARING:

HOW THE COMMUNITY OF INQUIRY FRAMEWORK PREDICTS KNOWLEDGE SHARING BEHAVIOR IN ONLINE LEARNING ENVIRONMENTS

By

Anne Doring

December 2015

Dissertation supervised by Dr. Misook Heo

The purpose of this study was to examine whether the CoI framework can predict self-reported knowledge sharing behaviors within graduate-level online courses. The overall goal was to determine if high levels of social, teaching, and cognitive presence can lead to increased knowledge distribution within online learning environments, leading to the co-construction of knowledge among learners. As part of the study, graduate students from the field of education were asked to complete a survey, which combined Swan et al.'s (2008) CoI survey instrument and Yu, Lu, & Liu's (2010) knowledge sharing survey tool. The survey assessed students' perceptions of social, teaching, and cognitive presence within their respective online courses, and also measured their knowledge sharing behavior within these same courses. The independent

variables were totaled scores of social presence, teaching presence, and cognitive presence. The dependent variable was the totaled score of knowledge sharing behavior.

A standard multiple regression design was utilized to determine whether the independent variables (social presence, teaching presence, and cognitive presence) are predictors of the dependent variable (knowledge sharing behavior). Regression results indicated that an overall model with two independent variables - teaching presence and social presence - significantly predicts knowledge sharing behavior, $R^2 = .637$, $R^2_{adj}=.615$, $F(2, 33) = 29.001$, $p < .001$. Cognitive presence, however, was not shown to significantly contribute to this model. In line with existing theories - including social capital theory, the organization knowledge creation theory (OKCT), and self-determination theory - results suggest that the more social elements of the CoI framework might better motivate students to interact and share knowledge. On the other hand, cognitive presence, which is more closely tied to individual learning outcomes, plays a smaller role in motivating students to participate and share knowledge within online learning environments.

DEDICATION

While I am so grateful for the support I received from all of my family members, I would like to dedicate this dissertation to my daughter, Elizabeth. May you always work hard and love what you do.

ACKNOWLEDGEMENT

I would like to sincerely thank my committee members, including Dr. Misook Heo, Dr. Sue Alman, and Dr. Gibbs Y. Kanyongo. Their time, patience, insight, and support was not only inspiring, but absolutely essential in allowing me to complete this dissertation.

Dr. Sue Alman acted as my incredible advisor during my graduate studies at the University of Pittsburgh, where I always admired her work and her teaching abilities. Dr. Alman graciously accepted to play the role as my committee member *years* after my graduation from the University of Pittsburgh; her generosity and willingness to help is more appreciated than she will ever know.

Dr. Kanyongo guided me through all of my statistics-related courses during my time as a doctoral student; I could not have completed this dissertation without his knowledge and incredible capacity for teaching. He is truly brilliant at what he does, and I am so thankful that he was willing to support me as a committee member.

And finally, I cannot thank Dr. Heo enough for everything she did for me during my time at Duquesne. I know that Dr. Heo supports, inspires, and reaches out to *all* of her students, but I will always think of her as my own personal mentor and motivator. Dr. Heo taught me everything I know about instructional technology, research, writing papers, interacting with faculty, and navigating the world of academia. She is brilliant, kind, hard-working, and wise, and I hope to one day emulate just a fraction of who she is.

TABLE OF CONTENTS

Page

ABSTRACT iv

DEDICATION vi

ACKNOWLEDGEMENT vii

LIST OF TABLES xiii

LIST OF FIGURES xiv

Chapter I Introduction 1

Definition of Knowledge 2

Knowledge Sharing and Knowledge Management 3

Organizational Knowledge Creation Theory 4

Knowledge Sharing and Online Learning 5

Statement of the Problem 7

Purpose of the Research 9

Research Questions 9

Significance of the Study 10

Possible Limitations 11

Definition of the Terms 12

Chapter II Literature Review 14

Knowledge Management 14

History of KM 15

Knowledge Management Technologies 18

Knowledge Management Theories 19

Intellectual capital theory and intellectual property theory 20
Organizational knowledge creation theory 21
Knowledge building theory 24
Benefits and Obstacles Associated with KM 25
Online Learning 26
History of online learning 27
Learning Management Systems 30
Online Learning Theories 31
Social constructivism 31
Social presence theory 32
Benefits and Obstacles to Online Learning 34
Obstacles to online learning 36
Benefits of online learning 37
Knowledge Sharing 39
Knowledge Sharing Theories 40
Social exchange theory 42
Social capital theory 42
Self-Determination theory 43
Motivations and Barriers to Knowledge Sharing 44
Community of Inquiry 46
History of CoI 47
Social Presence 49
Cognitive Presence 50

Teaching Presence 51
CoI and Knowledge Sharing Behavior 52
Limitations of the CoI Framework 53
Assessments 54
Community of Inquiry Assessment Tool 54
Knowledge Assessment Tool 56
Chapter III Methodology 61
Introduction 61
Research Questions 62
Expected Results 63
Hypotheses 64
Null-Hypotheses 64
Research Design 65
Participants 66
Instrument 67
Procedures 68
Variables 70
Independent Variables 70
Dependent Variables 71
Data Analysis 72
Chapter IV Results 73
Null Hypothesis Review 73
Sample Size 74

Participant Demographics 74
Age and Gender 75
Degree Program and Student Status 75
Friendships 76
Experience with Online Learning and Technology 77
Multiple Regression Analysis 78
Outliers 78
Testing Assumptions 79
Standard Multiple Regression 82
Null Hypothesis Results 85
Null Hypothesis H_{01} 86
Null Hypothesis H_{02} 86
Null Hypothesis H_{03} 86
Summary 86
Chapter V Discussion 90
Summary of the Study 90
Description of the Variables 91
Summary of the Procedure 92
Interpretation of Results 92
Findings Related to Literature 93
Limitations and Future Studies 97
Conclusion and Practical Application 100
References 103

Appendix A Survey Instrument 137
Demographics 137
Teaching Presence 137
Design and organization 137
Facilitation 138
Direct Instruction 138
Social Presence 138
Affective expression 138
Open communication 139
Group cohesion 139
Cognitive Presence 139
Triggering event 139
Exploration 139
Integration 139
Resolution 140
Knowledge Sharing Behavior 140
Appendix B IRB Approval 141
Appendix C Email to Instructors 142
Appendix D Email to Students 143
Appendix E Online Forum Post 145
Appendix F Consent Form 147
Appendix G Standard Multiple Regression Output 150

LIST OF TABLES

Page

Table 1 *CoI Factors* 55

Table 2 *Factor Reliability Results* 59

Table 3 *Independent Variables* 71

Table 4 *Dependent Variable* 72

Table 5 *Respondents' Age Range* 75

Table 6 *Respondents' Degree Program* 76

Table 7 *Respondents' Student Status* 76

Table 8 *Respondents' Friendships within the Course* 77

Table 9 *Respondents' Previous Online Courses* 77

Table 10 *Coefficients for Model Variable* 80

Table 11 *Scores for Independent and Dependent Variables* 83

Table 12 *Model Summary of First Model* 84

Table 13 *Coefficients for Model Variable* 84

Table 14 *Model Summary of Second Model* 84

Table 15 *Coefficients for Model Variable* 85

LIST OF FIGURES

Page

Figure 1. SECI model 22

Figure 2. Graphical Representation Testing for Outliers. 79

Figure 3. Graphical Representation Testing for Linearity..... 81

Figure 4. Residual Plots Testing for Homoscedasticity. 82

Chapter I

Introduction

In recent years, online education has become an accepted and convenient alternative to the standard, university classroom setting, growing nearly 300 percent between 2002 and 2010 (Allen & Seaman, 2011; Beetham & Sharpe, 2013). In response to this shift, university administrators are actively increasing the number of online courses offered to students (Allen & Seaman, 2014). As this trend continues, much research has been conducted to analyze how these environments ensure quality student learning (see Brindley, Walit & Blaschke, 2009; Kearsley, 2009). The goal of many instructors and instructional designers is to create social and collaborative settings where learners actively construct knowledge while interacting with their peers (Lave & Wenger, 1991); however, online programs have historically relied on asynchronous technologies, such as discussion boards, that do not always create opportunities for immediate social interaction and feedback (Blessing & Kortenkamp, 2008; Dunlap & Lowenthal, 2009).

To overcome the possible lack of social interaction, researchers and practitioners continue to see the importance of a constructivist or social constructivist approach when designing and implementing online learning environments (Huang, 2002). While the terms constructivism and social constructivism are often used interchangeably (Andrews, 2012), social constructivism emphasizes that culture and context help shape our perception of society, and that our knowledge is based on this understanding (Kim, 2001). With this view in mind, social interaction and knowledge sharing is the key to a successful learning environment (Ma & Yuen, 2011).

Within the knowledge sharing literature, the concept of motivation - both extrinsic and intrinsic - determines the levels at which students share their knowledge (Lin, 2007). Motivating this knowledge sharing behavior, however, faces many obstacles within an asynchronous online learning environment, where interaction and feedback is no longer immediate (Vonderwell, 2003).

To this end, researchers have suggested that online learning environments that provide opportunities for forming social connections better motivate students to demonstrate high levels of knowledge sharing behavior, thus leading to improved learning outcomes (Ma & Yuen, 2011). Researchers and practitioners might therefore improve online learning environments if students are motivated to share their knowledge with their peers.

Definition of Knowledge

The concept of knowledge is problematic, as our understanding of knowledge often changes based on context. Within such fields as cognitive science and education, for example, the concept of knowledge is complex. The traditional view of knowledge, often called the realist perspective, is based on the concept that reality exists regardless of whether we take an interest in it; from this perspective, knowledge is only true if it corresponds with an objective view of what exists in the real world (Bodner, 1986). The problem with this perspective, however, is that it is impossible to judge how well our understandings correspond to reality (Bodner, 1986).

In the late 1960s, Jean Piaget's concept of intellectual development came into prominence (Duit & Treagust, 1997). From his work, constructivism evolved, suggesting that knowledge is constructed within the minds of the learner (Bodner, 1986).

Researchers within the field of education now seem to be in a general agreement that knowledge is a social construct that only holds meaning through communication and interaction with others (Norris, Mason, Robson, Lefrere & Collier, 2003). Knowledge can therefore be seen as something that grows when shared and transferred (Beerli, 2003). Within online learning contexts, where students are physically separated, cultivating this knowledge sharing behavior might be of particular importance. Knowledge sharing, which refers to the behaviors that lead to the spread of learning among individuals (Chen & Huang, 2009; Moorman & Miner, 1998), might therefore be a missing component in the majority of online learning environments.

Knowledge sharing is seen in two branches of the literature: academic classrooms and workplace communities (Ma & Yuen, 2011). While research of knowledge sharing within academic environments is relatively new, it has received much attention within the field of Knowledge Management (Yuen & Majid, 2007).

Knowledge Sharing and Knowledge Management

Knowledge Management (KM) is a field of study that addresses the importance of sharing, capturing, and organizing knowledge in a way that benefits a larger community. The field of KM often utilizes an informal and simplistic understanding of knowledge (Alvesson & Karreman, 2001); specifically, knowledge is understood as a subset of information, and it is assumed to be linked to experience (Alvesson & Karreman, 2001; Leonard and Sensiper, 1998). For example, in online settings, information is taken from repositories - such as educational Websites and digital libraries - and is then processed by users who access these systems. According to professionals within the field of KM, this processed information is turned into knowledge (Leung & Chan, 2007; Wang & Noe,

2010) through a complex procedure that requires the interplay between technology and the human information processing system.

Well-developed knowledge management systems and practices have existed in the private sector for some time (Kidwell, Vander Linde, & Johnson, 2000). Businesses and organizations within the private sector use these systems to capture, code, and share employees' knowledge (Hansen, Nohria, & Tierney, 1999). From a business standpoint, knowledge sharing plays an important role in KM (Hendriks, 1999); when this knowledge is shared, it is captured and added as an asset of an organization. Sharing and capturing this knowledge ensures that business systems and procedures are owned, managed, and distributed from one central hub and stored as records that can benefit and support future company growth (Alavi & Leidner, 1999). KM strategies are seen as an important asset in the business sector, and it is for this reason that the systems are more developed than what currently exist in academia (Piccoli, Ahmad, & Ives, 2000).

Organizational Knowledge Creation Theory

KM theories and principles that support these systems have been actively investigated and implemented to help both large and small companies collect employees' knowledge and build a large repository of knowledge assets. One such theory, the organizational knowledge creation theory (OKCT), explains that what an individual knows can benefit the organization as a whole (Huang & Liaw, 2004). This theory describes knowledge as an asset, and highlights KM as a roll-up of knowledge from the individual employees to the larger organization (Dunne & Butler, 2004).

Within this theory, two main categories of knowledge emerge: implicit knowledge and explicit knowledge. Implicit knowledge is defined as intangible

knowledge that exists within an individual's mind; explicit knowledge, on the other hand, is tangible, and has been recorded in the form of a document or other such artifact that is stored indefinitely as an asset (Nonaka, Byosiere, Borucki, & Konno, 1994). With the help of KM systems, knowledge is created and distributed during the transition process between tacit to tacit knowledge (socialization), tacit to explicit knowledge (externalization), explicit to explicit knowledge (combination), and explicit to tacit knowledge (internalization) (Nonaka, 1991; Smith, 2001). From this framework, often called the SECI framework, knowledge is generated by actively sharing information with peers.

While the SECI framework is popular within the field of KM, some researchers suggest that this framework can be useful in understanding how students learn within online learning environments (see Oztok, 2012). As social constructivists highlight social interactions and context as essential components in knowledge construction (Derry, 1999), the SECI framework similarly underscores the importance of social interaction as the foundation of knowledge creation, especially within the socialization process of knowledge sharing.

Knowledge Sharing and Online Learning

While knowledge might play an important role within academic research, online learning environments do not always allow for traditional interactions between students that is required for demonstrating this knowledge (Hung, 2003), and might hinder the natural process of knowledge creation as defined by the SECI framework. Additionally, recent literature has noted the difficulty of motivating students to share knowledge with others (Hung, Durcikova, Lai & Lin, 2011). Questions therefore arise as to whether

knowledge can truly be shared and generated within a rigid online learning community (Veletsianos & Navarrete, 2012).

In order to help students share knowledge within online learning communities, researchers could potentially find ways of cultivating communities that increase the interaction between students, and therefore, the demonstrating and sharing of knowledge between students. Additionally, it might be important to understand the motivations behind knowledge sharing, and how the community factors into this process. As sharing knowledge can lead to new knowledge and innovations (Chen & Huang, 2009), motivating students to share this knowledge has become an important subject in recent literature (Hung, Durcikova, Lai, & Lin, 2011; Huang & Liaw, 2004). Some researchers have identified a strong community as a motivating factor in knowledge sharing; specifically, when individuals view knowledge as a public good belonging to a larger group, knowledge is more readily shared (Ardichvili, Page, & Wentling, 2003).

Similarly, researchers of the Community of Inquiry (CoI) framework suggest that that knowledge is embedded within groups and social contexts (Pardales & Girod, 2006). The concept of the CoI began with Charles Sanders (1839–1914) who used the term to refer to a group of individuals who collaborate to arrive at an end result (Pardales & Girod, 2006). More recent research of the CoI framework has suggested that online students are motivated to participate and learn in environments that show high levels of student presence, teaching presence, and cognitive presence (Garrison, Anderson & Archer, 2000). Through these three factors, students within these environments learn and construct knowledge through meaningful interactions with their learning community (Garrison & Arbaugh, 2007).

Statement of the Problem

The ultimate goal of any learning community is attaining knowledge, and according to social constructivists, knowledge is created through social interactions. Knowledge sharing is therefore a necessary and important step in knowledge attainment, and therefore learning (Ma & Yuen, 2011). Knowledge sharing, however, faces many obstacles within an online learning environment, where interaction is no longer immediate or physically demonstrated (Sirisaengtaksin & Olfman, 2014; Vonderwell, 2003). As the physical limitation of knowledge sharing has been extensively studied by KM researchers, online learning researchers might benefit from past KM research that has focused on online knowledge sharing.

Knowledge sharing is a difficult concept to cultivate, as it is strongly linked to motivation (Lin, 2007; Osterloh & Frey, 2000). The concepts of knowledge sharing and KM are well-studied in businesses and organizations, but limited research has been conducted to understand how KM concepts apply to academia (Piccoli, Ahmad, & Ives, 2000; Serenko, Bontis, Booker, Sadeddin, & Hardie, 2010).

The goal of KM is slightly altered from the perspective of academic learning, as researchers often argue that the focus of academia and the marketplace are fundamentally different (Fuller, 2012). While collecting knowledge as an asset might not be the ultimate goal of KM practices within academia, it might still be useful to use KM theories and practices to better understand the process of knowledge creation and knowledge sharing.

Borrowing from KM literature, an improved understanding of knowledge creation and knowledge sharing might help instructors and instructional designers improve the

design of online courses. While many researchers define successful learning environments as social and collaborative settings where learners actively construct knowledge while interacting with their peers (Lave & Wenger, 1991), most online programs rely on technologies that do not always allow for peer interaction and feedback (Blessing & Kortenkamp, 2008; Dunlap & Lowenthal, 2009). By improving our understanding of how knowledge is created and shared online, and what motivates students to actively participate in this process, instructors and instructional designers might better support students and student learning outcomes (Oztok, 2012).

In conjunction with KM theories and practices, an existing academic framework, such as the Community of Inquiry (CoI) framework, might be useful in understanding and assessing how quality online learning environments can affect knowledge sharing activities. Rooted in social constructivism and Dewey's (1933) concept of practical inquiry, Garrison, Anderson and Archer (2000) developed the CoI framework to understand how learning occurs through the interaction of social presence, teaching presence, and cognitive presence. Within this framework, each of these elements work together to generate a strong learning community that is well-structured and leads to higher-order thinking and learning (Garrison & Arbaugh, 2007).

As the CoI framework is rooted in social constructivism, it might be appropriately linked with traditional KM frameworks to better understand how knowledge is generated and shared within online learning environments. By enhancing social constructivists' understanding of learning with KM's definition of knowledge, researchers might be able to construct online learning environments that allow for increased knowledge sharing and improved learning outcomes.

Purpose of the Research

This study will investigate whether the CoI framework can predict self-reported knowledge sharing behaviors as demonstrated by online graduate students. The results will guide researchers' understanding of knowledge stimulation and distribution within online learning environments. While KM theories and systems within the business sector focus on resources that generate and transform knowledge for the good of the organization (Dunne & Butler, 2004), a deeper understanding of knowledge sharing within online learning contexts might lead to increases in student motivation to share knowledge with members of their online learning community. In order to help generate and distribute knowledge within these online learning environments, this exploratory study will examine the CoI framework and investigate whether the three factors of the CoI (social presence, teaching presence, and cognitive presence) can influence students' willingness to share knowledge within online learning environments. The results of the study might help guide future researchers and practitioners to develop online learning environments that meet established best practices as defined by the CoI and knowledge sharing frameworks.

Research Questions

Using the CoI framework, amended to include questions surrounding students' self-reported knowledge sharing behavior, this exploratory study investigates the CoI factors that influence students' self-reported knowledge sharing behavior within an online learning community. Specifically, the following research question and subquestions will be explored:

- To what extent do elements of the CoI framework predict self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of social presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of teaching presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of cognitive presence influence students' self-reported knowledge sharing behavior within an online learning environment?

Significance of the Study

The results of the research findings will help instructors and instructional designers understand whether certain factors of an online learning environment - namely, social presence, teaching presence, and cognitive presence - can influence students' knowledge sharing behaviors. A better understanding of how and why knowledge is shared within an online learning environment will pave the way for improved online learning systems (Kidwell, Vander Linde, & Johnson, 2000). If it is discovered that specific tactics facilitate a more successful online classroom by increasing CoI elements within online learning environments, this study will help practitioners improve their online teaching methods and strategies. Based upon research findings, online instructors could make informed decisions about whether to systematically promote knowledge

sharing behaviors, and will thus maximize online learners' satisfaction and improve learning outcomes.

Possible Limitations

While the study will attempt to understand how and why knowledge is shared, and whether knowledge sharing behaviors are affected by a strong CoI, there are possible limitations that should be considered. One limitation is that students will be asked to self-report their perceptions of social presence, teaching presence, and cognitive presence, as well as their knowledge sharing behavior. Some researchers have highlighted connections between age and levels of satisfaction and engagement within online learning environments (Shea & Bidjerano, 2009), which might affect perceptions as they relate to the CoI framework. Additionally, students might not accurately assess their level of knowledge sharing behavior, and because the survey relies on self-reported measures, actual behaviors could differ from what is reported.

Additionally, while this study attempts to understand how the CoI might influenced knowledge sharing behavior, it does not explore whether knowledge sharing behavior leads to improved learning outcomes. While certain theories suggest that knowledge sharing leads to knowledge co-construction, this study focuses specifically on perceptions of social, teaching, and cognitive presence, and whether these perceptions lead to self-reported knowledge sharing behavior.

Finally, this study does not consider certain variables that might affect student engagement and success within online learning environments, such as the use of mobile devices (Vogel, Kennedy, & Kwok, 2009) or the level of quality of instruction (Diaz,

2002). While understanding the effect of these factors is outside the scope of this study, future studies might be needed to better understand the effects of these potential factors.

Definition of the Terms

Community of Inquiry –The Community of Inquiry (CoI) framework is used to describe and assess quality online learning environments (Swan & Ice, 2010). Through this framework, Garrison, Anderson and Archer (2000) suggested that learning occurs through the interaction of social presence, cognitive presence, and teaching presence.

Learning Management System – A Learning Management System (LMS) is an online system that manages course-related information and communication for an online classroom (Watson & Watson, 2007). Different LMS brands offer varying technologies to support online learning environments, including discussion boards, blogs, wikis, and synchronous communication tools.

Knowledge co-construction – social constructivists suggest that knowledge co-construction occurs when students are given the opportunity to interact with other learners and share and discuss what they know (Redmond, 2006).

Knowledge management – knowledge management is the process through which an organization manages and organizes knowledge (Piccoli, Ahmad, & Ives, 2000).

Knowledge management tools – knowledge management tools are systems and applications that help manage knowledge in the form of digital artifacts (Leung & Chan, 2007).

Knowledge sharing – knowledge sharing refers to the behaviors that lead to the spread of learning among individuals (Chen & Huang, 2009; Moorman & Miner, 1998).

Online learning environment – for the purpose of this paper, an online learning environment is considered to be an asynchronous, computer-mediated environment, where students independently log into an LMS at various times to access reading material and communication tools (Garrison, 2003**)**.

Organizational knowledge creation theory (OKCT) – OKCT explains that what an individual knows can benefit the organization as a whole (Huang & Liaw, 2004). According to the OKCT, knowledge is created through the following four modes:

- Tacit to tacit (socialization) – tacit knowledge is passed to another person;
- Explicit to explicit (Combination) – explicit knowledge is turned into another form of explicit knowledge, such as using a reference to write a research paper;
- Tacit to explicit (externalization) – tacit knowledge is recorded and passed to another individual; and
- Explicit to tacit (internalization) – explicit knowledge is understood and processed by an individual (Huang & Liaw, 2004; Nonaka, 1994).

Chapter II

Literature Review

Knowledge Management

Knowledge Management (KM) can be seen from two perspectives: a business perspective, where knowledge is created, captured, organized, and used as an asset; and from a cognitive science perspective, where knowledge is seen as a human resource that allows us to function intelligently (Rad & Bayrami, 2010). In the past few decades, business-focused KM theories and strategies have received much attention for the potential role they play in the success of large organizations (Kidwell, Vander Linde, & Johnson, 2000; Prusak, 2001). Knowledge, it is argued, can be found in company policies, systems, documents, and individual employees (Grant, 1996). The process of managing this knowledge includes the practices and strategies that capture knowledge, organize these resources, and distribute knowledge throughout the organization (Costa et al., 2008), and can be supported by groups of people, by technology, or by a combination of both people and technology. For example, a group of managers within an organization might create a document that outlines their informal process of training new employees, upload this document into an Intranet, and then use the Intranet to distribute this document to other managers within the organization. After collaborative refinements and revisions, this single document might eventually change and develop into a formal employee training program within the organization. By capturing the knowledge of existing employees, and distributing this knowledge through internal technologies, the company has improved the efficiency of its operations (Alavi & Leidner, 2001; Peters, 1992). In this way, KM policies can help companies operate efficiently at a global level,

preserve knowledge that is lost through growth and employee turnover, and form well-planned strategies for future growth (Prusak, 2001).

This section outlines the history of KM, as well as the technologies that are used in conjunction with KM practices. This section also explores KM theories, and the benefits and obstacles of implementing these policies and practices.

History of KM

While the terms and concepts surrounding KM did not emerge until recently (Schutt, 2003), the foundation for KM started in the 1950s with the advancement of computers and computerization, when information was turning digital and becoming more automated. This change in business structure and practices influenced the transformation of the manual labor worker to the modern-day desk worker, where information and knowledge took a more central role (Drucker, 1959). These automated processes created more opportunities for business, and even allowed larger organizations to expand their products and services at a rapid pace; however, such expansions brought on new challenges as workers and their managers were tasked with exchanging vast amounts of information with their partners and customers (Wiig, 1997).

In response, Peter Drucker studied the Knowledge Worker in the late 1950s, and focused his attention on the importance of information and knowledge as organizational assets (Barclay & Murray, 2000; Drucker, 1959). This idea continued to develop with the help of cognitive scientists and sociologists during the 1970s. These researchers developed a deeper understanding of how people reason and process information; more specifically, researchers began to explore the concepts behind knowledge-based organizational behaviors, such as group decision making (see Janis & Mann 1977;

Simon, 1976). These early advancements in IT, cognitive science, and concepts in group decision making, formed the foundation of KM as we understand it today.

With this foundation in place, it became possible for organizations to explore the possibility of managing knowledge as an asset of the enterprise. In 1975, Chaparral Steel integrated a management approach to knowledge, tapping into individual knowledge resources and using that knowledge to build and refine business processes (Holsapple & Joshi, 2001). While Chaparral Steel did not *purposefully* implement a KM solution, their approach is an example of a business method that can capture individuals' knowledge and turn this knowledge into company assets. Chaparral Steel's people-centered approach is often considered to be one of the first KM solutions (Holsapple & Joshi, 2001; Wiigs, 1997).

During the 1980s, organizations began to formally plan and implement knowledge strategies using strategically developed technologies (Wiigs, 1997). For example, Digital Equipment Corporation installed a knowledge system - called XCON - to support internal processes and procedures. More organizations soon followed, including United Services Automobile Association (USAA), which implemented a knowledge-based system to transfer knowledge to practitioners (McCampbell, Clare, & Glitters, 1999).

Following these individual efforts at the organizational level, consulting firms began to take an interest in KM during the 1990s. As laptops and other technologies enabled consultants to integrate themselves within their customers' organizations - and therefore away from their own firms - the need to connect with coworkers and managers

became increasingly important, further expanding the need to manage knowledge assets (Schutt, 2003).

Continuing through the 1990s, the field of KM was mainly supported by practitioners who were tasked with exploring knowledge as a corporate asset (Serenko, Bontis, Booker, Sadeddin, & Hardie, 2010). From the standpoint of businesses, it became increasingly important to capture employees' knowledge so that it could be recorded and archived for future use (Zack, 1999). In fact, some research has even shown a link between intellectual capital investment and financial wealth (Bontis, 2004).

While the term KM became increasingly popular, critics suggested that business practices and procedures often did not change (Wilson, 2002); while organizations were spending a significant amount of time and resources implementing KB practices, they were not effectively capturing and utilizing knowledge. Throughout the 1990s and the early part of this century, KM was often debated, with researchers and practitioners arguing over the validity of the concept (Stenmark, 2001).

During the 21st century, new ideas emerged within the field of KM. With the advancement of social media services, such as Facebook and Myspace, KM technologies have been expanded to include Web 2.0 tools (including Wikis, chat systems, profiles, and tagging). These tools can be seen as instrumental within the arena of KM (Levy, 2009), in that they encourage members of a community to articulate their thoughts and ideas and share this knowledge with other users. In this way, these social media tools can be added to existing KM technologies that are used to capture and distribute knowledge.

Knowledge Management Technologies

KM technologies are often utilized to capture, maintain, and distribute knowledge. While the process of distributing data and unstructured information is often supported by technology, the concept of technology-supported *knowledge* distribution is somewhat controversial (McDermott, 1999). For example, some researchers and practitioners suggest that knowledge cannot be managed or captured through the use of technology, due to the argument that knowledge is created through social interactions (Malhotra, 1998); however, others see knowledge management systems (KMSs) as integral aspects to the knowledge management process. While KM does not necessarily rely on technology (Alavi & Leidner, 2001), the management and distribution of knowledge often takes place within KMSs and other related technologies.

KMSs are platforms that help professionals create, organize, and distribute knowledge (Alavi & Leidner, 2001). From a business standpoint, capturing employee knowledge is an important strategy that increases knowledge assets and ensures that procedures are owned, managed, and distributed from one central hub in order to support future company growth (Alavi & Leidner, 2001).

KMSs can support KM in numerous ways, including the management and distribution of an organization's best practices (O'Dell & Grayson, 1998), the creation of knowledge directories that link users to subject matter experts, and the creation of virtual networks that encourage socialization and collaboration (Ruggles, 1998). Other tools within KMS platforms include document repositories, discussion forums and lists, and retrieval systems that incorporate customized filtering methods (Hahn & Subramani, 2000). Individual implementations of KMSs can be found in many organizations; for

example, researchers recently studied a KMS developed by an organization that was designed to distribute knowledge among its employees (King & Marks, 2008). The KMS acted as a secure Intranet system that provided a number of tools for its users including e-mail, message postings, virtual meeting rooms, electronic libraries, directories of people and information, and a database of "lessons learned." This system was reported as easy to use and well utilized by its members. In addition, due to adequate support from supervisors and managers, users were motivated to contribute their individual knowledge to the system, which ensured the success of the KMS. Such KMSs help connect people and ideas in a social way so that these technologies can track knowledge sources and assist in the creation of new knowledge.

Researchers have even studied KMSs as tools for creating a collective memory for an organization (Spender, 1996; Walsh & Ungson, 1991). Organizational memory can be defined as methods through which knowledge from the past influences an organization's present-day activities (Sten & Zwaas, 1995). In this way, current organizational memory can help in decision making and problem solving using previously collected knowledge. Organizational memory can include explicit knowledge that resides in documents or databases (Dworman, 1998), or tacit knowledge acquired by individuals (Tan, Teo, Tan & Wei, 1998). Organizations manage memory by organizing, storing, and retrieving this knowledge when needed.

Knowledge Management Theories

Before KM can effectively be integrated into an institution or organization, the basic concepts of knowledge, including the theories surrounding knowledge creation,

must be understood. While some theories focus on the economics of KM, others focus specifically on knowledge creation and learning.

Intellectual capital theory and intellectual property theory. Two main theories have evolved from work in information economics: intellectual capital theory and intellectual property theory (Baskerville & Dulipovici, 2006). Both theories originated from within the business perspective of KM.

As a concept, intellectual capital is an asset that consists of intellectual material (Stewart & Ruckdeschel, 1998). Intellectual capital theory argues that knowledge is a raw material that can be transformed into a valuable asset of an organization. This theory grew as a response to researchers who argued that the physical capital of an organization is more important than the less tangible assets of an organization, such as sales networks (Baskerville & Dulipovici, 2006). Intellectual capital theory argues that organizational knowledge is indeed a capital asset, and highlights patents, copyrights, and other 'rights of the mind' as important foundations for organizational success (Baskerville & Dulipovici, 2006; Brooking, 1997).

As intellectual capital theory stresses that organizations must possess a knowledge portfolio, intellectual property theory stresses the importance of managing it. Intellectual property theory underscores the legal and ethical issues of intellectual capital (Slater, 1998), and explores the ways in which intellectual capital can be protected. This theory, however, also focuses on knowledge assets, such as trade secrets (Baskerville & Dulipovici, 2006; Slater, 1998), and therefore exists specifically to better understand KM within the business sector.

Organizational knowledge creation theory. In addition to theories that exist to explain knowledge as a business asset, other KM theories look at knowledge from a learning perspective. Before knowledge can be managed within an organization, it must be created. Within today's literature, the predominate theory of knowledge creation is the organizational knowledge creation theory. Unlike information, knowledge does not exist independently of the human mind (Fahey & Prusak, 1998); instead, it is the result of cognitive processing of outside information and stimuli (Alavi & Leidner, 2001). In line with this concept, Ikujiro Nonaka and his colleagues (Nonaka 1994; Nonaka et al. 1994) described two main categories of knowledge, which are still often referred to throughout literature: tacit knowledge and explicit knowledge. Tacit knowledge is defined as intangible knowledge that exists within an individual's mind; explicit knowledge, on the other hand, is tangible, and has been recorded in the form of a document or other such artifact that is stored as an asset (Nonaka et al., 1994). From this theory, the SECI framework emerged, outlining four modes of knowledge creation:

- Tacit to tacit (Socialization) occurs when tacit knowledge is passed to another person;
- Tacit to explicit (Externalization) occurs when tacit knowledge is recorded and passed to another individual;
- Explicit to explicit (Combination) occurs when explicit knowledge is turned into another form of explicit knowledge, such as using a reference to write a research paper; and

- Explicit to tacit (Internalization) occurs when explicit knowledge is understood and processed by an individual (Huang & Liaw, 2004; Nonaka, 1994).

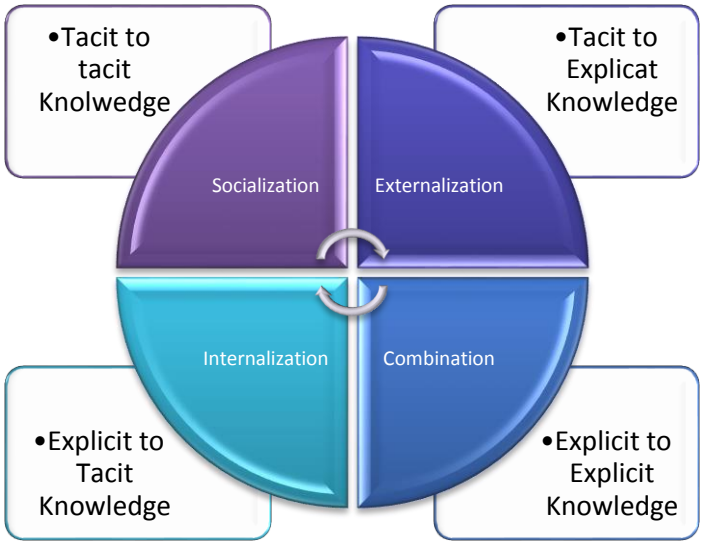

Figure 1. SECI model (Adapted with permission from Nonaka, I., A dynamic theory of organizational knowledge creation, Organization Science, 5, 1, 1994. Copyright 1994, the Institute for Operations Research and the Management Sciences, 5521 Research Park Drive, Suite 200, Catonsville, Maryland 21228 USA).

This model of knowledge creation describes knowledge as dynamic, moving continuously between tacit and explicit forms. Within the organization, knowledge is described as an asset, and KM is highlighted as a roll-up of knowledge from the individual employees to the larger organization (Dunne & Butler, 2004). In this sense, knowledge starts off within the individual, and is then amplified by collective members of an organization (Haridimos & Vladimirou, 2002). Individuals, when engaging in

social interactions, participate in this forum of collective knowledge creation. This process is often informal; before knowledge exchanges can be captured and used effectively to an organization's advantage, formal processes, procedures, and technologies are put in place to capture this knowledge, expand upon this knowledge, and distributed it for enterprise-wide use (Nonaka, 1994).

One subarea of organizational knowledge, called organizational learning, is described as the process of improving group knowledge through the acquisition of better information (Harvey & Denton, 1999). Under the SECI model, organizations learn through the transition between tacit knowledge to explicit knowledge, and vice versa.

One question that is raised with regards to organizational learning is whether learning takes place at the individual level, or whether it takes place at the organizational level. Within individuals, knowledge is learned through a complex cognitive process; within organizations, however, knowledge is learned collectively, and is tied to key individuals who drive organizational change (Cook & Yanow, 2001).

Some researchers argue, however, that organizations learn the same way as an individual learns (Levitt & March, 1988). Under this concept, organizations are treated as individuals. An organization learns when a change takes place within that organization (for example, through structural changes or process changes). This idea of organizations participating in the learning process is not always accepted by researchers; these researchers suggest that organizational learning depends on individual memory, and that organizations do not express any sort of cognitive capacity. In addition, while it has been suggested that organizational learning is tied to change, others note that learning does not necessarily lead to change (Cook & Yanow, 2001).

While the idea of organizational learning as a cognitive process can be difficult to accept, researchers see organizational culture as a more conventional concept (Cook & Yanow, 2001). Organizational culture is defined as what a group, made up of individuals, learns over time (Schein, 1990). New individuals in the group learn to adapt to the group norms; specifically, all individuals perceive, think, and feel a specific way towards issues and problems. The strength of an organizational culture is tied to the stability of the group and the length of time the group has existed (Schein, 1990).

Knowledge building theory. Another well-accepted knowledge theory that exists within the literature is called the knowledge building theory (Scardamalia & Bereite, 1991). While the OKCT focuses on the creation and transfer of knowledge, the knowledge building theory describes knowledge creation in relation to learning. Learning is an internal process, but according to the knowledge building theory, knowledge building occurs outside of the individual, through interactions and dialogs with others. In this way, knowledge is an advancement of the community, rather than the individual (Scardamalia & Bereiter, 2006).

While knowledge can be built within any field or community (Kimmerle et al., 2010), the knowledge building theory is often analyzed in parallel with the education process. According to knowledge building pedagogy, knowledge can take place in school classrooms, and can be identified through advances in the state of knowledge in the learning community as a whole (Scardamalia & Bereiter, 2006). By facilitating the exchange of individual ideas and thought processes, the community's knowledge can expand and create new knowledge for that particular group.

Technology is often highlighted as the facilitator of the knowledge building process. While organizational knowledge creation can take place with or without the assistance of technology, systems and tools play a large supportive role during knowledge building (Kolbitsch & Maurer, 2006). These tools cultivate learning and knowledge building within learning communities, as they host the exchange between the individual and the group. Educational software and knowledge forums provide shared, collaborative spaces where all participants can contribute individual ideas, notes, and examples (Kolbitsch & Maurer, 2006). These ideas are then discussed, reformatted, and finally added to the collective knowledge compilation.

This process is only possible, however, when the community takes on a sense of collective cognitive responsibility (Scardamalia, 2002). Each member of the learning community must play a role in the learning process, and participate in the advancement of knowledge, focusing on authentic problem-solving activities. With this process in place, learning and knowledge building occur simultaneously and help advance these learning communities.

These theories that have been used to define KM have successfully given the field the flexibility to support a wide range of domains and disciplines. While the specifics of how organizations manage knowledge is still often debated in literature, research has certainly highlighted the importance of knowledge creation and knowledge sharing, as found in these theories and frameworks.

Benefits and Obstacles Associated with KM

KM is not always accepted as a valid enterprise strategy; in fact, some suggest that KM is merely a fad implemented by consultants in order to combat economic

gridlocks (Wiig, 1997; Wilson, 2002). In addition, the vague distinction between knowledge and information leads to the argument that KM is simply a rebranding of Information Management (Wilson, 2002); within the field of IT, knowledge is defined as what a person knows, and involves internal comprehension and understanding of the subject at hand (Wilson, 2002), while everything outside of the mind can be defined as either data (facts) or information (data embedded in a relevant context) (Leung & Chan, 2007). Before KM systems can make use of information, data must be transitioned from information to knowledge (Bhatt, 2001). This somewhat ambiguous distinction between knowledge and information leads to questions about whether KM practices and systems can be seen as valuable organizational strategies.

Others argue that KM is an increasingly necessary strategy that should be implemented in any company wishing to remain competitive, especially at the global level (Wiig, 1997). While specific KM strategies and theories have yet to be standardized (Demarest, 2002), information technology is playing a central role in the management of organization knowledge assets. As technology continues to be developed and implemented as a solution to KM issues, researchers suggest that it is increasingly important to understand KM, and implement solid strategies in order to sustain and standardize KM within growing organizations (Demarest, 2002).

Online Learning

As with KM practices and technologies, online learning also saw an increase in popularity during the start of the new century (Allen & Seaman, 2011). Online learning is situated within computer-mediated environments, where students log into a Learning Management System (LMS) to access reading material and communication tools

(Garrison, 2003). Online learning environments can be both synchronous, where students log in at pre-specified times, or asynchronous, where students log in independently. As online learning became more prevalent, theories and pedagogies played an increasingly important role in the development of online courses; faculty and administrators attempted to align proven learning theories - especially constructivism - with the goals of online learning (Ford & Lott, 2012). This section explores the history of online learning, technologies that support colleges and universities, benefits and obstacles to online learning, and theories and pedagogies that are often used in support of online learning.

History of online learning

Garrison (1985) and Nipper (1989), two theorists within the field of distance education, describe three major phases of distance learning: education that was delivered through the postal system, education that was delivered through the mass media (radio, television, and film), and education that was delivered through interactive technologies (audio, visual text, and Web technologies).

Isaac Pitman is widely credited as the first instructor participating within the realm of distance education. In 1840, he began corresponding with students from Bath, England through the penny post system (The Sacramento County Office of Education, 2005). In the 1920s, radio created a new form of communication for use in distance education (Haworth & Hopkins, 2009), which paved the way for television in the 1940s (Casey, 2008; Haworth & Hopkins, 2009). Educators used these new technologies to broadcast educational programs to learners, which created new learning options outside of the traditional classroom.

While the postal system, radio, and television delivered education through either delayed or one-way communication methods, the third phase of distance education relied on new technologies that allowed for advanced communication and interaction. These more immediate and interactive communication tools, including email and computer conferencing (Harasim, 2000), enabled instructors and students to instantaneously communicate back and forth. These tools were first used to simply supplement university courses, but advanced computer conferencing technology eventually led the way towards the first online program in 1982, which was conducted by the Western Behavioral Sciences Institute (WBSI) (Harasim, 2000). WBSI faculty encountered various issues during this first online course - including poor participation among students - and suggested that lectures and Q&A sessions did little to encourage learning within these environments (Feenberg, 1993; Harasim, 2000). From this first experience with online learning environments, instructors learned to incorporate discussions into the online sessions to promote collaboration and participation (Harasim, 2000).

As technology became increasingly accessible and cost effective, its ties with distance education became more pronounced (Bates, 1993; Sumner, 2000). Now, with more immediate connections to the Internet, online learning materials provide quick, easy, and inexpensive access to knowledge; however, problems still exist when finding ways to guide learners to materials that best represent their current state of learning (Pirolli & Kairam, 2012). To respond to this, recent theorists now focus on gathering knowledge resources in a way that is customized to the individual learner, as personalized learning has been shown to lead to improved learning (Bloom, 1984; Corbett, 2001).

Social tagging and Web 2.0 technologies, for example, can engage learners through interactive and flexible tools (Anderson & Dron, 2011; Taylor, 2001).

In their paper titled, A Knowledge-Tracing Model of Learning from a Social Tagging System, Pirolli and Kairam (2012) make use of advanced online learning tools, and explore ways of personalizing learning through social tags found within online material. Using the concept of knowledge tracing, where knowledge is represented through traces of online behavior, Pirolli and Kairam suggest that social tags can model knowledge within online environments. The social tags, which are acquired by reading tagged online material, are used to represent knowledge states of the students and to customize instructional methods according to individual student needs.

As successful online learning environments are closely tied to the advancement of communication technologies (Anderson & Dron, 2011; Sumner, 2000), social networking tools have also advanced online learning, providing methods of communication that extend beyond typical face-to-face interactions (Brady, Holcomb, & Smith, 2010). Social networking systems (SNSs), which allow students to craft personal profiles to represent themselves within online learning environments, can be used to promote informal learning and build social connections among learners and instructors (Dabbagh & Kitsantas, 2012). When students are physically separated, they are able to construct a representation of themselves without the restrictions found in face-to-face environments. In her study analyzing social network usage in online learning environments, Heo (2011) found that online students consciously select specific information to disclose to particular groups. Her findings show that students take advantage of available technology to carefully self-present, and in turn, make connections with specific groups of users. These

students who experience feelings of connectedness and community show an increase in motivation and successful learning outcomes (Du, Havard, & Li, 2005; Osterman, 2000; Ryan & Patrick, 2001).

Learning Management Systems

As online learning tools advance, they continue to rely on technologies that facilitate distant interactions. Whether these interactions take place through social tagging or more immediate social interactions with peers, these tools are usually grounded in platforms that allow for a singular point of contact between students and the instructor. To help meet the needs of online learners, researchers are borrowing concepts from advanced KM technologies and applying similar ideas to the field of online learning. KM strategies are seen as an important asset in the business sector, and these tools are also supporting academic learning environments (Francisco, 2006; Piccoli, Ahmad, & Ives, 2000).

One example of an academic KM tool, the Learning Management System (LMS), is often implemented to host online courses, while also tracks the learning progress of individual students (Rapuano & Zoino, 2006). These systems can be used in schools and universities to capture specific course information and store it as shared knowledge resources that can be distributed and shared with students and instructors.

LMSs within academia can be structured to enable formal learning by capturing, storing, and presenting knowledge within specific topic areas (Godwin-Jones, 2009; Piccoli, Ahmad, & Ives, 2000). LMSs can also be used by faculty and students as knowledge repositories, where content and databases can be accessible from one centralized area for searching and researching (Dalsgaard, 2006).

Through these LMSs, instructors can support learning communities by providing students and faculty with tools that give learners dynamic learning content within the larger community. Web 2.0 toolsets are often integrated into LMSs; these tools include discussion boards, profiles, and chat systems, which can be employed to better connect students coming together within an online learning environment (see Heo, 2011; Zarecky, Doring, & Heo, 2012). With the recent advancement of Web 2.0 tools, researchers are findings ways of utilizing these tools to disperse knowledge within online learning communities (Brook & Oliver, 2003). In fact, it has been suggested that LMS tools might potentially affect levels of interaction within online learning environments (Rubin, Fernandes, Avgerinou, Moore, 2010).

Online Learning Theories

To properly design and utilize LMSs and their associated toolsets, researchers often implement these platforms using well-researched pedagogies and learning theories. Within any learning environment, quality academic instruction must be rooted in learning theories that support varying learning styles and goals; it is therefore important to focus not only on technology, but to also integrate proven teaching strategies within these LMSs (Harris, Mishra, & Koehler, 2009).

Social constructivism. Social constructivism is a broad learning theory (Isaacson, 2013), and is often used to understand how knowledge is created within online learning environments (Kanuka & Anderson, 1998). Social constructivism highlights culture and context as essential components in knowledge construction (Derry, 1999). According to the social constructivist view, knowledge and learning cannot exist without context (Kim, 2001). Vygotsky (1978), who is often associated with social

constructivism (Kanuka & Anderson, 1998), emphasized that culture and social contexts heavily influence learning. From this perspective, learning occurs in social environments where students construct knowledge in a collaborative manner, using shared group experiences to connect with one another.

An important aspect to social constructivism is the concept of knowledge co-construction: knowledge is not constructed by individuals, but co-constructed through social interactions (Hull & Saxon, 2009). Within the context of online learning, this generation of knowledge is problematic, as online social interactions might not meet basic requirements as outlined by social constructivists. For example, individual students might be logging in from different geographic locations (with differing world views), might come from different socioeconomic backgrounds (with differing resources), and might hold very different social and cultural perspectives (Oztok, 2012). Additionally, while LMSs have played a major role in facilitating knowledge in academia, some researchers argue that the rigid structure of LMSs prevent knowledge from being created (Veletsianos & Navarrete, 2012). Most online classrooms still rely heavily on discussion boards and other tools that sometimes generate low-levels of interaction (Willems, 2007).

Social presence theory. While traditional social constructivists might see social interaction as problematic within online learning environments, other researchers see more potential in these environments. Social presence theory (SPT), which suggests that communication is directly associated with the level at which people feel socially aware of each other (Richardson & Swan, 2003), is often used to understand how social connections can be cultivated within online learning environments. In 1976, Short et al. first described SPT while attempting to understand the level of social interaction that

takes place within technology-based environments (Oztok & Brett, 2011). By analyzing conversations that occurred over the telephone, without the visual aspect of communication, the researchers defined social presence as the degree of communication between two individuals and arranged the level of social presence by degree: F2F mediums seemed to provide the most social presence, and written, text-based communication provided the least. This theory helped researchers understand to what extent communication can occur without the immediacy of F2F interaction (Woods & Baker, 2004).

As online learning became more popular, researchers drew from SPT to understand communication within online learning environments (Lowenthal, 2009). For example, students' perceived level of learning in online learning environments has been shown to directly correlate with their perceived level of social interaction (Richardson & Swan, 2003). Such results indicate that students who are more actively engaged in online learning environments, and who are able to make connections with other students, tend to succeed in online courses (Richard & Swan, 2003).

Others suggest that while social presence can positively influence online learning, student characteristics also play a role in the perceived levels of social presence (Tu & Mclssac, 2002). Studies have shown that perceptions of online communication are strongly related to characteristics of the students, leading researchers to identify specific variables that predict students' perception of social, online learning (Tu & McIssac, 2002). Such variables include familiarity with others, attitudes towards technology, and access to technology, to name a few. These results suggest that while social presence is indeed a factor of success in online learning environments, these perceptions can be

improved by understanding individual student assets, and providing an environment where each student can feel connected with one another.

Critics of SPT point to its vague definition (Biocca et al., 2003); specifically, that the theory does not stipulate whether social presence is influenced by the perception of social interaction or the quality of the medium itself. In fact, Short et al. (1976) originally applied the theory to telephone usage, and suggested that it is the *medium* that determines the level of social interaction. Other researchers argue that it is important to analyze both the quality of the medium, as well as the perceptions of that medium (Walther, 1992).

As online learning technologies and associated theories advance, researchers will continue to analyze the importance of maintaining a socially connected environment that allows students to share knowledge and base their learning in appropriate contexts. These theories and others suggest that both technology and strong frameworks play a key role in the success of online learning environments.

Benefits and Obstacles to Online Learning

While theoretical research advances, online learning environments continue to become a more common alternative to the traditional, F2F learning environment. Many universities see synchronous online learning as a cost-effective method of expanding services and increasing course options **(**Karber, 2003; Rumble, 2014**)**. Students are responding positively: the 2013 Survey of Online Learning reported that during the fall 2012 term, 7.1 million students were taking at least one online course (Allen & Seaman, 2014**)**. With this increase in popularity, online education is continuing to evolve to provide a flexible environment that accommodates a variety of students and learning

styles. When designed correctly, online learning environments can address individual learners' preferences and assist students in attaining their desired level of learning (Ally, 2004). When individuals are physically separated and capable of presenting themselves in carefully defined ways, they can potentially construct a more controlled representation of themselves and avoid social preconceptions that are sometimes found in F2F environments (Simonson, Smaldino, Albright, & Zvacek, 2000). Others, however, suggest that online learning, which changes the standard, F2F approach to human interaction, inhibits the more traditional, social aspect of learning (Bullen, 1998), and should instead be counted on to support independent learning **(**Peters, 2000**)**.

Researchers sometimes highlight mixed findings when analyzing online learning environments. For example, in their study examining an online course, Stein et al. (2003) found that some students felt part of a cohesive group, while others felt isolated. Students who felt connected to the group reported that their interactions with others were deep and meaningful, and that their level of critical thinking improved.

It has also been shown that the success of online learning environments might be affected by many factors, including student demographics, course structure, and the type of technology used to host the course. Specifically, recent studies have found that graduate students in particular are more likely than undergraduate students to disclose personal information within online learning environments (Doring, Hodge, and Heo, 2014), and show high levels of self-regulated learning characteristics (Colorado & Eberle, 2010), leading to successful learning outcomes. Another study found that cohort-based learning might positively affect students' attitudes and perceived course satisfaction (Alman, Frey, & Tomer, 2012). It has even been suggested that the type of

LMS - such as Blackboard or Moodle - can potentially affect levels of social, teaching, and cognitive presence (Rubin, Fernandes, Avgerinou, Moore, 2010). For example, in their study examining how virtual interaction can support learning, Cao et al. (2008) found that certain types of virtual interaction (for example, QA-based virtual interaction) increased learner satisfaction. The findings also showed, however, a limited influence of virtual interaction on actual learning. These mixed results indicate that the level of interaction and perceived learning experienced in online environments varies, and might be closely tied to unnamed influences.

Obstacles to online learning. As noted by Smith and Hermann (2007), some researchers see online courses as isolated environments that fail to promote a sense of community and fall short of successful learning. In fact, early studies within the field of online learning have reported feelings of isolation and discontent experienced by students enrolled in online courses (Bennett, Priest, & Macpherson, 1999; Hacker & Niederhauser, 2000; Rovai & Wighting, 2005). When considering the distance that is inherent in online learning environments, it has been suggested that quality learning decreases in online courses where physical interaction naturally decreases (Hung, 2003). Non-verbal cues, such as emoticons, can symbolize emotions and feelings (Liccardi et al., 2007); however, unintentional expressions, which take the form of facial expressions, eye contact, and body language, can provide information that students might not otherwise willingly provide (Mehrabian, 1969). Within a traditional, F2F classroom setting, student behaviors are modeled and reinforced through visual observations (Ormrod, 1999). Students in these classrooms observe their peers' behavior, can immediately reproduce that behavior, and that behavior is reinforced by clear, visible, and external social cues,

including body language and facial expressions. With the introduction of online learning, however, this process of modeling and reinforcing becomes less clear. If a student cannot visually see a modeled behavior, or clearly understand an instructor and a peer's reaction, some question whether observational learning can truly take place. The lack of visual indicators changes the way instructors and students interact with each other, and perhaps decreases the level of understanding within the classroom.

Other research shows that not only does the method of communication change, but the introduction of more advanced technology might actually hinder some online learners who do not feel as technologically advanced as their peers. For example, Wegerif (1998) suggests that some students identify as being "insiders," or experienced technology users, while others identify as being "outsiders," or inexperienced technology users. This division between insiders and outsiders can create an obvious barrier between students, and in turn, decrease the level of learning that takes place for those who feel disconnected from the medium.

Benefits of online learning. While early research suggested that online learning environments create isolated learning spaces, some recent studies see these classrooms as arenas that can foster relationships (Lemak et al., 2005). In fact, researchers suggest that online learning environments, when supported by advanced tools, might even provide methods of communication that extend beyond typical F2F interactions (Brady, Holcomb & Smith, 2010). In her study analyzing social network usage in online learning environments, Heo (2011) found that online students consciously select specific information to disclose to particular groups. Her findings show that students take advantage of available technology to carefully self-present, and in turn, make connections

with specific groups of users. This behavior suggests that not only do meaningful interactions occur in online learning environments, but students find ways of improving their interactions using the available technology. These students who experience feelings of connectedness and community show an increase in motivation and successful learning outcomes (Du, Havard, & Li, 2005; Osterman, 2000; Ryan & Patrick, 2001).

In addition, resent research shows that using these online tools can actually lead to high-quality discourse. Specifically, online courses that are supported by asynchronous communication tools, such as discussion boards, encourage students to craft more self-reflective responses, leading to deeper learning when compared to F2F, synchronous discourse (Hiltz & Goldman, 2005; Jaffe et al., 2006). These asynchronous communication tools create platforms that are less time sensitive than F2F exchanges, allowing for more carefully crafted responses and conversations.

These reported benefits of online learning environments highlight the advantages that technology can provide classrooms. Not only is communication delivered in a variety of mediums that can provide a sense of community, but students with varying personalities and learning styles can benefit from the flexibility of the online classroom, which might not be reproduced in a strictly F2F classroom.

These mixed findings suggest that while online environments can potentially support student learning, there is still much to be learned about how to implement and manage successful online learning environments. While researchers tend to be in general agreement that social connections and collaboration form the basis for success online learning, more research is needed to understand the foundations that cultivate successful, collaborative online learning environments.

Knowledge Sharing

Within academia, researchers continue to investigate the benefits and obstacles of successful online learning, and often highlight the importance of community interaction and collaboration, including knowledge co-construction (Gunawardena, Lowe, & Anderson, 1997). Social constructivists highlight knowledge co-construction as an important aspect of successful learning environments, and part of knowledge co-instruction is knowledge sharing (Uzun, Uzun, & Medeni, 2013). More specifically, knowledge construction happens when students are given the opportunity to interact with other learners and share and discuss what they know (Redmond, 2006).

Within the private sector, researchers have suggested that knowledge sharing leads to innovation and improved interactions (Norris, Mason, Robson, Lefrere, & Collier, 2003; Wang & Noe, 2010). It has been noted that in addition to hiring knowledge employees and providing job-specific training, organizations must also consider how to transfer expertise from experts to novices with the organization (Hinds, Patterson, & Pfeffer, 2001; Wang & Noe, 2010). These efforts, however, are sometimes thwarted by the lack of understanding as to why and how individuals share knowledge.

Similarly, while research suggests that social connections within online learning environments can lead directly to successful learning and knowledge sharing (Cost et al., 2008), there is still concern about the ability to motivate students to interact and collaborate within online learning environments (Knowles & Kerkman, 2007). To help reach this goal, some researchers of online learning are beginning to look at how accepted learning theories, combined with KM theories, can be used to help motivate students to share knowledge within an online environment (see, Oztok, 2012).

This section provides a definition of knowledge - within both academia and the private sector - as well as an overview of knowledge sharing theories that have been explored within the fields of KM and online learning. Additionally, this section outlines the motivations and barriers to knowledge sharing activities.

Knowledge Sharing Theories

Knowledge sharing is seen as an essential process within the field of KM (Yu, Lu, & Liu, 2010), as most KM practices focus on the push of knowledge (providing knowledge) and the pull of knowledge (consuming knowledge) (Frost, 2010). Researchers also see the importance of knowledge sharing within academia (Huang & Liaw, 2007; Oztok, 2012). Surfacing a student's prior knowledge is a vital step to learning and the co-construction of knowledge (Oztok, 2012), and therefore, knowledge sharing can form the foundation of a successful online learning environment (Ma & Yuen, 2011).

While social constructivists highlight the importance of knowledge co-construction, it is not always clear how or why students are motivated to share knowledge. Within academia, motivation can be defined as the drive that leads students to learn and reach their full academic potential (Ardichvili, Page, & Wentling, 2013; Martin & Tracey, 2002), and has been named as an important factor in developing students' critical thinking skills and academic achievement (Ardichvili, Page, & Wentling, 2013; Tuan, Chin, & Shieh, 2005).

The concept of motivation is often divided into two categories: intrinsic and extrinsic. Intrinsically-motivated students engage in activities for internal satisfaction,

while externally-motivated students perform tasks to attain a particular result (Deci & Ryan, 1985; Harlow, 1953; Lin, 2007).

Within the field of KM, extrinsic motivation to share knowledge is often based on the perceived value associated with knowledge exchange (Kankankalli, Tan, & Wei, 2005; Lin, 2007; Osterloh & Frey, 2000). For example, the benefits of sharing knowledge (organizational rewards) must outweigh the cost of sharing knowledge (time and effort) (Lin, 2007). While it has been suggested that some extrinsic motivators can influence knowledge sharing activities (Huang & Liaw, 2007), not all outcome-based rewards foster knowledge sharing among individuals (Wang & Noe, 2010). For example, in recent research, certain forms of extrinsic motivation, such as public recognition, might influence knowledge sharing activities (Lin, 2007). Other researchers have found, however, that intrinsic motivators are much more powerful enablers of knowledge sharing activities (Ardichvili, Page, & Wentling, 2003; Osterloh & Frey, 2000).

Intrinsic motivation has certainly been highlighted as an important factor in predicting knowledge sharing behavior. Intrinsic motivation has been shown to influence learning and participation in voluntary knowledge sharing activities (Lin, 2007; Osterloh & Frey, 2000), and creates a sense of self-efficacy, or confidence, in one's ability to provide useful knowledge (Constant, Kiesler, & Sproull, 1994). It is difficult, however, to understand how to cultivate intrinsic motivation; intrinsic motivation is based on altruism, or enjoyment in helping others (Lin, 2007), as well as personal fulfillment, and is therefore considered to be self-directed (Grant, 2008). Additionally, it has been suggested that there is no significant body of research that assesses the difference between extrinsic and intrinsic motivation factors in knowledge sharing activities (Lin,

2007). It is therefore difficult to determine how to specifically cultivate intrinsic motivation in a way that leads to knowledge sharing behaviors.

Various theories of motivation have been developed to better understand what leads to knowledge sharing behaviors. These theories are often based on economic frameworks, as knowledge sharing is a form of social exchange (Bock & Kim, 2002).

Social exchange theory. Social exchange theory is used to explain why organizations enter into relationships. The theory looks at how organizational relationships evolve over time as each party demonstrates trustworthiness; in this way, social exchange theory is based on the concept of mutual trust (Emerson; 1976; Lee, 2001). When looking at social exchange theory from a knowledge sharing perspective, researchers suggests that intrinsic benefits from social associations can help motivate workers to share their knowledge (Bock & Kim, 2002). More specifically, it is suggested that workers who see knowledge sharing as an activity that will improve work-place relationships have positive attitudes towards knowledge sharing. In fact, research has shown that knowledge sharing between individuals within an organization leads to successful business partnerships (Lee, 2001). Within the area of online learning, it has been shown that the lack of social exchange can lead to negative outcomes for trust and online learning ability (Lin et al., 2010). Critics of social exchange theory, however, often suggest that it is difficult to test the concepts of cost and reward, and the theory is therefore problematic when attempting to analyze what individuals experience as rewarding behaviors (Sabetelli & Shehan, 1993).

Social capital theory. Social capital theory explains that social ties and connections can increase a set of resources available to a person or a group (Lin, 2002).

This theory is another economics-based theory often used to understand the motivations behind sharing knowledge. This theory suggests that knowledge sharing behavior can lead to improved social associations, and even power (Chiu, Hsu, & Wang, 2006). Social capital is sometimes divided into two subcategories: bridging social capital, which is linked to "weak ties," and bonding social capital, which is linked to emotionally close relationships (Ellison, Steinfield, & Lampe, 2007; Putnam, 2000). While bonding social capital plays a powerful role in offline relationships, bridging social capital might be beneficial for supporting online relationships (Ellison, Steinfield, & Lampe, 2007), which can create informal social connections, and lead to the transfer of knowledge (Inkpen & Tsang, 2005). For example, researchers have used social capital theory to understand student use of online social networks; one study found a strong association between the use of Facebook and social capital, suggesting that Facebook can benefit students experiencing low self-esteem (Ellison, Steinfield, & Lampe, 2007). Such studies are limited, however, in their ability to fully understand these social connections, as researchers often rely on self-reports and self-assessments.

Self-Determination theory. Self-determination theory is another theory often used to understand knowledge sharing motivations. The self-determination theory highlights two types of motivations that push individuals to share knowledge: autonomous motivation and controlled motivation (Gagne, 2009). Autonomy-supported learning involves choice and preference, while controlled learning involves external persuasion (Gagne & Deci, 2005). Autonomous learners have a desire to satisfy interpersonal relationships and assimilate according to their perceived surroundings, while controlled learners may feel self-conscious, leading them to behave with defensive

tendencies (Gagne & Deci, 2005). According to self-determination theory, social contexts that provide autonomous support can increase internal motivations (Vansteenkiste et al., 2006), and help students thrive in social, interactive environments (Chen & Jang, 2010). Critics, however, argue that autonomy should not be assumed as a universal psychological need. They instead suggest that social acceptance is often dependent on others, and therefore autonomy might not be a common motivator (Markus & Kitayama, 2003; Markus, Kitayama, & Heiman, 1996).

Motivations and Barriers to Knowledge Sharing

While many learning benefits have been correlated with knowledge sharing, obstacles do exist that prevent successful knowledge sharing activities. For example, the organizational knowledge creation theory (OKCT) suggests that knowledge is shared and distributed during the transition process between tacit to tacit knowledge (socialization), tacit to explicit knowledge (externalization), explicit to tacit knowledge (internalization), and explicit to explicit knowledge (combination). This process of sharing and distributing knowledge can be interrupted by factors of motivation, including mutual trust (Nonaka & von Krogh, 2009) and factors related to technology (Riege, 2005).

According to research, trust plays a large role in factors of motivation (Wang & Noe, 2010). For example, some researchers have shown that building long-term, positive relationships with individuals within an organization help generate knowledge sharing behaviors among participants (Chow & Chan, 2008; Ramasamy et al., 2006; Wong et al., 2001). Research has shown that trust is a critical factor within the knowledge sharing process, not only affecting overall knowledge exchange, but also increasing the

likelihood that the exchanged knowledge is absorbed and understood (Abrams et al., 2003).

Promoting trust can be a difficult endeavor, however, as interpersonal trust requires the willingness to be vulnerable (cheng, Yeh, & Tu, 2008; Doney and Cannon, 1997). To better understand how trust can be encouraged, researchers have looked at factors that lead to trust within the context of knowledge sharing: feelings of benevolence (for example, one party cares for the other) and levels of competence (for example, one party has relevant expertise) are two such factors (Abrams et al., 2003). Encouraging these feelings of benevolence and competence can be difficult; one study found that an organization must establish a set of shared goals within a group, and must hold people accountable for trust (Abrams et al., 2003). In other words, by cultivating a set of shared goals and values within an organization, its members are more willing and able to form interpersonal, trusting relationships that can lead to knowledge sharing behaviors.

Relatedly, it has also been shown that environments that emphasize and promote individual competition can hinder collaborative exchanges (Schepers & Van den Ber, 2007; Wang & Noe, 2010). In one study that looked at knowledge sharing practices at a large organization, individuals were less willing to participate in knowledge sharing behavior when knowledge was seen as belonging to the organization (Ardichvili, Page & Wentling, 2003). When individuals within an organization are able to trust each other, and interact safely within an environment with an articulated set of shared values and goals, knowledge sharing activities are more likely to take place.

Knowledge sharing behaviors can face barriers, however, when groups interact in technology-based systems that are seen as rigid and formal; in fact, knowledge is more

readily shared when asked for informally than when requested through a large, online KM system (Abrams, 2003; Ardichivili, Page, & Wentling, 2003; Dixon, 2000). Additionally, authentic learning environments have also been shown to motivate students to participate in collaborative learning activities (Curtis & Lawson, 2001). When technology-based interactions are seen as solo tasks, motivation to share knowledge actually decreases (Ardichvili, Page & Wentling, 2003). To combat this effect, Web 2.0 tools, such as social networking sites, blogs and wikis, which were created to drive collaboration and group interactions, were first leveraged by businesses to deformalize KM systems and encourage group knowledge sharing (Paroutis & Al Saleh, 2009). Unfortunately, however, some researchers have found that Web 2.0 tools are usually only used by two groups: recent college graduates and information technology (IT) staff members, who identify as being technologically sophisticated (McAfee, 2006; Paroutis & Al Saleh, 2009). If only certain groups use these more interactive systems, knowledge sharing activities might not be widespread, thus hindering the knowledge sharing process.

Knowledge sharing has certainly been widely examined in both KM and online learning literature. Many factors have been named as motivators of knowledge sharing behavior; by borrowing from research and findings in the KM literature, online students might benefit from improved learning environments where students participate as a group in constructing knowledge.

Community of Inquiry

While many factors have been named as motivators to knowledge sharing, a growing body of research is highlighting a strong community of inquiry (CoI) as a crucial component in a successful online learning environment, as defined by social

constructivists (Swan, Garrison, & Richardson, 2009; Swam, 2010). Garrison and Anderson (2003) suggest that a successful CoI relies on student self-direction, and therefore motivation (Jézégou, 2010), to support the necessary interaction that is required for collaboration and group problem-solving. In fact, some suggest that the CoI might play a key role in encouraging knowledge sharing behavior within online learning environments (Garrison, Kanuka, & Hawes, n.d.). As a strong CoI creates a platform for mutual trust and respect (Swanson & Hornsby, 2000), such an environment can increase students' motivation to share knowledge within such a community, and overcome traditional knowledge sharing barriers.

The CoI framework might help explain how online learning environments can be crafted to increase feelings of connectedness and trust, and in turn, increase knowledge sharing activities. This section provides a brief overview and history of the CoI framework, and describes its three elements: social presence, teaching presence, and cognitive presence. Additionally, this section explores the ways in which the CoI framework might support knowledge sharing behavior within online learning environments, as well as its limitations, as suggested within current literature.

History of CoI

The CoI framework was founded on John Dewey's concept of inquiry and community. Dewey described inquiry as rooted in social activity and community; specifically, students are able to construct meaning from collaboration with their learning community (Swan, Garrison, & Richardson, 2009). He believed that within any learning environment, individual learning is rooted in social perceptions (Rovai, 2004). In addition to underscoring the importance of community, Dewey believed that inquiry

should be rooted in practical problem solving (Ravai, 2004). In this way, learning is a collaborative activity where groups interact during the process of inquiry.

As online learning evolved within higher education, much attention was focused on whether or not these online learning environments could support the social interaction needed for learning, especially as higher education has historically emphasized the constructivist approach to learning (Ravai, 2004). Additionally, researchers were attempting to make sense of newer online learning environments, which were replacing the traditional idea of distance education with more collaborative, group-based discussion forums (Swan, 2010). In response, a Canadian Social Sciences and Humanities research project, entitled, "A Study of the Characteristics and Qualities of Text-Based Computer Conferencing for Educational Purposes" (1997-2001), was launched with the purpose of creating a model of a community of inquiry (CoI Website, n.d.). These researchers worked to better understand if and how online learning environments could indeed support quality learning with a focus on inquiry. In their resulting paper, Garrison, Anderson and Archer (2000) suggested that quality online learning does indeed occur through the interaction of social presence, teaching presence, and cognitive presence. Each of these interdependent elements work together to generate a strong learning community that is well-structured and leads to higher-order thinking and inquiry-based learning (Garrison & Arbaugh, 2007). Since its publication, the CoI framework has provided the foundation for empirical research in a variety of educational settings (CoI Website, n.d.). It has been used to inform both research and practice, and has played a major role in better understanding online learning environments (Swan, 2010).

Social Presence

An element of the CoI - social presence - looks at learners' ability to project themselves socially and emotionally in online environments (Garrison & Arbaugh, 2007). Indicators of social presence include expressions of personality during group activities, and interest in peers. Social presence is the longest studied element within the framework, and precedes the CoI framework by over 20 years (Swan et al., 2008).

Some researchers have questioned the extent to which online students truly co-construct knowledge within online learning environments, and it is sometimes suggested that online learning environments may not require social presence to help sustain continuous communication (Annand, 2011). Other researchers, however, have found that students' perceived level of social presence directly correlates with their perceived level of learning (Richardson & Swan, 2003) and increased participation in online discussions (Swan & Shih, 2005). Such results indicate that students who are more actively engaged in online learning environments, and who are able to make connections with other students, tend to succeed in online courses (Richard & Swan, 2003).

Much research has been conducted to understand how social presence can be cultivated within online learning environments. While some researchers focus on mimicking traditional classroom activities in order to recreate online social interactions, it has also been argued that perception of group inclusion is vital to an increased perception of social presence (Rogers & Lea, 2005). In this sense, informal methods of communication, such as instant messaging, might play a key role in cultivating group connections and feelings of social presence (Nippard & Murphy, 2007). Additionally, the use of specific linguistic techniques, such as figurative and metaphorical language,

has been shown to be linked with social presence (Delfino & Manca, 2007). These results suggest that authentic and immediate communication might be key in cultivating online learning environments with high levels of social presence.

Cognitive Presence

A second element of the CoI - cognitive presence - highlights the ability of learners to construct meaning through a continual and deliberate cycle of reflection and discourse (Garrison & Arbaugh, 2007). This cycle of practical inquiry allows students to move from understanding to exploration, integration, and application (Garrison, 2007). Cognitive presence originated from Dewey's concept of scientific inquiry (1933), and while it is the least understood element of the CoI framework, it is also a critical component (Swan et al., 2008). Researchers suggest that participation and thinking skills interact to allow students to process the information that they learn in online learning environments. Asynchronous learning environments have been shown to cultivate high levels of cognitive presence (Garrison, 2003); additionally, cognitive presence has been linked to both perceived and actual learning outcomes (Akyol & Garrison, 2011). Indicators of cognitive presence might be demonstrated when students show an understanding of a subject matter in their communications and assignments.

Researchers suggest that elements of both teaching and social presence help cultivate high levels of cognitive presence within online learning environments (Archibald, 2010), underscoring the key role that cognitive presence plays within the CoI framework. The design of an online program has also been shown to generate critical thinking. In their study of cognitive presence, Garrison and Cleveland-Innes (2005) designed a course to encourage high levels of cognitive presence; specifically, they

ensured a high level of instructor engagement, and discussion board questions and assignments were crafted to generate thoughtful responses and reflections. Their results showed an increase in cognitive presence experienced among students participating within the course. Other studies have found that certain factors play a key role in the support of cognitive presence within asynchronous online learning environments, including discourse, collaboration, management, reflection, monitoring, and knowledge construction (Kanuka & Garrison, 2004). These results suggest that cognitive presence can be heavily influenced through both structure, design and leadership (Garrison, 2007), and can lead to important knowledge creation activities within online learning environments.

Teaching Presence

A third element of the CoI - teaching presence - underscores the importance of mediation within online learning environments, including the design, facilitation, and direction of cognitive and social processes (Garrison & Arbaugh, 2007). This mediation is important for students to achieve meaningful learning outcomes, and is critical when sustaining both social and cognitive presence in students (Garrison, 2007). Teaching presence might be demonstrated when instructors provide direct instruction or when they respond immediately to student inquiries

Teaching presence has been shown to influence social presence within online learning environments. For example, student interaction and collaboration are positively influenced by increased instructor participation (Murphy, 2004). Additionally, as social presence is seen as a function of both learners and teachers, the perceived level of

instructor participation has been shown to play a strong role in determining student satisfaction and perceived level of social presence.

Teaching presence has also been shown to heavily influence cognitive presence. Evidence suggests that online students depend heavily on instruction to help negotiate meaning and the co-construction of knowledge (Hull & Saxon, 2009). For example, Murphy (2004) suggests that in order for high-level collaboration to occur within asynchronous discussions, instructors must employ techniques aimed at promoting these processes. In short, without instructor direction, asynchronous discussions can become serial monologues (Garrison, 2007; Pawn, Paulus, Yalcin, & Chang, 2003).

From these findings it is clear that while the three elements of the CoI all play important but separate roles in their ability to support collaborative online learning environments, they do not exist in individual vacuums (Shea, Fredericksen, Picket, & Pelz, 2003). Instead, each element is highly correlated with the others, and should be taken into consideration as a unit when assessing the CoI framework within online learning environments. Taken together, the CoI framework might lead to improved learning environments in which students feel comfortable sharing knowledge, thus leading to improved learning outcomes.

CoI and Knowledge Sharing Behavior

Within the literature, the CoI Framework has not often been linked with knowledge sharing behavior. Studies have shown, however, that a strong CoI environment is significantly correlated with perceived learning (Rovai, 2002), implying the possibility that the CoI framework might motivate students to participate, collaborate, and share knowledge with other students.

Knowledge sharing has been linked to other collaborative communities, including Communities of Practice (CoP). CoP is another framework based on social participation and other foundational concepts shared with the CoI framework. Encouraging students to share knowledge has been shown to influence communities of practice (CoP) (Hung & Yuen, 2010). As knowledge sharing has been connected to the CoP framework, it might also be important to understand the ways in which knowledge sharing is connected to the CoI framework.

The element of cognitive presence might be particularly connected with knowledge sharing behavior. The perception of an open social climate has been shown to facilitate the knowledge sharing process, which is necessary to sustain cognitive presence (Anderson, Rourke, Garrison, & Archer, 2001; Ling, 2007). In this way, knowledge sharing behavior and the CoI framework might each affect and support the other. As the CoI framework is based on the concept that effective online learning requires a community that supports deep and meaningful learning (Swan et al., 2008), knowledge sharing behavior could be affected by supporting social, teaching, and cognitive presence within an online learning environment.

Limitations of the CoI Framework

While the CoI framework is seen as one of the more important frameworks when evaluating online learning environments (Garrison & Arbaugh, 2007), it is still relatively new. It has been suggested that researchers too often focus specifically on the individual components of the framework (either social, teaching, or cognitive presence) (Shea et al., 2009); studies that simultaneously explore the three components are limited (Arbaugh, 2008).

Additionally, not all aspects of online learning have been investigated by the CoI framework. For example, the CoI framework was originally developed to better understand the role of online discussion boards within online learning environments (Swan, 2010). As online learning environments evolve beyond discussion board interactions, it has been suggested that the CoI framework should also expand to focus on the complete learning environment (Shea et al., 2009).

The statistical methods used to study the CoI framework have also been questioned. For example, most studies have relied on small sample sizes and basic statistical techniques (Arbaugh, 2008). While the CoI framework and its accompanying survey tool have certainly been proven popular in recent research, it is still relatively new and untested; as a result, the findings for much of this research can be considered questionable (Arbaugh, 2008). More research is needed to better understand the CoI framework, and its role in supporting online learning environments.

Assessments

To understand how elements of the CoI can affect knowledge sharing behaviors within online learning environments, multiple assessment tools were utilized. Specifically, this study combines the CoI survey tool with the Knowledge Assessment tool to help answer this important question.

Community of Inquiry Assessment Tool

The CoI framework is typically measured using one tool: The CoI survey tool. The CoI framework was developed during a research project, entitled, "A Study of the Characteristics and Qualities of Text-Based Computer Conferencing for Educational Purposes" (1997-2001) (CoI Website, n.d.). As an extension to this project, an

assessment tool was specifically created to measure the three elements of the CoI framework: social presence, teaching presence, and cognitive presence. The survey as it stands today includes 34 total questions: 9 questions for social presence, 12 items for cognitive presence, and 13 questions for teaching presence. The questionnaire typically makes use of a 5-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Within the social presence construct, first-order factors include open communication, group cohesion, and affective expression. Within the cognitive presence factor, first-order factors include triggering event, exploration, integration, and solution. Within the teaching presence factor, first-order factors include design and organization, facilitating discourse, and direct instruction (Garrison & Arbaugh, 2007).

Arbaugh et al. (2008) first administered this questionnaire through an exploratory study, and it was shown by researchers to be a valid, reliable, and an efficient measure of social presence and cognitive presence. While factor analysis highlighted teaching presence as a factor, it suggested that teaching presence consisted of two first-order factors instead of three: 1) course design and organization and 2) instructor behavior (Arbaugh et al., 2008). Additionally, within this study, Cronbach's Alpha yielded internal consistencies of 0.94 for teaching presence, 0.91 for social presence, and 0.95 for cognitive presence (see Table 1).

Table 1

CoI Factors (Arbaugh et al., 2008)

Factors	Cronbach's Alpha
Social Presence	0.91

Teaching Presence	0.94
Cognitive Presence	0.95

Follow-up studies - including both exploratory factor analysis and confirmatory factor analysis studies - have questioned teaching presence as a factor, as well as its composition. While some studies have found two distinct first-order factors of teaching presence (design and directed facilitation), most have found three (design, facilitation, and direct instruction) (Garrison, 2007). It has been suggested that this difference in findings might be related to the effect of social and cognitive presence, and how these two elements influence teaching presence and how it is perceived. Additionally, it has been suggested that students might not be sophisticated enough to distinguish between facilitation and direct instruction (Garrison, 2007). Other studies, however, have confirmed the factor structure of the CoI survey as well as the causal relationships among the presences predicted by the CoI framework (Arbaugh & Hwang, 2006; Garrison, Cleveland-Innes, & Fung, 2010).

While more studies need to be conducted in order to better understand these factors, the general consensus within the literature is that the CoI framework questionnaire is a stable instrument that can be used within a variety of areas, including large-scale, inter-institutional, and cross-disciplinary studies (ITS, n.d.).

Knowledge Assessment Tool

While the CoI framework is usually assessed using one standard tool, knowledge sharing behavior has been explored in a variety of ways. When measured in qualitative studies, knowledge sharing behavior is observed using interviews, observations, and

document analysis to answer research questions (Wang & Noe, 2010). More often, however, knowledge sharing is measured using quantitative, self-assessment tools.

When thinking about knowledge from the perspective of the Organizational Knowledge Creation theory (OKCT), assessing knowledge sharing might be divided into four separate measurements: tacit to tacit knowledge (socialization), tacit to explicit knowledge (externalization), explicit to tacit knowledge (internalization), and explicit to explicit knowledge (combination). For example, to understand tacit to explicit knowledge conversation, a researcher might measure the number of shared documents; to measure explicit to tacit knowledge, a researcher might measure the number of hits on a document repository; to measure explicit to explicit knowledge, a researcher might measure the number of citations in a report (Lee, 2000). Understanding tacit to tacit knowledge sharing, however, becomes difficult, as it is entirely based on social interaction. Indeed, knowledge sharing behavior is difficult to observe from an external perspective (Davenport & Prusak, 1998). It has been suggested that self-reporting is the only method of measuring actual knowledge sharing behavior (Yu, Lu, & Liu, 2010), especially when focusing on the social aspect of knowledge sharing.

Quantitative studies often use these self-assessment tools to measure willingness to share knowledge as well as knowledge sharing behaviors (Wang & Noe, 2010). For example, in their study trying to understand why individuals are motivated to participate in blog activates, Hsu & Lin (2008) analyzed sharing motivations by surveying individuals' perceptions of expected reciprocal benefits, reputation, expected relationships, trust, and altruism. This survey was based partly on Bock & Kim's (2002)

Knowledge Sharing survey tool, and was validated as a multi-facet model to help understand the factors contributing to blog usage.

Looking more closely at Bock & Kim's Knowledge Sharing survey tool, the survey was based partially on self-efficacy and social exchange theory, which are often connected with knowledge sharing behaviors. As social exchange theory focuses specifically on intrinsic rewards, it is useful in understand how feelings of trust influence knowledge sharing (Bock & Kim, 2002). The survey was developed to understand knowledge sharing behaviors within an organization. Using this tool, it was reported that a positive attitude toward knowledge sharing was the most significant motivational factor of knowledge exchange (Bock & Kim, 2002; Gupta, Joshi, & Agarwal, 2012). Subsequent studies within the area of knowledge sharing have successfully utilized Bock and Kim's survey tool to better understand knowledge sharing (see Hsu & Lin, 2008; Lin & Lee, 2004; Yu, Lu, & Liu, 2010).

A recent study used Bock and Kim's survey tool to measure knowledge sharing behavior within Weblogs. In their article titled, *Exploring Factors that Influence Knowledge Sharing Behavior via Weblogs* (2010), Yu, Lu, and Liu developed a survey tool to understand how individuals can be encouraged to contribute personal knowledge within virtual communities. To minimize the possibility of participants incorrectly self-reporting in order to recreate consistent results, this survey instrument separated the measurement of actual knowledge sharing from intentions to share knowledge (Yu, Lu, & Liu, 2010). These researchers used three categories associated with a sharing culture: fairness, identification, and openness. The results of the study showed that the enjoyment

of helping others, a strong sharing culture, and feelings of usefulness were all strongly linked to members' knowledge sharing behavior (Yu, Lu, & Liu, 2010).

To develop their survey, Yu, Lu, and Liu recruited researchers within the field of KM to review their questions. It was revised based on their feedback, and the face and content validity was verified based on interviews with these professionals. Factors were created as a result of an extensive review of the literature, and included knowledge creation, knowledge transfer, knowledge sharing, and knowledge building. All items were measured using a 7-point Likert-type scale. A 50-participant pilot study was conducted prior to the actual test. The reliability scores were based on the report of Cronbach's Alphas, which ranged from 0.605 (for knowledge sharing) to 0.879 (for openness) (see Table 2). When the pilot study was completed, the questionnaire was revised twice before the final survey was conducted. The final survey was delivered to 442 participants, and showed that Yu, Lu, and Liu's behavioral model can effectively predict knowledge sharing behaviors within online communities. It was also shown to explain 78% of the variance related to knowledge sharing behavior.

Table 2

Factor Reliability Results (Yu, Lu, & Liu, 2010)

Factors	Cronbach's Alpha
Fairness	0.860
Identification	0.884
Openness	0.863
Enjoy helping	0.808
Usefulness	0.770
Knowledge sharing behavior	0.859

By combining the CoI survey tool with the knowledge sharing factor as defined by Yu, Lu, & Liu, this study attempts to understand if the CoI framework predicts knowledge sharing behavior. By employing the CoI framework, amended to include questions surrounding students' self-reported knowledge sharing behaviors, the results of the research findings will help researchers understand whether certain factors of an online learning environment - including social presence, teaching presence, and cognitive presence - can influence students' knowledge sharing behaviors, and improve online learning environments.

Chapter III

Methodology

Introduction

Social constructivists highlight knowledge co-construction as an important aspect of successful learning. Knowledge co-construction occurs when students are given the opportunity to interact with other learners and share and discuss what they know (Redmond, 2006). Knowledge sharing can therefore be seen as the foundation of successful learning; however, within online learning environments, students might feel hindered when attempting to interact with each other, as many online courses - especially asynchronous courses - do not always create opportunities for immediate interactions (Blessing & Kortenkamp, 2008; Dunlap & Lowenthal, 2009; Sirisaengtaksin & Olfman, 2014).

In order to overcome the inherent limitations of online learning environments, and encourage students to engage and share knowledge with their peers, a strong emphasis on collaboration and mutual trust within online learning frameworks might help motivate individual students to share knowledge with members of their online community. Researchers of the CoI framework have suggested that online students are motivated to participate and learn in environments that show high levels of student presence, teaching presence, and cognitive presence (Garrison, Anderson, & Archer, 2000). This study therefore investigated whether the CoI framework can predict self-reported knowledge sharing behaviors as demonstrated by graduate students.

Research Questions

While researchers have a strong understanding of how organizations capture and distribute knowledge, a better understanding of how and why knowledge is shared within an online learning environment will pave the way for improved online learning systems (Kidwell, Vander Linde, & Johnson, 2000). Using the CoI framework, amended to include questions surrounding students' self-reported knowledge sharing behavior, this exploratory study investigated the CoI factors that influence students' knowledge sharing activities within an online learning community. The following research questions were used to understand participants' perceptions of CoI factors, and the influence of these factors on knowledge sharing behavior. Specifically, the following research question and subquestions were explored:

- To what extent do factors of the CoI framework predict self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of social presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of teaching presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of cognitive presence influence students' self-reported knowledge sharing behavior within an online learning environment?

The findings will help researchers understand what motivates students to share knowledge within online learning environments, and will provide insight into whether feelings of social, teaching, and cognitive presence affect knowledge sharing behavior within online learning environments. Additionally, results might help online instructors make informed decisions about whether to systematically promote elements of CoI, and will thus maximize online learners' satisfaction and improve learning outcomes.

Expected Results

A successful online learning environment, which allows for collaboration and the co-construction of knowledge, relies on the ability for students to interact and share their knowledge (Redmond, 2006). The CoI framework is intended to meet these standards, creating an environment where students feel comfortable collaboratively constructing knowledge (Garrison, 2006). A successful CoI relies on student self-direction (Garrison & Anderson, 2003), and therefore motivation (Jézégou, 2010), and leads to a learning platform steeped in mutual trust and respect (Swanson & Hornsby, 2000).

Knowledge sharing is also heavily rooted in factors of motivation and trust. In fact, mutual trust has been shown to influence the process of knowledge sharing (Nonaka & von Krogh, 2009). In support of this goal, research suggests that social connections within online learning environments might lead directly to successful learning and knowledge sharing (Cost et al., 2008).

It was therefore anticipated that a strong CoI, measured by the CoI survey tool, will positively influence students' motivation to share knowledge within on online learning community, helping students overcome traditional knowledge sharing barriers. Specifically, it was anticipated that high levels of perceived social presence, teaching

presence, and cognitive presence help positively influence students' self-reported level of knowledge sharing behavior. Conversely, it was anticipated that low levels of perceived social presence, teaching presence, and cognitive presence negatively influence students' self-reported level of knowledge sharing behavior.

Hypotheses

H_A: There is a relationship between factors of the CoI framework and students' self-reported knowledge sharing behaviors within online learning environments.

H_{A1}: There is a relationship between students' perceived level of social presence and their self-reported knowledge sharing behaviors within online learning environments.

H_{A2}: There is a relationship between students' perceived level of teaching presence and their self-reported knowledge sharing behaviors within online learning environments.

H_{A3}: There is a relationship between students' perceived level of cognitive presence and their self-reported knowledge sharing behaviors within online learning environments.

Null-Hypotheses

H_0: There is no relationship between factors of the CoI framework and students' self-reported knowledge sharing behaviors within online learning environments.

H_{01}: There is no relationship between students' perceived level of social presence and their self-reported knowledge sharing behaviors within online learning environments.

H_{02}: There is no relationship between students' perceived level of teaching presence and their self-reported knowledge sharing behaviors within online learning environments.

H_{03}: There is no relationship between students' perceived level of cognitive presence and their self-reported knowledge sharing behaviors within online learning environments.

Research Design

In order to understand whether factors of the CoI framework predict students' self-reported knowledge sharing behavior, a survey instrument was utilized to collect information about students' perceptions of CoI factors within real-life online courses - including perceptions of social presence, teaching presence, and cognitive presence - and their knowledge sharing behavior.

Following Jacob Cohen's (1962) work on the power of statistical tests in behavioral studies, many researchers highlight the importance of statistical power analysis (Erdfelder, Faul, & Buchner, 1996). The statistical software G*power 3.1.7 was utilized to determine the sample size necessary for achieving a statistical power of .80, a p-value of .05, and a large effect size of .35 for a standard multiple regression test (Cohen, 1988). The priori analysis suggested a minimum number of 36 participants required to achieve the required statistical power for a test utilizing three predictor variables; therefore, the sample size was set at 36 participants.

Participants

First, graduate level, school of education students from one mid-size, non-profit university in Western Pennsylvania were recruited. Only 15 surveys were collected from this specific university, so other non-profit universities that include a school of education were contacted within Western Pennsylvania. Recruitment at these schools only yielded an additional three surveys, so the search was expanded to additional non-profit universities in the United States. After 36 surveys were collected, the survey was closed.

School of education students were selected due to their common understanding of social learning practices. Graduate students were chosen for the study as their enrollment in online courses is growing rapidly (Allen & Seaman, 2007), and it has been shown that graduate students are more willing than undergraduate students to disclose personal information within online learning environments (Doring, Hodge, & Heo, 2014), and show high levels of self-regulated learning characteristics (Colorado & Eberle, 2010). It was assumed that because the students were enrolled in an online course, they had access to a computer and an Internet connection.

Recent literature has suggested that student demographic information - such as gender (Bostock & Lizhi, 2005), student work status (Diaz, 2002), and age (Doring, Hodge, & Heo, 2014) - might affect student participation, privacy concerns, and success within online learning environments. To account for this, the study captured demographic information from the student participants, including: age, gender, academic program, student status, prior relationships with other members of the online learning environment, experience with online learning environments, and experience with technology.

Instrument

Swan et al.'s (2008) CoI survey instrument and Yu, Lu, & Liu's (2010) knowledge sharing survey tool was adopted for the study (see Appendix A). The CoI survey instrument has been shown by researchers to be valid, reliable, and an efficient measure of social presence, teaching presence, and cognitive presence. Specifically, factor loadings for the 34 items support the validity of the CoI's conceptual framework of teaching, social, and cognitive presence (Arbaugh et al., 2008). These three factors have been shown to account for 61.3% of the total variance in scores. Cronbach's Alpha has been shown to yield internal consistencies equal to 0.94 for teaching presence, 0.91 for social presence, and 0.95 for cognitive presence (Arbaugh et al., 2008). The three factors include various first-order factors. Within the social presence factor, the first-order factors that have been identified include open communication, group cohesion, and affective expression. Within the cognitive presence factor, the first-order factors that have been identified include triggering event, exploration, integration, and solution. Within the teaching presence factor, the first-order factors that have been identified include design and organization, facilitating discourse, and direct instruction (Garrison & Arbaugh, 2007). As the CoI survey tool is a standard tool used to measure the CoI framework, it was used in its standard form, and the questions were not adapted or changed for this study; however, the scales did change from a 5 point Likert scale to a 6 point Likert scale.

Yu, Lu, & Liu's (2010) developed a survey to understand knowledge sharing within weblogs. Their survey consisted of five factors: fairness, identification, openness, enjoyment in helping others, usefulness, and knowledge sharing behavior. Overall, Yu,

Lu, & Liu's survey instrument was found to be internally consistent and reliable. A pilot study was conducted with 50 participants, and the reliability scores were based on the report of Cronbach's Alpha, which ranged from 0.65 for knowledge sharing behavior to 0.879 for openness. The final study was able to explain 78% of the variance pertaining to intentions toward knowledge sharing behavior. For the purpose of this study, the survey was adapted to use only the factor of knowledge sharing, which includes four questions. Additionally, the 7 point Likert scale was changed to a 6 point Likert scale.

The 46-question instrument for the research study consisted of three sections: demographic survey, CoI survey, and Knowledge Sharing survey. The first section of the survey consisted of eight demographic-related questions, including age, gender, academic program, student status, prior relationships with other members of the online learning environment, experience with online learning environments, and experience with technology. The second section of the survey consisted of 34 questions that measured participants' perception of social presence, teaching presence, and cognitive presence. The third section of the survey consisted of four questions that measured participants' knowledge sharing behavior. The second and third sections of the survey used a six-point response scale (1=strongly disagree to 6=strongly agree), as an even number of choices might have encouraged participants to choose whether their answer reflects a positive or negative opinion.

Procedures

After receiving IRB approval (see Appendix B), instructors working at one mid-sized university within Western Pennsylvania were contacted. The selected university currently offers online courses within its School of Education. Next, instructors working

at a neighboring university were contacted. This university also currently offers online courses within its School of Education. For both schools, an email was sent to the instructors of School of Education online courses (see Appendix C), asking for their permission to recruit their online graduate students for participation in the study, and included an attached pre-written email that could then be distributed to students (see Appendix D). If an instructor distributed the attached invitation email, it was assumed that permission had been granted. The instructors then distributed the pre-written email to their students, describing the study, and indicating that all participants would have the option of entering to win a $100 gift card to Amazon.com.

In an effort to collect more data, an invitation to participate in the online survey was also posted in message boards within education-related forums, providing the same information as was emailed to the first group of students (see Appendix E). The message post specified that only currently enrolled online graduate students within a non-profit School of Education in the United States could participate.

All students were made aware that their current instructor would have no knowledge of their participation in the survey. It was also explained that their participation in the survey was confidential, as identifiers - such as names, email addresses, and IP address - were not collected; however, if participants chose to enter the $100 gift card raffle, they were asked to enter their email addresses in a separate form, so that the winner could be contacted. This identifier remained confidential, and resided in a password-protected online area, separated and unlinked from the submitted surveys. It was also explained that the survey instrument was housed on SurveyGizmo, a free online

survey service site. Participants were provided a URL link to SurveyGizmo's Privacy Policy, as well as a direct URL link to the online survey.

Participants who chose to click the link and complete the survey were first presented with an introductory page that contained a Duquesne University IRB-approved consent form informing participants as to how the data would be used and reported (see Appendix F). Confidentiality was assured, as all submitted email addresses were captured separately from the submitted survey, and stored in a password-protected area. By reading the consent form and continuing to the survey page, the participants consented to the terms of the research study. A total of 46 questions were then accessible to the participants. Each completed survey response was stored in the password-protected Website.

Variables

Independent Variables

The independent variables were scores of social presence, teaching presence, and cognitive presence from the second portion of the survey instrument. Scores were collected from individual survey questions and totaled for each of the three groups (see Table 3).

Table 3

Independent Variables

Variable	Definition
Perception of Social Presence	Total score (1 to 6) of perceptions of social presence. The score of 1 indicates low levels of social presence, and the score of 6 indicates high levels of social presence.
Perception of Teaching Presence	Total score (1 to 6) of perceptions of teaching presence. The score of 1 indicates low levels of teaching presence, and the score of 6 indicates high levels of teaching presence.
Perception of Cognitive Presence	Total score (1 to 6) of perceptions of cognitive presence. The score of 1 indicates low levels of cognitive presence, and the score of 6 indicates high levels of cognitive presence.

Dependent Variables

The dependent variable was score of knowledge sharing behavior from the third portion of the survey instrument. Scores were collected from individual survey questions and totaled for the group (see Table 4).

Table 4

Dependent Variable

Variable	Description
Knowledge Sharing Behavior	Total score (1 to 6) of self-reported knowledge sharing behavior. The score of 1 indicates low levels of self-reported knowledge sharing behavior, and the score of 6 indicates high levels of self-reported knowledge sharing behavior.

Data Analysis

Using SPSS version 22, data were first screened for missing data and outliers. After data were screened and outliers were addressed, the data were examined for test assumptions of Standard Multiple Regression.

A Mahalanabis distance variable was calculated to determine if outliers existed in the data set; specifically, whether any of the cases exceed a chi-square (x^2) criteria value. Tests for assumptions included multicollinearity, independence of the residuals, normality, linearity, and homoscedasticity.

Finally, Standard Multiple Regression was conducted to determine the accuracy of the independent variables (social presence, teaching presence, and cognitive presence) of predicting the dependent variable (self-reported knowledge sharing behavior). Regression results were analyzed to determine whether the overall model significantly predicts self-reported knowledge sharing behavior.

Chapter IV

Results

The purpose of this study was to examine whether the CoI framework can predict self-reported knowledge sharing behaviors within graduate-level online courses. The overall goal was to determine if high levels of social, teaching, and cognitive presence lead to increased knowledge distribution within online learning environments, leading to the co-construction of knowledge among learners.

As part of the study, graduate students from U.S. universities who were currently enrolled in an online course related to the field of education were asked to complete a survey. The survey assessed students' perceptions of social, teaching and cognitive presence within their respective online courses, and measured their self-reported knowledge sharing behavior within the online course. The independent variables were scores of social presence, teaching presence, and cognitive presence. The dependent variable was the score of knowledge sharing behavior. A standard multiple regression design was utilized to determine whether the independent variables (social presence, teaching presence, and cognitive presence) are predictors of the dependent variable (knowledge sharing behavior). This chapter presents and discusses the statistical analysis of the data and its results.

Null Hypothesis Review

This chapter will discuss the findings related to the following null hypotheses:

H_0: There is no relationship between factors of the CoI framework and students' self-reported knowledge sharing behaviors within online learning environments.

H_{01}: There is no relationship between social presence and students' self-reported knowledge sharing behaviors within online learning environments.

H_{02}: There is no relationship between teaching presence and students' self-reported knowledge sharing behaviors within online learning environments.

H_{03}: There is no relationship between cognitive presence and students' self-reported knowledge sharing behaviors within online learning environments.

Sample Size

A sample size of 36 was set to obtain a statistical power level of 0.80 and a large effect size of 0.36. Within a six month period (November 2014 to May 2015), 52 potential participants attempted to complete the survey, with 36 participants actually finishing the survey. While the sample size was somewhat limited, past research within the area of the CoI framework typically relies on small sample sizes (Arbaugh, 2007). The survey completion rate was 69%.

Participant Demographics

The first portion of the survey was designed to collect demographic characteristics of the respondents and their general experience with technology and online learning environments. Only students who were enrolled within an education-related graduate program and currently taking an online course were asked to participate.

Age and Gender

Of the 36 respondents, 22 were female (61%) and 14 were male (38%). In regards to age, a total of 17 were between the age of 20 and 29 (47%), 11 between the age of 30 and 39 (31%), seven between the age of 40 and 49 (19%), and one between the age of 50 and 59 (3%) (see Table 5). Similarly, a recent national online learners' priorities report (Noel-Levitz, 2011) states that over three years between 2008 and 2011, the majority of the online learners were females (female: 67%, male: 33%), and ranged in age from 25 to 44 years old (25-34 years: 30%, 35-44 years: 28%, 45-54 years: 20%, 24 and under: 15%, 55 and over: 7%).

Table 5

Respondents' Age Range

Age	Frequency	Percentage
20-29	17	47%
30-39	11	31%
40-49	7	19%
50-59	1	3%

Degree Program and Student Status

The respondents were also asked to report their current degree program and student status. Of the 36 respondents, 11 were working towards their Master's degree (31%) and 25 were working towards their Doctoral degree (69%).

Of these students, six reported that they were full time students, with no other family or work obligations (17%); 23 reported that they were full time students with family and/or work obligations (64%); one reported that he or she was a part time student with no work or family obligations (3%); four reported that they were part time students

with work and/or family obligations (11%); and two reported that their status did not fall within the listed descriptions (6%) (see Table 6 and Table 7 for degree program and student status, respectively). Similarly, the majority of online learners between 2008 and 2011 were employed full-time while working on their degrees (full-time: 61%, other: 39%) (Noel-Levitz, 2011).

Table 6

Respondents' Degree Program

Degree	Frequency	Percentage
Master's Degree	11	31%
Doctoral Degree	25	69%

Table 7

Respondents' Student Status

Status	Frequency	Percentage
Full time student, no work or family obligations.	6	17%
Full time student, work and/or family obligations.	23	64%
Part time student, no work or family obligations	1	3%
Part time student, work and/or family obligations.	4	11%
Other	2	6%

Friendships

Respondents were also asked to report whether or not they were enrolled in the course with friends. Of the 36 respondents, six reported no friends within the course (17%); seven reported 1-3 friends (19%); four reported 4-6 friends (11%); and 19 reported over 6 friends (53%) (see Table 8).

Table 8

Respondents' Friendships within the Course

Number of Friends	Frequency	Percentage
0	6	17%
1-3	7	19%
4-6	4	11%
Over 6	19	53%

Experience with Online Learning and Technology

Finally, respondents were asked to report whether or not they had ever previously enrolled in an online course. Of the 36 respondents, one reported no other experience with online learning environments (3%); nine reported 1-3 previous online courses (25%); seven reported 4-6 previous online courses (19%); and 19 reported over 6 previous online courses (53%) (see Table 9).

Table 9

Respondents' Previous Online Courses

Number of Previous Courses	Frequency	Percentage
0	1	3%
1-3	9	25%
4-6	7	19%
Over 6	19	53%

The average comfort level with computers was reported at 8.5 (on a scale from 1 to 10, with 10 representing an expert level). The average comfort level with the Internet was reported at 8.94 (on a scale from 1 to 10, with 10 representing an expert level).

Multiple Regression Analysis

Using SPSS (version 22) data were first screened for missing data and outliers, and data were analyzed to test the assumptions of multiple regression. Total scores for each of the predictor variables were transformed using summated scales, including Total Score of Social Presence (STotal), Total Score of Teaching Presence (TTotal), Total Score of Cognitive Presence (CTotal), and Total Score of Knowledge Sharing Behavior (KTotal).

Outliers

Data were first screened for missing data and outliers. A test of Mahalanobis distance (D^2) indicated there were no outliers in the data set; it was determined that no cases exceeded chi-square (x^2) criteria value. No cases were deleted from analysis (see Figure 3).

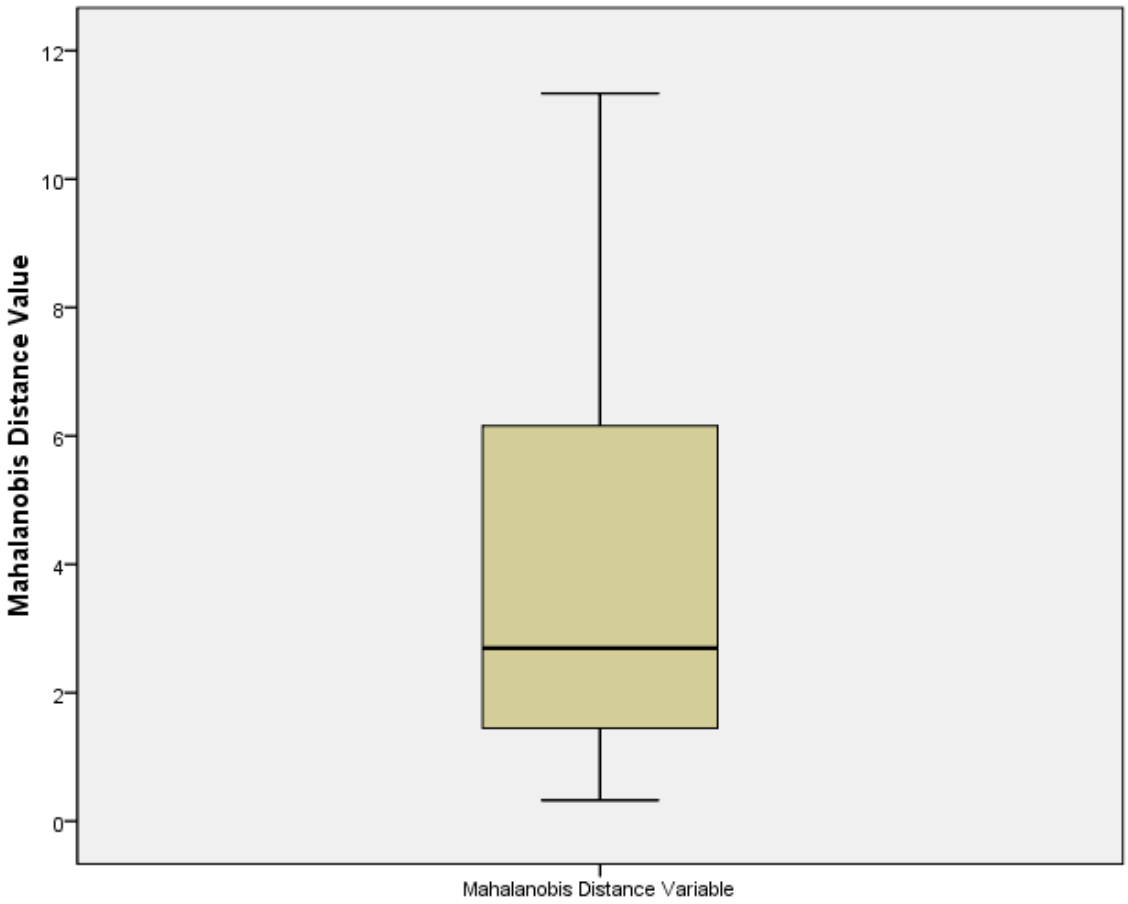

Figure 2. Graphical Representation Testing for Outliers.

Testing Assumptions

After data were assessed for outliers, data were tested for assumptions. Tests for assumptions included multicollinearity, independence of the residuals, normality, linearity, and homoscedasticity.

Multicollinearity was assessed to ensure that the correlation among the three independent variables did not lead to misleading interpretations of the model (Hair et al., 1998). To check for multicollinearity, tolerance and variance inflation factor (VIF) statistics were analyzed for each independent variable. Tolerance levels were well above

0.1 for each independent variable, and VIF levels were under 10, which is a common standard set for VIF. It was therefore determined that multicollinearity was not an issue (see Table 10).

Table 10

Coefficients for Model Variable

Construct	Tolerance	VIF
Perception of Teaching Presence	.168	5.955
Perception of Social Presence	.366	2.732
Perception of Cognitive Presence	.169	5.927

Independence of the residuals test was assessed using the Durbin-Watson value to understand if the residual terms were uncorrelated. The Durbin-Watson value can range from 0 to 4; if the residuals are uncorrelated, the value will be approximately equal to 2. Analysis found the Durbin-Watson value to be equal to 2.200, suggesting that the residual terms are uncorrelated.

Normality was assessed through the analysis of skewness and kurtosis. Skewness is the measure of symmetry of a distribution, and kurtosis is the measure of the flatness of a distribution when compared to a normal distribution (Hair et al., 1998). Total Score of Social Presence (STotal) was negatively distributed with a skewness of -.581 (SE=.393) and kurtosis of -.388 (SE=.768). Total Score of Teaching Presence (TTotal) was negatively distributed with a skewness of -.824 (SE=.393) and kurtosis of -.265 (SE=.768). Total Score of Cognitive Presence (CTotal) was negatively distributed with a skewness of -1.265 (SE=.398) and kurtosis of 1.758 (SE=.768). Total Score of Knowledge Sharing Behavior (KTotal) was distributed with a skewness of .39 (SE=.393)

and kurtosis of -.575 (SE=.768). With the skewness values ranging from -1.263 to .039, and kurtosis values ranging from -.575 to 1.758, the data can be considered to be reasonably normally distributed.

Linearity was assessed using a P-P plot of standardized residuals. Linearity of data refers to predicated values that fall in a straight line by having a constant change (Hair et al., 1998). The normal P-P plot showed the points were close to the line, indicating linearity (see Figure 4).

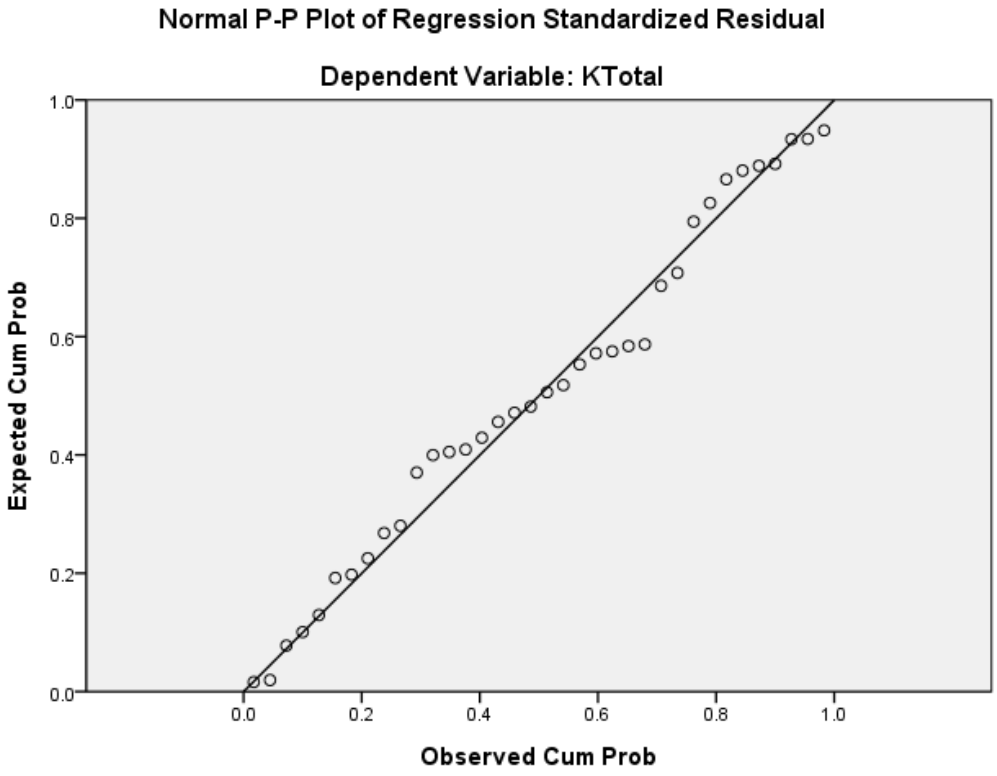

Figure 3. Graphical Representation Testing for Linearity.

Homoscedasticity was examined through the generation of a scatterplot of standardized predicted values. Homoscedasticity relates to the dependency between

variables (Hair et al., 1998). The scatterplot was somewhat dispersed, but not extreme (see Figure 5). The generally consistent spread indicated that homoscedasticity could be assumed.

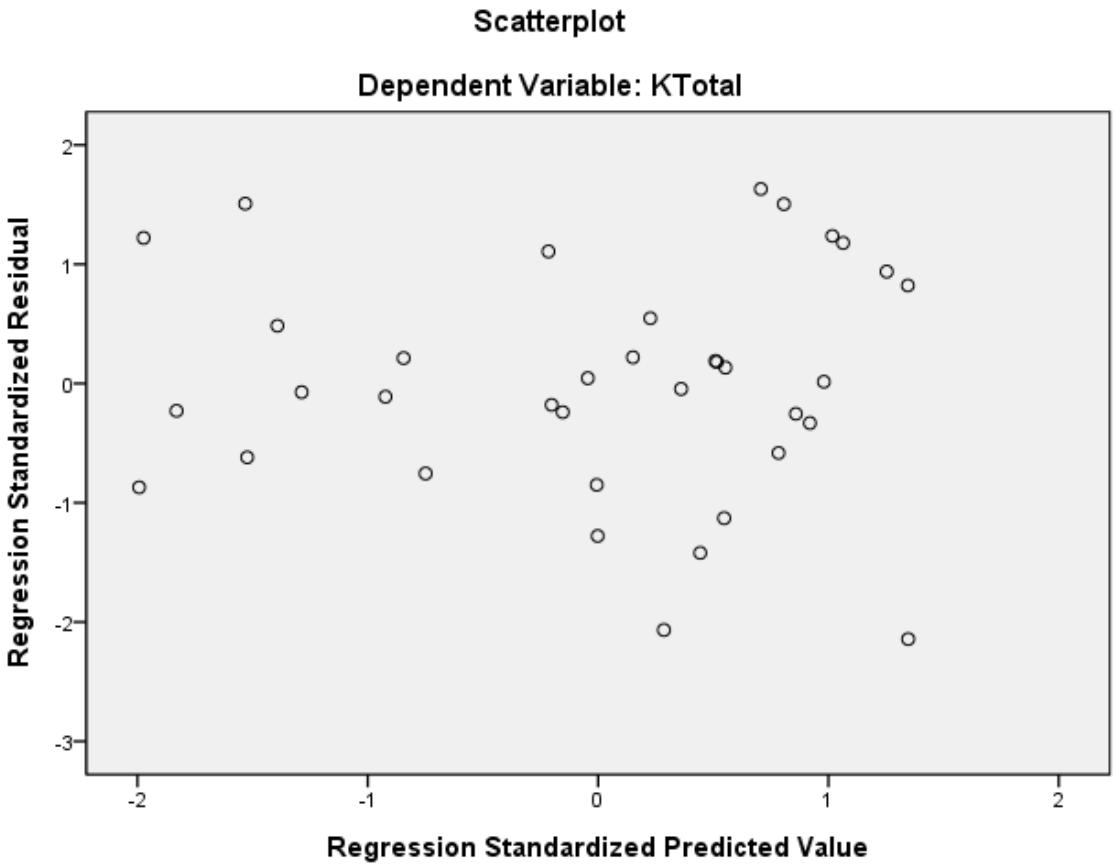

Figure 4. Residual Plots Testing for Homoscedasticity.

Standard Multiple Regression

Reliability scores were first analyzed to ensure internal consistency within the survey. In previous studies, the CoI Survey has yielded Cronbach's Alpha values of 0.94 for teaching presence, 0.91 for social presence, and 0.95 for cognitive presence (Arbaugh

et al., 2008). Yu, Lu, Liu's study (2010) found that their survey yielded a Cronbach's Alpha value of 0.605 for knowledge sharing. In line with these previous studies, this current study yielded Cronbach's Alpha values of 0.955 for teaching presence, 0.926 for social presence, 0.962 for cognitive presence, and 0.819 for knowledge sharing. These results demonstrated satisfactory measures of reliability.

After cleaning the data and testing for assumptions, total scores for social presence (STotal), teaching presence (TTotal), and cognitive presence (CTotal) were calculated for each respondent. Additionally, the total score for self-reported knowledge sharing behavior (KTotal) was calculated for each respondent. The mean score for social presence was 4.5833; the mean score for teaching presence was 4.7565; the mean score for cognitive presence was 4.6435; and the mean score for knowledge sharing was 4.5069 (see Table 11).

Table 11

Scores for Independent and Dependent Variables

Variable	Minimum	Maximum	Mean
Perception of Teaching Presence	2.46	6.00	4.7564
Perception of Social Presence	2.44	6.00	4.6435
Perception of Cognitive Presence	1.67	6.00	4.5069
Self-Reported Knowledge Sharing Behavior	2.50	6.00	4.7564

Standard Multiple Regression was then conducted using the Enter method to determine the accuracy of the independent variables (social presence, teaching presence, and cognitive presence) of predicting knowledge sharing behavior. A summary of regression coefficients is presented in Table 13.

Table 12

Model Summary of First Model

Predictors	R	R Square	Adjusted R Square	Sig. F Change
Perceptions of Teaching Presence; Perceptions of Social Presence; and Perceptions of Cognitive Presence	.798	.637	.603	.000

Table 13

Coefficients for Model Variable

Step	*B*	β	*T*	Bivariate *r*	Partial *t*	Sig.
Perception of Teaching Presence	.434	.483	1.860	.768	.312	.072
Perception of Social Presence	.315	.344	1.955	.734	.327	.059
Perception of Cognitive Presence	.017	.019	.073	.723	.013	.942

Based on these initial results, Standard Multiple Regression was conducted again using the Enter method to determine the accuracy of the more significant independent variables (social presence and teaching presence) of predicting knowledge sharing behavior. A summary of regression coefficients is presented in Table 15. The entire data analysis results can be found in Appendix G.

Table 14

Model Summary of Second Model

Predictors	R	R Square	Adjusted R Square	Sig. F Change
Perceptions of Teaching Presence; and Perceptions of Social Presence	.798	.637	.615	.000

Table 15

Coefficients for Model Variable

Step	*B*	β	*T*	Bivariate *r*	Partial *t*	Sig.
Perception of Teaching Presence	.447	.498	2.985	.768	.461	.005
Perception of Social Presence	.318	.348	2.085	.734	.341	.045

Null Hypothesis Results

The null hypothesis stated that there is no relationship between factors of the CoI framework and students' self-reported knowledge sharing behaviors within online learning environments. Initial regression results indicated that the overall model with all three independent variables (teaching presence, social presence, and cognitive presence) significantly predicts knowledge sharing behavior, $R^2 = .637$, $R^2_{adj}=.603$, $F(3, 32) = 18.753$, $p < .001$ (see Table 12). This model accounts for 63.7% of the variance in knowledge sharing behavior. After reviewing the beta weights, however, it was determined that no single variable significantly contributed ($p < .05$) to this model. Additionally, it was found that the cognitive presence independent variables played the least significant role in the model (see Table 13).

After removing the cognitive presence element, Standard Multiple Regression was repeated again. Regression results indicated that the overall model with two independent variables (teaching presence and social presence) significantly predicts knowledge sharing behavior, $R^2 = .637$, $R^2_{adj}=.615$, $F(2, 33) = 29.001$, $p < .001$ (see Table 14). This model accounts for 63.7% of the variance in knowledge sharing behavior. After reviewing the beta weights, it was determined that both independent variables significantly contribute ($p < .05$) to this model (See Table 15). Based on the regression model, the null hypothesis was not rejected, and it was concluded that CoI

framework does not play a role in predicting knowledge sharing behaviors within online learning environments.

Null Hypothesis H_{01}

The first null hypothesis (H_{01}) stated that there is no relationship between social presence and students' self-reported knowledge sharing behaviors within online learning environments. Based on the second regression model, the null hypothesis H_{01} was rejected, and it was concluded that social presence does help predict knowledge sharing behaviors within online learning environments.

Null Hypothesis H_{02}

The second null hypothesis (H_{02}) stated that there is no relationship between teaching presence and students' self-reported knowledge sharing behaviors within online learning environments. Based on the model, the null hypothesis H_{02} was rejected, and it was concluded that teaching presence does help predict knowledge sharing behaviors within online learning environments.

Null Hypothesis H_{03}

The third null hypothesis (H_{03}) stated that there is no relationship between cognitive presence and students' self-reported knowledge sharing behaviors within online learning environments. Based on the regression model, the null hypothesis H_{03} was not rejected, and it was concluded that cognitive presence does not help predict knowledge sharing behaviors within online learning environments.

Summary

This chapter presented the results and findings of the exploratory research into whether the CoI framework can predict self-reported knowledge sharing behaviors within

graduate-level online courses. Swan et al.'s (2008) CoI survey instrument and Yu, Lu, & Liu's (2010) knowledge sharing survey tool was adopted for the study. The survey assessed students' perception of social, teaching and cognitive presence within their respective online courses, and also asked them to assess their knowledge sharing behavior within the online course. All four variables were transformed into summated scale scores for analysis. Descriptive statistics and a standard multiple regression design was utilized to determine whether the independent variables (social presence, teaching presence, and cognitive presence) are predictors of the dependent variable (knowledge sharing behavior).

A total of 36 responses were collected, none of which were dropped due to missing data. Of the 36 respondents, the majority identified as female. In regards to age, the majority of respondents were in their 20s, followed by 30s, followed by 40s, and a small minority were in their 50s. The majority of respondents were working towards their Doctoral degree, and the minority reported that they were working towards their Master's degree. Additionally, the majority of respondents reported that they were full time students with family and/or work obligations, followed by respondents who reported that they were full time students with no other work/family obligations, followed by respondents who reported that they were part time students with work/family obligations; a small minority reported that they were part time students with no other work/family obligations.

Respondents were also asked to report whether or not they were enrolled in their online course with friends. The majority reported that they had over 6 friends in their course, followed by respondents who reported 1-3 friends, followed by respondents who

did not report having any friends in the course, followed by respondents who had 4-6 friends in the course. Additionally, the majority of respondents reported taking over 6 previous online courses, followed by students who reported taking 1-3 previous online courses, followed by students taking between 4-6 online courses; a small minority had no previous experience within online courses.

After cleaning the data and testing for assumptions, total scores for social presence (STotal), teaching presence (TTotal), and cognitive presence (CTotal) were calculated for each respondent. Additionally, the total score for self-reported knowledge sharing behavior (KTotal) was calculated for each respondent. The mean score for social presence was 4.5833; the mean score for teaching presence was 4.7565; the mean score for cognitive presence was 4.6435; and the mean score for knowledge sharing was 4.5069.

Standard Multiple Regression was then conducted using the Enter method to determine the accuracy of the independent variables (social presence, teaching presence, and cognitive presence) of predicting knowledge sharing behavior. Initial regression results indicated that the overall model with all three independent variables (teaching presence, social presence, and cognitive presence) significantly predicts knowledge sharing behavior. After reviewing the beta weights, however, it was determined that no single variable significantly contributed to this model. Additionally, it was found that the cognitive presence independent variables played the least significant role in the model.

After removing the cognitive presence element, Standard Multiple Regression was repeated again. Regression results indicated that the overall model with two independent variables (teaching presence and social presence) significantly predicts

knowledge sharing behavior. After reviewing the beta weights, it was determined that both independent variables significantly contribute to this model. Based on the regression model, the null hypothesis was not rejected, and it was concluded that CoI framework in its entirety does not play a role in predicting knowledge sharing behaviors within online learning environments. The results instead show that students' perception of social presence and teaching presence can predict students' knowledge sharing behavior; cognitive presence, however, was not shown to significantly contribute to this model.

Chapter V

Discussion

Summary of the Study

The purpose of this study was to examine whether or not the Community of Inquiry (CoI) framework - including social presence, teaching presence, and cognitive presence - can predict self-reported knowledge sharing behaviors within graduate-level online courses. The goal was to determine if high levels of social, teaching, and cognitive presence can lead to increased knowledge sharing within online learning environments, leading to improved co-construction of knowledge among learners. Specifically, the following research question and subquestions were explored:

- To what extent do elements of the CoI framework predict self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of social presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of teaching presence influence students' self-reported knowledge sharing behavior within an online learning environment?
    - To what extent do perceived levels of cognitive presence influence students' self-reported knowledge sharing behavior within an online learning environment?

The independent variables were scores of social presence, teaching presence, and cognitive presence. The dependent variable was the total score of knowledge sharing behavior.

Description of the Variables

Elements of the CoI framework have been well defined and analyzed in previous research, especially within research related to online learning. *Social presence* looks at learners' ability to project themselves socially and emotionally in online environments (Garrison & Arbaugh, 2007); studies show that students who are able to make connections with other students tend to succeed in online courses (Richard & Swan, 2003). *Teaching presence* underscores the importance of mediation within online learning environments (Garrison & Arbaugh, 2007), as online students depend heavily on instruction to help negotiate meaning and engage in the co-construction of knowledge (Hull & Saxon, 2009). *Cognitive presence* highlights the ability of learners to construct meaning through a continual and deliberate cycle of reflection and discourse (Garrison & Arbaugh, 2007), and suggests that thinking skills allow students to process the information that they learn in online learning environments.

Knowledge sharing has also been analyzed in previous research, including research within the field of Knowledge Management (KM) and online learning. Knowledge sharing occurs when students are given the opportunity to interact with other learners and share and discuss what they know (Redmond, 2006), and might be influenced by various factors related to trust and understanding.

Summary of the Procedure

Swan et al.'s (2008) CoI instrument and Yu, Lu, & Liu's (2010) knowledge sharing instrument were adopted for the study. The survey assessed students' perception of social, teaching and cognitive presence within their respective online courses, and also asked them to assess their knowledge sharing behavior within their online course.

As part of the study, graduate students from U.S. universities who were currently enrolled in an online course related to the field of education were asked to complete the survey. First, graduate level, school of education students from one mid-size, private university in a northeastern state, USA, were recruited. Only 15 responses were collected from this specific university, so other universities from the same area that include a school of education were contacted within Western Pennsylvania. Recruitment at these schools only yielded an additional three responses, so the search was expanded to additional universities across the United States. After a total of 36 responses were collected, the survey was closed.

Interpretation of Results

A standard multiple regression design was utilized to determine whether the independent variables (social presence, teaching presence, and cognitive presence) are predictors of the dependent variable (knowledge sharing behavior). Regression results indicated that teaching presence and social presence significantly predicts knowledge sharing behavior. Cognitive presence, however, was not shown to significantly predict knowledge sharing behavior within online learning environments.

Interestingly, previous studies suggest that high levels of cognitive presence align with positive learning outcomes (Akyol & Garrison, 2011). While cognitive presence

seems to help students connect with what they have learned, it might not directly influence students' willingness to share their knowledge with their peers. Instead, feelings of social connectedness - including the feeling of being socially connected with peers (social presence) and instructors (teaching presence) - seem to influence a student's willingness to share their knowledge and contribute to discussions within online learning environments.

When compared to cognitive presence, elements of social presence and teaching presence, which are more social in nature (Garrison, Anderson, & Archer, 2001), might better motivate students to participate and share their knowledge within online learning environments. While cognitive presence is certainly an important goal of any learning environment, this element might be less social in nature, and therefore not have the same ability to motivate students to participate and demonstrate knowledge sharing behaviors.

Findings Related to Literature

The results of this study mirror previous research findings regarding cognitive presence; however, the findings contradict other studies focusing specifically on cognitive presence and the CoI framework. Researchers have linked high levels of cognitive presence to reflection and discourse (Garrison & Arbaugh, 2007), supporting learners as they move from understanding of a topic to the application of their knowledge (Garrison, 2007). In this way, cognitive presence is strongly linked to participation, allowing students to connect with, and demonstrate, what they have learned.

In other ways, the results of this study fall in line with previous research findings. The literature describes cognitive presence as a difficult concept to measure, and not as well understood as social presence and teaching presence (Arbaugh, 2007; Garrison,

2006). It has also been suggested that cognitive presence is different than the other two elements of the CoI framework, in that it is more abstract and difficult to cultivate (Arbaugh, 2007). Additionally, it has been noted that social presence and teaching presence might simply lay the foundation for cognitive presence, and be more directly influenced by outside factors, such as online course formats (Arbaugh, 2007).

Results of this study are also supported by various theories, including theories based in Knowledge Management (KM). These theories include social capital theory, the organization knowledge creation theory (OKCT), and self-determination theory. This section discusses each of these theories and the ways in which they might help explain the results of this study.

Social capitol theory. Social capital theory explains that social ties and connections can increase a set of resources available to a person or a group (Lin, 2002) and has been used to understand motivations behind certain social behaviors within a community (Wasko & Faraj, 2005). This theory suggests that social associations can create informal social connections, and can lead to the transfer of knowledge (Inkpen & Tsang, 2005).

Knowledge sharing behavior within online learning communities has been linked with facets of social capital; specifically, social interaction ties, trust, norm of reciprocity, identification, shared vision, and shared language (Chiu, Hsu, & Wang, 2006). These facets are social in nature, and suggests that knowledge sharing is strongly connected with social links, including social ties with peers (social presence) and interaction with the instructor (teaching presence). On the other hand, cognitive presence is tied only indirectly with social factors, and focuses more on the reflection and learning process

(Garrison, Anderson, & Archer, 2001). In this way, social capital theory explains why social presence and teaching presence might influence knowledge sharing behavior, but it does not directly link cognitive presence or learning outcomes to knowledge sharing activities.

The organizational knowledge creation theory (OKCT) and motivation. The organizational knowledge creation theory (OKCT) suggests that knowledge is shared and distributed during the transition process between tacit to tacit knowledge (socialization), tacit to explicit knowledge (externalization), explicit to tacit knowledge (internalization), and explicit to explicit knowledge (combination). When students interact socially, they are exchanging some form of knowledge, especially during the socialization process of knowledge sharing. This process of sharing and distributing knowledge can be interrupted by factors of motivation, including mutual trust (Nonaka & von Krogh, 2009).

Osterloh and Frey (2000) have linked the sharing of tacit knowledge to motivation rooted in social connections. In their study, they compared intrinsic and extrinsic motivation for sharing knowledge. The results suggested that intrinsic motivations play a more powerful role in knowledge sharing when compared to extrinsic motivation, and highlighted intrinsic motivation as a necessity for transferring tacit knowledge between individuals. In fact, intrinsic motivation, which is rooted in social connections, has been consistently linked to voluntary knowledge sharing activities (Lin, 2007; Osterloh & Frey, 2000). High levels of social presence and teaching presence might therefore provide high levels of motivation for sharing knowledge within online learning environments.

Self-determination theory. Self-determination theory is another theory often used to understand knowledge sharing motivations. The self-determination theory highlights two types of motivations - autonomous and controlled - that push individuals to share knowledge (Gagne, 2009). Autonomy-supported learning involves choice and preference, while controlled learning involves external persuasion (Gagne & Deci, 2005). Autonomous learners have a desire to satisfy interpersonal relationships and assimilate according to their perceived surroundings, while controlled learners may feel self-conscious, leading them to behave with defensive tendencies (Gagne & Deci, 2005). According to self-determination theory, social contexts that provide autonomous support can increase internal motivations (Vansteenkiste et al., 2006), and help these students thrive in social, interactive environments (Chen & Jang, 2010). When an online learning community provides support through social interaction with peers (social presence) or through the support of an instructor (teaching presence), students might be more motivated to interact and share their knowledge.

Overall findings related to literature. While high levels of individual cognitive presence are essential to any learning environment - including an online learning environment (Garrison, 2003) - results of this study suggest that perhaps cognitive presence underscores an individual student's success, but might not motivate an individual to share knowledge. Instead, high levels of social presence and teaching presence might directly motivate students to share knowledge, leading to an online community that fully supports knowledge co-construction. Cognitive presence might be influenced by social presence and teaching presence (Archibald, 2010), but its role in knowledge sharing behavior does not seem to be as influential as the more inherently

social aspects of the CoI framework. Instead, feelings of social connectedness - including the feeling of being socially connected with peers (social presence) and instructors (teaching presence) - seem to influence a student's willingness to share their knowledge and contribute to discussions and conversations within online learning environments.

Limitations and Future Studies

Results of this study suggest that encouraging social presence among students (for example, creating opportunities for students to express their personality) and increasing teaching presence (for example, responding immediately to student comments and guiding online discussions), students might be encouraged to share their knowledge with their peers, leading to the co-construction of knowledge within online learning environments. The study does have limitations, however, that should be considered. These limitations might influence future studies that will help explain how the CoI framework can predict knowledge sharing.

An important limitation to note is a small sample size utilized in the study. A sample size of 36 was set to obtain a statistical power level of 0.80 and a large effect size of 0.36. Future studies might consider employing a smaller effect size, which would in turn lead to the requirement of a larger population. While past research within the area of the CoI framework has typically relied on small sample sizes (Arbaugh, 2007), a larger sample size will lead to more reliable results.

Another limitation is the survey instrument used to measure the CoI framework and knowledge sharing behavior. Students might not accurately assess elements of the CoI, or measure their level of knowledge sharing behavior. As the survey only collects

perceptions, actual behaviors might differ from what was actually reported. Future studies will benefit from additional tests that track and measure actual behaviors in online environments. For example, researchers might find it useful to collect evidence of social presence, teaching presence, cognitive presence, and knowledge sharing within online discussion boards, individual and group assignments, and other interactions. Evidence of social presence might be demonstrated when students clearly project their personality within group activities; teaching presence might be demonstrated when instructors provide direct instruction or when they respond immediately to student inquiries; cognitive presence might be demonstrated when students show understanding in their communications; and knowledge sharing might be demonstrated when students share what they know with others. By closely watching and monitoring behavior within a particular online course, future researchers might be able to better identify elements of the CoI and true knowledge sharing activities, rather than rely on self-reported measures.

Another important limitation to note is the unclear relationship between social presence, teaching presence, and cognitive presence. While the study found that cognitive presence does not play a direct role in predicting knowledge sharing behavior, it is unclear whether there is an indirect role. For example, as cognitive presence involves a continual cycle of reflection and discourse (Garrison & Arbaugh, 2007), knowledge sharing might be *less* useful during individual reflective activities, but *more* useful during discussion-related activities. Future studies might track students' thought processes and attitudes during an online course, and link indicators of high cognitive presence (understanding of a topic) to indicators of social presence (projected personalities) and teaching presence (directed instruction and immediacy). By better

understanding this cycle of cognitive reflection, future researchers might capture the ways in which social presence and teaching presence influence cognitive presence, and vice versa.

Additionally, this study did not control for variables such as self-directed learning readiness, prior online learning experience, and prior collaborative learning experience, which have all been linked to the CoI framework (Archibald, 2010). Relatedly, this study does not consider certain variables, such as the use of mobile devices (Vogel, Kennedy, & Kwok, 2009) or quality of instruction (Diaz, 2002), which might affect student engagement and success within online learning environments. While understanding the effect of these factors is outside the scope of this study, future studies might be needed to better understand how these factors influence a CoI. For example, the survey distributed to participants could be amended to capture elements of self-directed learning readiness, previous learning experiences, and types of devices used when accessing the course site. By considering these factors, an improved model might be created that better predicts knowledge sharing behavior.

Finally, while the study showed that two predictor variables (social presence and teaching presence) influenced knowledge sharing behavior, it did not explore whether knowledge sharing behavior led to improved learning outcomes. While certain theories suggest that knowledge sharing leads to knowledge co-construction, this study focuses specifically on perceptions of social, teaching, and cognitive presence, and whether these perceptions lead to self-reported knowledge sharing behavior. Future studies might capture the quality of discussion board entries, quality of assignments, and course grades,

and link these results to indicators of knowledge sharing. This research might give clear insight into how knowledge sharing behavior improves learning in online environments.

Conclusion and Practical Application

This study presented data examining whether or not the CoI framework can predict self-reported knowledge sharing behaviors within graduate-level online courses. The results showed that the more social elements of the CoI framework - including social presence and teaching presence - helped predict student knowledge sharing behavior. Cognitive presence, which is more closely tied to individual learning outcomes, did not play a key role in predicting knowledge sharing behavior.

Knowledge co-construction occurs when individuals are given the opportunity to interact with other learners and share and discuss what they know (Redmond, 2006). Knowledge Management (KM) theories that exist within the business sector have been used to understand how knowledge can be shared for the good of an organization (Dunne & Butler, 2004). Within the context of academia, researchers also see the importance of knowledge sharing (Huang & Liaw, 2007; Oztok, 2012), as social constructivists highlight knowledge co-construction as an important aspect of successful learning. Surfacing a student's prior knowledge is a vital step to learning and the co-construction of knowledge (Oztok, 2012), and therefore, knowledge sharing can form the foundation of a successful online learning environment (Ma & Yuen, 2011).

Future instructors and practitioners might decide to promote social presence among students, and increase their own teaching presence, by creating opportunities for collaborative, social learning; these collaborative opportunities might encourage students to share their knowledge with their peers. For example, an ideal online learning

assignment might take the form of a complex group assignment that requires the full participation and cooperation among each student participant. In line with the collaboration principle in multimedia learning, collaborative learning assignments provide the most benefit to students when they are intellectually demanding and require cooperation among group members (Kirschner, Kirschner, & Janssen, 2014). If a group assignment does not necessarily warrant or require collaboration among students, and can simply be completed by an individual, students are less likely to engage and make these important connections with their peers.

Additionally, complex decision-making tasks often distract or prevent collaborators from sharing their unshared information (information that is only available to one group member) (Kirschner, Kirschner, & Janssen, 2014). To encourage students to share this important knowledge, these demanding group activities should also ensure that they are crafted so that students must exchange resources with their group members. In this way, an intellectually demanding, collaborative assignment that truly requires peer-to-peer engagement might lead to more effective and authentic group connections (social presence).

Finally, the instructor overseeing this type of collaborative assignment might wish to express strong teaching presence as well. For example, the instructor might immediately respond to questions, watch discussions to ensure they are on track and relevant, and step in to respond if collaborative interactions dwindle (teaching presence).

While cognitive presence plays a key role in strong learning outcomes, the study underscores the importance of social presence and teaching presence when attempting to promote knowledge sharing. Future researchers and practitioners should carefully

develop online learning environments that meet established best practices as defined by the CoI framework in order to achieve the benefits of knowledge sharing and knowledge co-construction.

References

Abrams, L. C., Cross, R., Lesser, E., & Levin, D. Z. (2003). Nurturing interpersonal trust in knowledge-sharing networks. *The Academy of Management Executive, 17*, 64-77.

Akyol, Z., & Garrison, D. R. (2011). Understanding Cognitive Presence in an Online and Blended Community of Inquiry: *Assessing Outcomes and Processes for Deep Approaches to Learning. British Journal of Educational Technology, 42*, 233-250.

Alavi, M., & Leidner, D. (1999). Knowledge management systems: Issues, challenges and benefits. *Communications of the Association for Information Systems, 1*, 2–36.

Alexander A., Page, V., & Wentling, T. (2003). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management, 7*, 64-77.

Ally, M. (2004). Foundations of educational theory for online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 3–31). Alberta, Canada: Athabasca University.

Allen, E., & Seaman, J. (2011). *Going the distance: Online education in the United States, 2011*. Retrieved from http://www.onlinelearningsurvey.com/highered.html

Allen, I. E., & Seaman, J. (2014). Grade change: Tracking online education in the United States, 2013. *Babson Survey Research Group and Quahog Research Group.*

Retrieved from http://www.itcnetwork.org/webinars/898-grade-change-tracking-online-education-in-the-united-states-2013.pdf

Allen, I. E., & Seaman, J. (2007). *Online Nation. Five Years of Growth in Online learning*. Needham, MA: Sloan Consortium.

Alman, S. W., Frey, B., & Tomer, C. (2012). Social and cognitive presence as factors in learning and student retention: An investigation of the cohort model in an iSchool setting. *Journal of Education for Library and Information Science, 53,* 290-302.

Alvesson, M., & Kärreman, D. (2001). Odd couple: making sense of the curious concept of knowledge management. *Journal of management studies, 38,* 995-1018.

Anderson, T., Rourke, L., Garrison, D., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*, 1-17.

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *International Review of Research and Open and Distance Learning, 12.* Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/890/1826

Andrews, T. (2012). What is social constructivism? *Grounded Theory Review: An International Journal, 11*. Retrieved from http://groundedtheoryreview.com/2012/06/01/what-is-social-constructionism/

Annand, D. (2011). Social presence within the community of inquiry framework. *The International Review of Research in Open and Distance Learning, 12,* 40-56.

Arbaugh, J. B. (2007). An Empirical Verification of the Community of Inquiry Framework. *Journal of Asynchronous Learning Networks, 11*, 73-85.

Arbaugh, J. B. (2008). Does the community of inquiry framework predict outcomes in online MBA courses? *The International Review of Research in Open and Distance Learning, 9*. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/490/1045

Arbaugh, J., Cleveland-Innes, M., Diaz, S., Garrison, D. R., Ice, P., Richardson, J., & Swan, K. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*, 133-136.

Arbaugh, J. B., & Hwang, A. (2006). Does "teaching presence" exist in online MBA courses? *The Internet and Higher Education, 9*, 9-21.

Archibald, D. (2010). Fostering the development of cognitive presence: Initial findings using the community of inquiry survey instrument. *Internet & Higher Education, 13*, 73-74.

Ardichvili, A., Page, V., & Wentling, T. (2013). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management, 17*, 64-77.

Barclay, R. O., & Murray, P. C. (2000). What is knowledge management? *Knowledge Praxis.* Retrieved from http://www.imamu.edu.sa/Scientific_selections/abstracts/Abstract%20%20IT%20%203/What%20Is%20Knowledge%20Management.pdf

Baskerville, R., & Dulipovici, A. (2006). The theoretical foundations of knowledge management. *Knowledge Management Research & Practice, 4*, 83-105.

Bates, T. (1993). Theory and practice in the use of technology in distance education. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 183-200). New York, NY: Routledge.

Beerli, A. J. (2003). Why knowledge management strategies fail: Facilitating conditions for successful knowledge management strategies. In A.J. Beerli, S. Falk, & D. Diemers (Eds.), *Knowledge management and networked environments: Levering intellectual capital is virtual business communities* (pp. 3-16). New York, NY: AMACOM.

Beetham, H., & Sharpe, R. (Eds.). (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning*. New York, NY: Routledge.

Bennett, S., Priest, A. & Macpherson, C. (1999). Learning about online learning: An approach to staff development for university teachers. A*ustralian Journal of Educational Technology, 15*, 207-221. Retrieved from http://www.ascilite.org.au/ajet/ajet15/bennett.html

Bhatt, G. D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of knowledge management, 5*, 68-75.

Biocca, F., Harms, C., & Burgoon, J. (2003). Toward a more robust theory and measure of social presence. *Presence: Teleoperators and Virtual Environments, 12,* 456-480. doi:10.1162/105474603322761270

Blessing, A. M., & Kortenkamp, U. (2008). VideoClipQuests as a new setup for learning. In J.M. Spector et al. (Eds.), *Learning and instruction in the digital age* (pp. 145-157). Heidelberg, Germany: Springer Science+Business Media.

Bloom, B. (1984). The 2 sigma problem: The search for methods of instruction as effective as one-to-one tutoring. *Education Research, 13,* 4-16.

Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education, 63,* 873-878.

Bock, G. W., & Kim, Y.-G. (2002). Breaking the myths of rewards: An exploratory study of attitudes of knowledge-sharing. *Information Resources Management Journal, 15,* 14-21.

Bontis, N. (2004). National Intellectual Capital Index: a United Nations initiative for the Arab region. *Journal of Intellectual Capital, 5*, 13-39.

Bostock, S. J., & Lizhi, W. (2005). Gender in student online discussions. *Innovations in Education and Teaching International, 42,* 73-85.

Boyd, D. M., & Ellison, N. B. (2008). Social network sites: Definition, history and scholarship. *Journal of Computer-Mediated Communication, 13,* 210-230. doi:10.1111/j.1083-6101.2007.00393.x

Brady, K. P., Holcomb, L. B., & Smith, V. (2010). The use of alternative social networking sites in higher education settings: A case study of the e-learning benefits of Ning in Education. *Journal of Interactive Online Learning, 9,* 151-170.

Brindley, J. E., Walit, C., & Blaschke, L. M. (2009). Creating effective collaborative learning groups in an online environment, *The International Review of Research in Open and Distance Learning, 10.* Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/675/1271

Brook, C., & Olive, R. (2003). Online learning communities: Investigating a design framework. *Australian Journal of Educational Technology, 19*, 139-160.

Brooking, A. (1997). The management of intellectual capital. *Long Range Planning, 30*, 364-365.

Buckingham Shum, S. (1998). Negotiating the construction of organisational memories. In U. M. Borghoff & R. Pareschi (Eds.), *Information technology for knowledge management* (pp. 55-78). Berlin, Germany: Springer.

Bullen, M. (1998). Participation and critical thinking in online university distance education. *Journal of Distance Education, 13*, 1–32.

Cao, J., Crews, J. M., Lin, M., Burgoon, J. K., & Nunamaker, J. F. (2008). An empirical investigation of virtual interaction in supporting learning. *The DATA BASE for Advances in Information Systems, 39*, 51-68.

Casey, D. M. (2008). A Journey to Legitimacy: The Historical Development of Distance Education through Technology. *TechTrends, 52*, 45-51.

Chen, C-J., & Huang, J.-W. (2009). Strategic human resource practices and innovation performance — The mediating role of knowledge management capacity. *Journal of Business Research, 62*, 104-114.

Cheng, J. H., Yeh, C. H., & Tu, C. W. (2008). Trust and knowledge sharing in green supply chains. *Supply Chain Management: An International Journal, 13*, 283-295.

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior, 26*, 741-752. doi: 10.1016/j.chb.2010.01.011

Chiu, C.-M., Hsu, M.-H., & Wang, E. T. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems, 42*, 1872-1888.

Chow, W. S., & Chan, L. S. (2008). Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management, 45*, 458-465.

Cobb, S. C. (2009). Social presence and online learning: a current view from a research perspective. *Journal of Interactive Online Learning, 8*, 241–254.

Cohen, J. (1962). The statistical power of abnormal-social psychological research: A review. *Journal of Abnormal & Social Psychology, 65,* 145-153.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Mahwa, New Jersey: Lawrence Erlbaum.

CoI. (n.d.). The community of inquiry. Retrieved from https://coi.athabascau.ca/

Colorado, J. T., & Eberle, J. (2010). Student demographics and success in online learning environments. *Emporia State Research Studies, 46*, 4-10.

Constant, D., Kiesler, S., & Sproull, L. (1994). What's mine is ours, or is it? A study of attitudes about information sharing. *Information systems research, 5*, 400-421.

Cook, S. D., & Yanow, D. (2001). Culture and organizational learning. *Journal of Management Inquiry, 2,* 373–390. doi: 10.1177/105649269324010

Corbett, A.T (2001). Cognitive computer tutors: Solving the two-sigma problem. *Proceedings From the 8th International Conference, Berlin.* Retrieved from http://link.springer.com/chapter/10.1007%2F3-540-44566-8_14

Costa, R. A., Oliveira, R. Y. S., Silva, E. M., & Meira, S. R. L. (2008). A.M.I.G.O.S.: Knowledge management and social networks. *Proceedings of the 26th Annual ACM International Conference on Design of Communication, NY,* 235–242.

Curtis, D. D., & Lawson, M. J. (2001). Exploring collaborative online learning. *Journal of Asynchronous Learning Networks, 5*, 21-34.

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education, 15*, 3-8.

Dagada, R., & Jakovljevic, M. (2004). 'Where have all the trainers gone?' E-learning strategies and toolsin the corporate training environment. *Proceedings of the 2004 Annual Research Conference of the South African Institute of computer Scientists and Information Technologists on IT Research in Developing Countries, South Africa,* 194–203.

Dalsgaard, C. (2006). Social software: E-learning beyond learning management systems. *European Journal of Open, Distance and E-Learning, 2*. Retrieved from http://www.eurodl.org/materials/contrib/2006/Christian_Dalsgaard.htm

Davenport, T. H., & Prusak, L. (1998). *Working knowledge*. Boston, MA: Harvard Business School Press.

Deci, E. L., & Ryan, R.M. (1985). *Intrinsic Motivation and Self-determination in Human Behavior*. New York, NY: Plenum.

Delfino, M. & Manca, S. (2007). The expression of social presence through the use of figurative language in a web based learning environment. *Computers in Human Behavior, 23*, 2190-2211.

Demarest, M. (2003). Understanding knowledge management. *Long Range Planning, 30,* 374–384. doi: 10.1016/S0024-6301(97)90250-8

Derry, S. J. (1999). A Fish called peer learning: Searching for common themes. In A. M. O'Donnell & A. King (Eds.), *Cognitive perspectives on peer learning* (pp. 197-211). Mahwa, NJ Lawrence Erlbaum.

Dewey, J. (1933). *How we think* (Rev ed.). Boston, MA: D.C. Heath.

Diaz, D. P. (2002). Online drop rates revisited. *The Technology Source, 3*. Retrieved from http://www.technologysource.org/article/online_drop_rates_revisited/

Doney, P. M., & Cannon, J. P. (1997), An examination of the nature of trust in buyer-seller relationships. *Journal of Marketing, 16*, 35-51.

Doring, A., Hodge, A., & Heo, M. (2014). Online learners and their self-disclosure preferences. *Journal of Information Technology Education: Research, 13*, 163-175.

Drucker, P. (1957). *Landmarks of Tomorrow*. New York, NY: Harper & Row.

Du, J., Havard, B., & Li, H. (2005). Dynamic online discussion: Task-oriented interaction for deep learning. *Educational Media International*, *42*, 207–218.

Duit, R., & Treagust, D. F. (1997). *Learning in Science-From Behaviourism Towards Social Constructivism and Beyond*. Dordrecht, Netherlands: Kluwer Academic Publishers.

Dunlap, J. C. & Lowenthal, P. R. (2009). Tweeting the Night Away: Using Twitter to Enhance Social Presence. *Journal of Information Systems Education, 20*, 129-135.

Dunne, A., & Butler, T. (2004). Beyond knowledge management—introducing a framework for learning management systems. *Journal of Cases on Information Technology, 7*, 455–465.

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication, 12*, 1143-1168.

Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, 335-362. Retrieved from http://www.communicationcache.com/uploads/1/0/8/8/10887248/social_exchange_theory_-_1976.pdf

Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior research methods, instruments, & computers, 28*, 1-11.

Fahey, L., & Prusak, L. (1998). The eleven deadliest sins of knowledge management. *California Management Review, 40*, 265–276.

Feenberg, A. (1993). Building a global network: the WBSI executive education experience. In L. Harasim (Ed.), *Global networks: computers and international communication* (pp. 185–197). Cambridge, MA: MIT Press.

Ford, A., & Lott, L. (2012). *The impact of technology on constructivist pedagogies. Theories of Educational Technology*. Retrieved from https://sites.google.com/a/boisestate.edu/edtechtheories/the-impact-of-technology-on-constructivist-pedagogies-1

Francisco, J. R. (2006). *Knowledge management tools supporting education*. Retrieved from http://ssrn.com/abstract=916609

Frost, A. (2010). *Managing Sharing*. Retrieved from http://www.knowledge-management-tools.net/knowledge-sharing.html

Fuller, S. (2012). *Knowledge management foundations*. New York, NY: Routledge.

Gagne, M. (2009). A model of knowledge-sharing motivation. *Human Resource Management, 48,* 571-589.

Gagne, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 25,* 331-62.

Garrison, D. R. (1985). Three generations of technological innovations in distance education. *Distance Education, 6*, 235-241.

Garrison, D. R. (2006). Online collaboration principles. *Journal of Asynchronous Learning Networks, 10*, 25-34.

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*, 61-72.

Garrison, D. R. (2003). Cognitive presence for effective asynchronous online learning: the role of reflective inquiry, self-direction and metacognition. In J. Bourne & J. C. Moore (Eds.), *Elements of quality online education: Practice and direction,* (pp. 47–58). Needham, MA: Sloan-C.

Garrions, D. R., & Anderson, T. (2003). *E-Learning in the 21st Century: A Framework for Research and Practice*. New York, NY: Routledge.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*, 87−105.

Garrison, D. R. (2006). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Proceedings of the Sloan-C Summer Workshop, Baltimore, MD*. Retrieved from http://wiki.sln.suny.edu/download/attachments/4032379/v11n1_8garrison.pdf

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *Internet and Higher Education, 10*, 157–172.

Garrison, D.R. & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Education, 19*, 133-148.

Garrison, D.R. Cleveland-Innes, M., & Fun, T.S. (2010). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *Internet and Higher Education, 13*, 31-36.

Garrison, D. R., Kanuka H. & Hawes, D. (n.d.). *Communities of Inquiry*. Retrieved from http://commons.ucalgary.ca/documents/Comm_of_Inquiry.pdf

Gunawardena, C. N. (1995). Social presence theory and implications for interaction collaborative learning in computer conferences. *International journal of education telecommunications, 1*, 147–166.

Gunawardena, C. N., Low, C. A., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research, 17*, 397-431.

Godwin-Jones, R. (2009). Emerging technologies: personal learning environments. *Language Learning & Technology, 13,* 3-9.

Grace, A., & Butler, T. (2005). Beyond knowledge management: Introducing a framework for learning management systems. *Journal of Cases on Information Technology, 7.* Retrieved from http://is2.lse.ac.uk/asp/aspecis/20040042.pdf

Granger, D., & Bowman, M. (2003). Constructing knowledge at a distance: The learner in context. In M. G. Moore & W. G. Anderson (Eds.), *The handbook of distance education* (pp. 169-180). Mahwah, NJ: Erlbaum.

Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organization capability as knowledge integration. *Organization Science, 7,* 275–389.

Grant, A. M. (2008). Does intrinsic motivation fuel the prosocial fire? Motivational synergy in predicting persistence, performance, and productivity. *Journal of applied psychology, 93,* 48.

Greenberg, L. (2002). *LMS and LCMS: What's the difference?* Retrieved from http://scripts.cac.psu.edu/staff/g/m/gms/fa07/IST-440W/LMS%20and%20LCMS_%20What's%20the%20Difference_.pdf

Gupta, B., Joshi, S., & Agarwal, M. (2012). The effect of expected benefit and perceived cost on employees' knowledge sharing behavior: A study of IT employees in India. *Organizations and Markets in Emerging Economies, 13,* 8-19.

Hacker, D. J., & Niederhauser, D. S. (2000). Promoting deep and durable learning in the online classroom. *New Directions for Teaching and Learning, 84,* 53-63.

Hahn, J., & Subramani, M. R. (2000). A framework of knowledge management systems: issues and challenges for theory and practice. *Proceedings of the Twenty First International Conference on Information Systems, Atlanta, GA*, 302–312.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Hansen, M. T., Nohria, N., & Tierney, T. (1999). What's your strategy for management knowledge? *Harvard Business Review*. Retrieved from http://consulting-ideas.com/wp-content/uploads/Whats-your-strat-art.pdf

Harasim, L. (2000). Shift happens: Online education as a new paradigm in learning. *Internet and Higher Education, 3*, 41-61.

Harlow, H. F. (1953). Motivation as a factor in the acquisition of new responses. In *Current theory and research on motivation* (pp. 24–49). Lincoln: University of Nebraska Press.

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education, 41*, 393-416.

Harvey, C., & Denton, J. (1999). To come of age: Antecedents of organizational learning. *Journal of Management Studies, 37*, 897–918. doi: 10.1111/1467-6486.00163

Haworth, M., & Hopkinds, S. (2009). On the air: Educational Radio, its history and effect on literacy, and educational technology implementation. *ETEC, 540*. Retrieved from http://blogs.ubc.ca/etec540sept09/2009/10/28/on-the-air-

educational-radio-its-history-and-effect-on-literacy-and-educational-technology-by-michael-haworth-stephanie-hopkins/

Hendriks, P. (1999). Why share knowledge? The influence of ICT on the motivation for knowledge sharing. *Knowledge and process management, 6*, 91-100.

Heo, M. (2011). Communication privacy disclosure management: an empirical study of socialization support in a Pseudo-Online Course. *Journal of Interactive Online Learning, 10*, 76-95.

Hiltz, S. R., & Goldman, R. (2005). *Learning together online: Research on asynchronous learning networks*. Mahwah, NJ: Lawrence Erlbaum.

Hinds, P. J., Patterson, M., & Pfeffer, J. (2001). Bothered by abstraction: The effect of expertise on knowledge transfer and subsequent novice performance. *Journal of Applied Psychology, 86*, 1232-1243.

Holsapple, C. W., & Joshi, K. D. (2001). Organizational knowledge resources. *Decision Support Systems, 31*, 39–54. doi: 10.1016/S0167-9236(00)00118-4

Hsu, C. L., & Lin, J. C. C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management, 45*, 65-74.

Huang, H.-M. (2002). Towards constructivism for adult learners in online environments. *British Journal of Educational Technology, 33*, 27-37.

Huang, H.-M., & Liaw, S.-S. (2004). The framework of knowledge creation for online learning environments. *Canadian Journal of Learning and Technology, 30*. Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/119/113

Huang, H.-M., & Liaw, S.-S. (2007). Exploring Learners' motivation on knowledge sharing for e-learning. *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications, Chesapeake, VA*, 2539-22545.

Hung, H. T., & Yuen, S. C. Y. (2010). Educational use of social networking technology in higher education. *Teaching in Higher Education, 15*, 703-714.

Hung, S.-Y., Durcikova, A., Lai, H. M., & Lin, W.-M. (2011). The influence of intrinsic and extrinsic motivation on individuals' knowledge sharing behavior. *International Journal of Human-Computer Studies, 66*, 415-427.

Hull, D. M., & Saxon,T. F. (2009). Negotiation of meaning and co-construction of knowledge: An experimental analysis of asynchronous online instruction. *Computers & Education, 52*, 624-639.

Hung, W. (2003). Building learning communities by enhancing social presence: Implementing blended instructional delivery methods. *SIGGROUP Bulletin, 24,* 79–84.

Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of management review, 30*, 146-165.

Isaacson, K. (2013). An Investigation into the Affordances of Google Hangouts for possible use in Synchronous Online Learning Environments. In *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 2461-2465). Retrieved from http://www.editlib.org/p/112315/proceeding_112315.pdf

Jaffe, R., Moir, E., Swanson, E., & Wheeler, G. (2006). EMentoring for student success: Online mentoring and professional development for new science teachers. In C.

Dede (Ed.), *Online professional development for teachers: Emerging models and methods* (pp. 89–116). Cambridge, MA: Harvard Education Press.

Janis, I. L., & Mann, L. (1977). *Decision-making: A psychological analysis of conflict, choice, and commitment*. New York, NY: The Free Press.

Jonassen, D. H. (1991). Evaluating constructivistic learning. *Educational Technology, 28,* 13-16.

Kankanhalli, A., Tan, B. C. Y., & Wei, K. K. (2005). Understanding seeking from electronic knowledge repositories: an empirical study. *Journal of the American Society for Information Science and Technology, 56,* 1156–66.

Karber, D. J. (2003). Comparisons and contrasts in traditional versus on-line teaching in management. *Higher Education in Europe, 26*, 533–536.

Kearsley, G. (2009). Tips for training online instructors. Retrieved from http://home.sprynet.com/~gkearsley/OItips.htm

Kidwell, J. J., Vander Linde, K. M., & Johnson, S. L. (2000). Knowledge Management Practices in Education. *Educause Quarterly, 4*, 28–33.

Kim, B. (2001). Social constructivism. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved from http://www.coe.uga.edu/epltt/SocialConstructivism.htm

Kimmerle, J., Cress, U., Held, C., & Moskaliuk, J. (2010). Social software and knowledge building: supporting co-evolution of individual and collective knowledge. *Proceedings of the 9th International Conference of the Learning Sciences, Chicago, IL*, 9–16.

King, W. R., & Marks, P. V. (2008). Motivating knowledge sharing through a knowledge management system. *Omega, 36,* 131–146. doi: 10.1016/j.omega.2005.10.006

Kirschner, P.A, Kirschner, F., & Janssen, J. (2014). The collaboration principle in multimedia learning. In R.E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 547–575). Cambridge, England: Cambridge UP.

Knowles, E., & Kerkman, D. (2007). An investigation of students attitude and motivation toward online learning. *Student Motivation, 2,* 70-80.

Kolbitsch, J., & Maurer, H. (2006). The transformation of the web: How emerging communities shape the information we consume. *Journal of Universal Computer Science, 12,* 187–213.

Kanuka, H., & Anderson, T. (1998). Online social interchange, discord, and knowledge construction. *The Journal of Distance Education, 13,* 57-74.

Kanuka, H., & Garrison, D. R. (2004). Cognitive Presence in Online Learning. *Journal of Computing in Higher Education, 15,* 30-48.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* New York, NY: Cambridge University Press.

Lee, J. N. (2001). The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success. *Information & Management, 38,* 323-335.

Lee, L. L. (2000). Knowledge sharing metrics for large organizations. *Knowledge management–Classic and Contemporary Works*, 403-419. Retrieved from

http://www2.optimice.com.au/upload/Knowledge_Sharing_Metrics_for_Large_Organisations.pdf

Lemak, D., Shin, S., Reed, R., & Montgomery, J. (2005). Technology, transactional distance, and instructor effectiveness: An empirical investigation. *Academy of Management Learning & Education, 4*, 150–158.

Leonard, D. and Sensiper, S. (1998). The role of tacit knowledge in group innovation. *California Management Review, 40*, 112–32.

Leung, C., & Chan, Y. (2007). Knowledge management system for electronic learning of IT skills. *Proceedings of the 8th ACM SIGITE Conference on Information Technology Education, New York, NY,* 53–58. doi: 10.1145/1324302.1324316

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Reviews of Sociology, 14,* 319–338.

Levy, M. (2009). Web 2.0 implications on knowledge management. *Journal of Knowledge Management, 13,* 120–134.

Liccardi, I., Ounnas, A., Pau, R., Massey, E., Kinnunen, P., Lewthwaite, S., Midy, M. A., & Sakar, C. (2007). The role of social networks in students' learning experiences. *ACM SIGCSE Bull, 39*, 224–237.

Light, M. A., & Light, I. H. (2008). The geographic expansion of Mexican immigration in the United States and its implications for local law enforcement. *Law Enforcement Executive Forum Journal, 8*, 73–82.

Lin, C. P., Chiu, C. K., Joe, S. W., & Tsai, Y. H. (2010). Assessing online learning ability from a social exchange perspective: A survey of virtual teams within

business organizations. Intl. *Journal of Human–Computer Interaction, 26,* 849-867.

Lin, H. F. (2007). Effects of extrinsic and intrinsic motivation on employee knowledge sharing intentions. *Journal of information science, 33,* 135-149.

Lin, H. F., & Lee, G. G. (2004). Perceptions of senior managers toward knowledge-sharing behaviour. *Management Decision, 42,* 108-125.

Lin, N. (2004). Social capital: a theory of social structure and action. *Social Forces, 82,* 1209-1211.

Ling, L. (2007). Community of inquiry in an online undergraduate information technology course. *Journal of Information Technology Education: Research, 6,* 153-168.

Little, B. (2011, April). Reports of the death of the LMS have been greatly exaggerated. *eLearn Magazine*. Retrieved from http://elearnmag.acm.org/archive.cfm?aid=1999650

Lowenthal, P. R. (2009). The evolution and influence of social presence theory on online learning. In TT Kidd (Ed.), *Online education and adult learning: New frontiers for teaching practices* (pp. 124–139). Hershey, PA: IGI Global.

Ma, W. W., & Yuen, A. H. (2011). Understanding online knowledge sharing: An interpersonal relationship perspective. *Computers & Education, 56,* 210-219.

Malhotra, Y. (2000). From information management to knowledge management: Beyond the 'Hi-Tech Hidebound' systems. In K. Srikantaiah & M.E.D. Koenig (Eds.), *Knowledge Management for the information professional* (pp. 37–61). Medford, NJ: Information Today Inc.

Markus, H. R., & Kitayama, S. (2003). Models of agency: Sociocultural diversity in the construction of action. In V. Murphy-Berman & J. J. Berman (Eds.), *Nebraska Symposium on Motivation: Cross-cultural differences in perspectives on the self* (pp. 1-57). Lincoln: University of Nebraska Press.

Markus, H. R., Kitayama, S., & Heiman, R. J. (1996). Culture and "basic psychological principles. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 857-913). New York, NY: Guilford.

Martin, A. J. & Tracey, D. (2002). Motivating students to learn. *Learning-Links—Publication of Association for Children with Learning Disabilities, 3*, 1-5.

McAfee, A. (2006). *Evangelizing in the empty quarter, the impact of IT on businesses and their leaders*. Retrieved from blog.hbs.edu/faculty/amcafee/index.php/faculty_amcafee_v3/evangelizing_in_the_empty_quarter

McCampbell, A. S., Clare, L. M., & Gitters, S. H. (1999). Knowledge management: the new challenge for the 21st century. *Journal of Knowledge Management, 3*, 172-179.

McDermott, R. (1999). Why information technology inspired but cannot deliver knowledge management. *California management review, 41*, 103-117.

Mclnerney, C. (2002). Knowledge management and the dynamic nature of knowledge. *Journal of the American Society for Information Science and Technology, 53*, 1009–1018.

McMahon, M. (1997). Social Constructivism and the World Wide Web—A Paradigm for Learning. *Proceedings from the ASCILITE conference, Perth, Australia.*

Retrieved from http://www.ascilite.org/conferences/perth97/papers/Mcmahon/Mcmahon.html

Mehrabian, A. (1969). Some referents and measures of nonverbal behavior. *Behavior Research Methods and Instrumentation, 1*, 205–207.

Moorman, C., & Miner, A. S. (1998). Organizational improvisation and organizational memory. *Academy of Management Review, 23*, 698–723.

Murphy, E. (2004). Recognizing and promoting collaboration in an online asynchronous discussion. *British Journal of Educational Technology, 35*, 421–431.

Nippard, E. & Murphy, E. (2007). Social Presence in the Web-based Synchronous Secondary Classroom. *Canadian Journal of Learning and Technology, 33.* Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/24/22

Nipper, S. (1989). Third generation distance learning and computer conferencing. In R. Mason & A. Kaye (Eds.), *Mindweave: Communication, computers and distance education* (pp. 63–73). Oxford, UK: Permagon.

Noel-Levitz (2011). Priorities Survey for Online Learners. Retrieved from https://www.noellevitz.com/upload/Papers_and_Research/2011/PSOL_report%20 2011.pdf

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5,* 14–37. doi: 10.1287/orsc.5.1.14

Nonaka, I. Byosiere, C., Borucki, Konno, N. (1994). Organizational knowledge creation theory: A first comprehensive test. *International Business Review, 3,* 337–351.

Nonaka, I., & Nishiguchi, T. (2001). *Knowledge emergence: Social, technical, and evolutionary dimensions of knowledge creation*. Oxford, UK: Oxford University Press.

Nonaka I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York, NY: Oxford University Press.

Nonaka I., & Toyama, R. (2003). The knowledge-creating theory revisited: Knowledge creation as a synthesizing process. *Knowledge Management Research and Practice, 1,* 2–10.

Nonaka, I., & von Krogh, G. (2009). Tacit knowledge and knowledge conversion: Controversy and advancement in Organizational Knowledge Creation Theory. *Organizational Science, 20*, 635-652.

Norris, D. M., Mason, J., Robson, R., Lefrere, P., & Collier, G. (2003). A Revolution in Knowledge Sharing. *Educause review, 38*, 14-26.

Ormrod, J. E. (1999). *Human learning* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall

Osterloh, M., & Frey, B. (2000). Motivation, knowledge, transfer, and organizational forms. *Organization Science, 11,* 538–50.

Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research, 70*, 323–367. doi:10.3102/00346543070003323

Oztok, M. (2012). Tacit knowledge in online learning: Community, identity and social capital. *Technology, Pedagogy and Education, 22,* 21–36.

Oztok, M., & Brett, C. (2011). Social presence and online learning: A review of research. *Journal of Distance Education, 25*. Retrieved from http://www.jofde.ca/index.php/jde/article/view/758/1299

Pardales, M. J., Girod, M. (2006). Community of Inquiry: Its past and present future. *Education Philosophy and Theory, 38,* 299-30

Paroutis, S., & Al Saleh, A. (2009). Determinants of knowledge sharing using Web 2.0 technologies. *Journal of Knowledge Management, 13,* 52-63.

Pawn, F., Paulus, T. M., Yalcin, S., & Chang, C. (2003). Online learning: Patterns of engagement and interaction among in-service teachers. *Language Learning & Technology, 7,* 119–140.

Peters, O. (2000). The transformation of the university into an institution of independent learning. In T. Evans & D. Nation (Eds.), *Changing university teaching: Reflections on creating educational technologies* (pp. 10–23). London, UK: Kogan Page.

Piccoli, G., Ahmad, R. & Ives, B. (2000). Knowledge management in academia: A proposed framework. *Information Technology and Management, 1*, 229–245.

Pirolli, P., & Kairam, S. (2012). User modeling and user-adapted interaction. *The Journal of Personalization Research, 22.* Retrieved from http://hci.stanford.edu/publications/2013/Pirolli-UMUAI2013.pdf

Prusak, L. (2001). Where did knowledge management come from? *IBM Systems Journal, 30,* 1002–1007. doi: 10.1147/sj.404.01002

Rad, A. A., & Bayrami, D. (2010). *Knowledge management in theory and practice: Introduction to knowledge management in theory and practice.* Presented at Nice

Sophia Antipolis University. Retrieved from http://www.slideshare.net/davidbayrami/introduction-to-knowledge-management-in-theory-and-practice-4482064

Ramasamy, B., Goh, K. W., & Yeung, M. C. H. (2006). Is Guanxi (relationship) a bridge to knowledge transfer? *Journal of Business Research, 59*, 130–139.

Rapuano, S., & Zoino, F. (2006). A learning management system including laboratory experiments on measurement instrumentation. *IEE Transactions on Instrumentation and Measurement, 55,* 1757-1766.

Redmond, P. (2006). A flexible framework for online collaborative learning. *The Internet and Higher Education, 9*, 267—276.

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *JALN, 7*, 68–88.

Riege, A. (2005). Three-dozen knowledge-sharing barriers managers must consider. *Journal of knowledge management, 9*, 18-35.

Rogers, P. & Lea. M (2005). Social presence in distributed group environments: the role of social identity. *Behavior & Information Technology, 24*, 151-158.

Rovai, A. P. (2004). A constructivist approach to online college learning. *The Internet and Higher Education, 7*, 79-93.

Rovai, A. P., & Wighting, M. J. (2005). Feelings of alienation and community among higher education students in a virtual classroom. *The Internet and Higher Education, 8*, 97-110.

Rozwell, C. (2009). Socialization of knowledge management drives greater reuse. *Gartner Research Report*. Retrieved from ftp://121-73-78-

33.cable.telstraclear.net/C/Caroline/My%20Documents/Managing%20Enterprise%20Information/knowledge%20Management/socialization_of_knowledge_m_167449.pdf

Rubin, B., Fernandes, R., Avgerinou, M. D., & Moore, J. (2010). The effect of learning management systems on student and faculty outcomes. *The Internet and Higher Education, 13*, 82-83.

Rumble, G. (2014). The costs and economics of online distance education. In O. Zawacki-Richter & T. Anderson (Eds.), *Online distance education: Towards a research agenda* (pp. 197-216). Alberta, Canada: AU Press.

Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal, 38,* 437–460. doi:10.3102/00028312038002437

Sabatelli, R. M., & Shehan, C. L. (1993). Exchange and resource theories. In P. Boss, W.Doherty, R. LaRossa, W. Schumm, & S. Steinmetz (Eds.), *Sourcebook of family theories and methods: A contextual approach* (pp. 385-411). New York, NY: Plenum.

The Sacramento County Office of Education. (2005). *What is distance learning*? Retrieved from http://www.cdlponline.org/index.cfm?fuseaction=whatis&pg=3

San Diego State University Instructional Technology Services. (n.d.). *Community of inquiry survey*. Retrieved from http://fevatools.wikispaces.com/Community+of+Inquiry+survey

Scardamalia, M., & Bereiter, C. (1991). Higher levels of agency for children in knowledge building: A challenge for the design of new knowledge media. *The Journal of the Learning Sciences, 1,* 37–68. doi: 10.1207/s15327809jls0101_3

Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith (Ed.), *Liberal education in a knowledge society* (pp. 67–98). Chicago, IL: Open Court.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 97–118). New York, NY: Cambridge University Press.

Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education, 52*, 543-553.

Shea, P.J., Fredericksen, E.E., Picket E.E., & Pelz, W.E. (2003). A preliminary investigation of "teaching presence" in the SUNY learning network. In: J. Bourne and J. C. Moore (Eds.), *Elements of quality online education: Practice and direction* (pp. 279–312). Needham, MA: Sloan-C.

Shea, P. J. (2006). A study of students' sense of community in online learning environments. *Journal of Asynchronous Learning Network, 10*, 35-44.

Shea, P., Hayes, S., Vickers, J., Gozza-Cohen, M., Uzuner, S., Mehta, R., & Rangan, P. (2010). A re-examination of the community of inquiry framework: Social network and content analysis. *The Internet and Higher Education, 13*, 10-21.

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education, 9*, 175−190.

Schein, E. H. (1990). Organizational culture. *American Psychologist, 45,* 109–119. doi: 10.1037/0003-066X.45.2.109

Schepers, P., & van den Berg, P. T. (2007). Social factors of work-environment creativity. *Journal of Business and Psychology, 21*, 407−428.

Schmees, M. (2006). Organizing technology enhanced learning. *Proceedings of the 8th international Conference on Electronic Commerce, NY,* 139–150.

Schutt, P. (2003). The post-Nonaka knowledge management. *Journal of Universal Computer Science, 9,* 451–462.

Serenko, A., Bontis, N., Booker, L., Sadeddin, K., & Hardie, T. (2010). A scientometric analysis of knowledge management and intellectual capital academic literature (1994-2008). *Journal of Knowledge Management, 14*, 3-23.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London, UK: Wiley.

Simon, H. A. (1976). *Administrative behavior: A study of decision making processes in administrative organizations* (3rd ed.). New York, NY: The Free Press.

Simonson, M., Smaldino, S., Albright, M. & Zvacek, S. (2000). *Teaching and Learning at a Distance: Foundations of Distance Education*. Upper Saddle River, NJ: Merrill.

Sincero, S. M. (2011). Social Learning Theory. Retrieved from http://www.experiment-resources.com/social-learning-theory.html

Sirisaengtaksin, K., & Olfman, L. (2014). *A Design for a Notification and Recommender Mobile App for Educational Online Discussion*. Retrieved from http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1631&context=amcis2014

Slater, D. (1998). Storing the mind, minding the store. *CIO, 11*, 46–51.

Smith, E. A. (2001). The role of tacit and explicit knowledge in the workplace. *Journal of knowledge Management, 5*, 311-321.

Smith, G. G., & Hermann, K. (2007). Front-Stage and Back-Stage in Hybrid E-Learning Face-to-Face Courses. *International Journal on ELearning, 6*, 455–474.

Spender, J.-C. (1996). Organizational knowledge, learning and memory: three concepts in search of a theory. *Journal of Organizational Change Management, 9*, 63-78.

Stenmark, D. (2001). Leveraging tacit organizational knowledge. *Journal of Management Information Systems, 17,* 9-24.

Stein, D. S., Wheaton, J. E., Calvin, J., & Overtoom, C. (2003). The role of community in online learning. *Proceedings from the 2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education, Columbus, OH,* 199–204.

Stein, E. W., & Zwaas, V. (1995). Actualizing organizational memory with information systems. *Information Systems Research, 6*, 85-117.

Stewart, T., & Ruckdeschel, C. (1998). *Intellectual capital: The new wealth of organizations*. Retrieved from http://www.qfinance.com/contentFiles/QF01/g956u8c7/11/1/intellectual-capital.pdf

Sumner, J. (2000). Serving the system: A critical history of distance education. *Open Learning, 15*, 267–285.

Swan, K. & Ice, P. (2010). The Community of Inquiry framework ten years later: introduction to the special issue. *Internet and Higher Education, 13*, 1–4.

Swan, K., Garrison, D. R. & Richardson, J. C. (2009). A constructivist approach to online learning: the Community of Inquiry framework. In C. R. Payne (Ed.), *Information technology and constructivism in higher education: Progressive learning frameworks* (pp. 43-57). Hershey, PA: IGI Global.

Swan, K. & Shih, L. F. (2005). On the Nature and Development of Social Presence in Online course Discussions. *Journal of Asynchronous Learning Networks, 9,* 115-136.

Swan, K., Shea, P., Richardson, J., Ice, P., Garrison, D. R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. *E-mentor, 2*, 1-12.

Swanson, K., & Hornsby, K. (2000). The Community of Inquiry:A survey of traditional classroom and webcourse application. *Analytic Teaching, 21,* 87-105.

Tan, S., Teo, H., Tan, B., & Wei, K. (1998). Developing a preliminary framework for knowledge management in organizations. *Proceedings of the Americas Conference of AIS*, 629-631. Retrieved from http://aisel.aisnet.org/amcis1998/211/

Taylor, J. (2001). *Automating e-learning: The higher education revolution*. Retrieved from http://www.backingaustraliasfuture.gov.au/submissions/issues_sub/pdf/i43_3.pdf.

Taylor, P., & Maor, D. (2000). Assessing the efficacy of online teaching with the Constructivist On-Line Learning Environment Survey. In A. Herrmann and M.M. Kulski (Eds.), *Flexible Futures in Tertiary Teaching*. Retrieved from http://lsn.curtin.edu.au/tlf/tlf2000/taylor.html

Trentin, G. (2001). From formal training to communities of practice via network-based learning. *Educational Technology, 41,* 5–14.

Tu, C.H., & McIssac, M. (2002). The relationship of social presence and interaction in online classes. *The American Journal of Distance Education, 16,* 131–150. doi: 10.1207/S15389286AJDE1603_2

Tuan, H. L., Chin, C. C., & Shieh, S. H. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education, 27,* 639-654.

Uzun, C., Uzun, F. E., & Medeni, T. (2013). Social knowledge co-construction conceptual framework and Google applications. *International Journal of eBusiness and eGovernment Studies, 5,* 68-77.

Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist, 41,* 19-31. doi: 10.1207/s15326985ep4101_4

Veletsianos, G., & Navarrete, C. (2012). Online social networks as formal learning environments: Learner experiences and activities. *The International Review of Research in Open and Distance Learning, 13.* Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1078/2077

Vogel, D., Kennedy, D., & Kwok, R. C. W. (2009). Does using mobile device applications lead to learning? *Journal of Interactive Learning Research, 20*, 469-485.

Vonderwell, S. (2003). An examination of asynchronous communication experiences and perspectives of students in an online course: A case study. *The Internet and higher education, 6*, 77-90.

Vygotsky, L. S. (1978) Mind in Society*: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Walsh, J. P., & Ungson, G. R. (1991). Organizational memory. *Academy of Management Review, 16*, 57-91.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication research, 19*, 52–90. doi: 10.1177/009365092019001003

Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review, 20,* 115-131.

Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS quarterly, 29*, 35-57.

Watson, W. R., & Watson, S. L. (2007). An argument for clarity: What are learning management systems, what are they not, and what should they become. *TechTrends, 51,* 28-34.

Wegerif, R. (1998). The Social Dimension of Asynchronous Learning Networks. *Journal of Asynchronous Learning Networks, 2,* 34-49.

White, K. F., & Lutters, W. G. (2007). Structuring cross-organizational knowledge sharing. *Proceedings of the 2007 International ACM Conference on Supporting Group Work, NY,* 187-196.

Wiig, K. M. (1997). Knowledge management: Where did it come from and where will it go? *Expert Systems with Applications, 13,* 1–14. doi: 10.1016/S0957-4174(97)00018-3

Willems, J. (2007). When words fail: A case for multimodality in e-learning. *Proceedings from ascilite, Singapore*, 1070-1078.

Wilson, T. D. (2002). The nonsense of knowledge management. *Information Research, 8.* Retrieved from http://informationr.net/ir/8-1/paper144.html

Wong, C. D., Wong, W.T., Hui, C., & Law, K.S. (2001). The significant role of Chinese employees' organizational commitment: implications for managing in Chinese societies. *Journal of World Business, 36,* 326–340.

Woods, R. H., & Baker, J. D. (2004). Interaction and immediacy in online learning. *The International Review of Research in Open and Distance Learning, 5.* Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/186/268

Yu, T.-K., Lu, L.-C., & Liu, T.-F. (2010). Exploring factors that influence knowledge sharing behavior via weblogs. *Computers in Human Behavior, 26,* 32-41.

Zack, M. H. (1999). Managing codified knowledge. *Sloan Management Review, 40,* 45-58.

Zarecky, A., Doring, A., & Heo, M. (2012). The online learning environment: Building a social and collaborative community. *Proceedings of the 2012 World Conference*

on Educational Multimedia, Hypermedia and Telecommunications, Denver, CO, 1048–1053.

Zhengqiang, B., Kaizhou, G., Xiangqing, L., Lei, G., & Hui, Z. (2008). Evaluating organization external knowledge acquisition. *Proceedings of the 1st International Conference on Forensic Applications and Techniques in Telecommunications, Information, and Multimedia and workshop,* Adelaide, Australia, 165-168.

Appendix A

Survey Instrument

Demographics

1. What is your age?
2. What is your gender?
3. What is your anticipated degree (masters of doctorate)?
4. What is your student status (full-time with no family/job responsibilities; full-time with family/job responsibilities; Part-time with no family/job responsibilities; Part-time with family/job responsibilities)
5. Approximately how many students do you know in this online course? 0, 1-3. 4-6, over 6?
6. Other than this current course, how many online courses have you enrolled in during your lifetime? 0, 1-3. 4-6, over 6?
7. On a scale from 1 to 10, what is your overall comfort level with computers (1 being not comfortable at all, and ten being an expert)?
8. On a scale from 1 to 10, what is your overall comfort level with the Internet (1 being not comfortable at all, and ten being an expert)?

Please answer the following questions from 1 to 6: 1 = strongly disagree, 2 = disagree, 4 = slightly disagree, 4 = slightly agree, 5 = agree, 6=strongly agree.

Teaching Presence

Design and organization

9. The instructor clearly communicated important course topics.

10. The instructor clearly communicated important course goals.
11. The instructor provided clear instructions on how to participate in course learning activities.
12. The instructor clearly communicated important due dates/time frames for learning activities.

Facilitation

13. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
14. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
15. The instructor helped to keep course participants engaged and participating in productive dialogue.
16. The instructor helped keep the course participants on task in a way that helped me to learn.
17. The instructor encouraged course participants to explore new concepts in this course.
18. Instructor actions reinforced the development of a sense of community among course participants.

Direct Instruction

19. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
20. The instructor provided feedback that helped me understand my strengths and weaknesses.
21. The instructor provided feedback in a timely fashion.

Social Presence

Affective expression

22. Getting to know other course participants gave me a sense of belonging in the course.
23. I was able to form distinct impressions of some course participants.
24. Online or web-based communication is an excellent medium for social interaction.

Open communication

25. I felt comfortable conversing through the online medium.
26. I felt comfortable participating in the course discussions.
27. I felt comfortable interacting with other course participants.

Group cohesion

28. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
29. I felt that my point of view was acknowledged by other course participants.
30. Online discussions help me to develop a sense of collaboration.

Cognitive Presence

Triggering event

31. Problems posed increased my interest in course issues.
32. Course activities piqued my curiosity.
33. I felt motivated to explore content related questions.

Exploration

34. I utilized a variety of information sources to explore problems posed in this course.
35. Brainstorming and finding relevant information helped me resolve content related questions.
36. Online discussions were valuable in helping me appreciate different perspectives.

Integration

37. Combining new information helped me answer questions raised in course activities.
38. Learning activities helped me construct explanations/solutions.
39. Reflection on course content and discussions helped me understand fundamental concepts in this class.

Resolution

40. I can describe ways to test and apply the knowledge created in this course.
41. I have developed solutions to course problems that can be applied in practice.
42. I can apply the knowledge created in this course to my work or other non-class related activities.

Knowledge Sharing Behavior

43. I have contributed knowledge to this community.
44. I usually actively share my knowledge with others.
45. I have contributed knowledge to other members that resulted in the development of new insights.
46. I have tried to share my educational and training expertise with other members in more effective ways.

Appendix B

IRB Approval

Institutional Review Board
DUQUESNE UNIVERSITY

Duquesne University IRB *Protocol Exemption Notification*

To: Anne Doring
From: Linda Goodfellow, IRB Chair
Subject: Protocol #2014/10/17
Date: 11/15/2014

The protocol **2014/10/17. Online Knowledge Sharing: Investigating the Community of Inquiry Framework and its Effect on Knowledge Sharing Behavior in Online Learning Environments** has been verified by the Institutional Review Board as **Exempt** according to 45CFR46.101(b)(4): Existing Data & Specimens - No Identifiers on 11/15/2014.

The consent form and recruitment emails are attached and stamped with IRB approval and approval date. You should use the stamped forms as originals for copies that you distribute or display if possible.

If you propose any changes in your procedure or consent process, you must complete an amendment form of those changes and submit it to the IRB Chair for approval. Please wait for the approval before implementing any changes to the original protocol. In addition, if any unanticipated problems or adverse effects on subjects are discovered, you must immediately report them to the IRB Chair before proceeding with the study.

Because the study is exempt and there is no specific expiration date, you will not receive a continual renewal notification nor will you need to complete an annual report. However, when the study is complete, you must terminate the study by completing the Exempt Study Termination Form that can be found under IRB Documentation. Please upload the completed form to your protocol page via Mentor. Keep a copy of your research records, other than those you have agreed to destroy for confidentiality, over a period of five years after the study's completion.

Please note that changes to your protocol may affect its exempt status. Please contact me directly to discuss any changes you may contemplate.

Thank you for contributing to Duquesne's research endeavors,

Linda Goodfellow, PhD, RN, FAAN

IRB Chair

goodfellow@duq.edu

Appendix C

Email to Instructors

Subject: Invitation to Participate in a Research Study

Body: My name is Anne Doring, and I am a doctoral candidate in the Instructional Technology program at Duquesne University. The purpose of this email is to request your kind support of a study that I am conducting as part of my dissertation. The study seeks to investigate whether the Community of Inquiry (CoI) framework predicts student knowledge sharing behavior within online learning environments. The results of the study may help guide future researchers and practitioners develop online learning environments that meet established best practices as defined by the CoI and knowledge sharing frameworks.

In support of this research study, I am asking that you forward the attached email invitation to students enrolled in your online course(s), or post this message as a Blackboard announcement in your online course(s).

If you agree to participate, the interruption to your course will be minimal. Students will be asked to participate in a survey (approximately 20 minutes in length), and will have the option to enroll in a drawing to win a $100 gift card to amazon.com. Participation in this survey will be strictly voluntary, and the collected survey responses will remain anonymous.

This study has been approved by Duquesne University Institutional Review Board.

Thank you for your time and kind consideration. Please let me know if you have any questions or concerns.

Anne Doring
doringa@duq.edu
[redacted]

Appendix D

Email to Students

Subject: Win a $100 gift card and support a research study

Body: Opportunity to Participate in a Research Study

My name is Anne Doring, a doctoral candidate in Duquesne University's Instructional Technology program. The purpose of this email is to ask for your participation in a research study that investigates the Community of Inquiry (CoI) framework and its effect on student knowledge sharing behavior within online learning environments. You are being contacted because you are currently enrolled in an online course with a school of education.

The survey, which will take approximately 20 minutes to complete, is hosted in a free version of SurveyGizmo, and will collect your perceptions on social, cognitive, and teaching presence, as well as your knowledge sharing behavior, within your online course. The survey is set up to be completely anonymous – your name, IP address, or email will not be attached to your survey.

SurveyGizmo is a safe and secure site, as outlined in its Privacy Policy, which applies to all of their products and services. The Privacy Policy states that data collected in surveys is owned by the researcher. SurveyGizmo does not sell data collected in surveys. Extensive security measures are in place to protect any collected data, including firewalls and unique usernames and passwords. Anonymous surveys do not store identifying information, including Geodata, IP addresses, email invite data, and the Status Log will not include Response IDs.

Additionally, your instructor will not know whether or not you decided to participate in the survey. If you agree to participate in the study, please visit this site to access the survey:

http://www.surveygizmo.com/s3/1853465/Online-Knowledge-Sharing-and-the-CoI-Framework

To enter the drawing to win a $100 gift card to amazon.com, click the **Enter to Win** link at the end of the survey and provide your email address. The *Enter to Win* page is separate from the main survey and is not connected to your survey responses, so your survey responses will still be anonymous. Your email address will not be shared or distributed, and will be stored in the researcher's password-protected computer. Only the researcher will have access to this data.

Please note, surveys must be completed online; paper-form surveys will not be made available in order to ensure anonymity.

This study has been approved by Duquesne University Institutional Review Board.

Thank you for considering to participate!

Anne Doring

[redacted]

doringa@duq.edu

Appendix E

Online Forum Post

Subject: Take a Survey to Support Study in Education and Enter to Win Gift Card

Post: I am a doctoral candidate in Duquesne University's Instructional Technology program. The purpose of this post is to ask for your participation in a research study that investigates the Community of Inquiry (CoI) framework and its effect on student knowledge sharing behavior within online learning environments.

After you take the survey you can enter to win a $100 Amazon gift card.

Before participating in this survey, please ensure that you meet the following criteria:

- You are a graduate student, enrolled in a private school of education.
- You are taking at least one online course related to the field of education.

The survey, which will take approximately 20 minutes to complete, is hosted in a free version of SurveyGizmo, and will collect your perceptions on social, cognitive, and teaching presence, as well as your knowledge sharing behavior, within your online course. The survey is set up to be completely anonymous – your name, IP address, or email will not be attached to your survey.

SurveyGizmo is a safe and secure site, as outlined in its Privacy Policy, which applies to all of their products and services. The Privacy Policy states that data collected in surveys is owned by the researcher. SurveyGizmo does not sell data collected in surveys. Extensive security measures are in place to protect any collected data, including firewalls and unique usernames and passwords. Anonymous surveys do not store identifying information, including Geodata, IP addresses, email invite data, and the Status Log will not include Response IDs.

http://www.surveygizmo.com/s3/1853465/Online-Knowledge-Sharing-and-the-CoI-Framework

To enter the drawing to win a $100 gift card to Amazon.com, click the **Enter to Win** link at the end of the survey and provide your email address. The *Enter to Win* page is separate from the main survey and is not connected to your survey responses, so your survey responses will still be anonymous. Your email address will not be shared or distributed, and will be stored in the researcher's password-protected computer. Only the researcher will have access to this data.

Please note, surveys must be completed online; paper-form surveys will not be made available in order to ensure anonymity.

This study has been approved by Duquesne University Institutional Review Board.

Thank you for considering to participate!

Anne Doring
[redacted]
doringa@duq.edu

Appendix F

Consent Form

DUQUESNE UNIVERSITY

600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE: Online Knowledge Sharing: Investigating the Community of Inquiry Framework and its Effect on Knowledge Sharing Behavior in Online Learning Environments.

STUDENT INVESTIGATOR: Anne Doring
Doctoral candidate
Department of Instruction and Leadership in Education
School of Education
doringa@duq.edu
[redacted]

ADVISOR: Dr. Misook Heo
heom@duq.edu
Department of Instruction and Leadership in Education
School of Education
412-396-1662

PURPOSE: You are being asked to participate in a research project that seeks to investigate whether the Community of Inquiry (CoI) framework predicts self-reported knowledge sharing behavior within online learning environments. You will be asked to complete a survey (approximately 20 minutes) that will collect demographic information; your perceptions of social, cognitive, and teaching presence; and your knowledge sharing behaviors within an online learning environment.

These are the only requests that will be made of you.

RISKS AND BENEFITS: There are no risks greater than those encountered in everyday life. By submitting the survey, you will help support research that may lead to online learning environments that support improved learning outcomes.

COMPENSATION: There will be no compensation for participation, but you will have the option to enter a drawing to win a $100 gift card amaon.com. Participation in the project will require no monetary cost to you.

CONFIDENTIALITY: Identifiable information such as your name, IP address, or email will never appear on any survey or research instruments. The researcher will not be able to link your responses with your identity; no identity will be made in the data analysis.

If you choose to enter the drawing to win a $100 gift card to amazon.com, your email address will be collected in a separate survey form at the completion of the survey so that you can be contacted in the event that you win the drawing; however, your email address will be kept separate from your survey response.

All submitted survey responses and gift card drawing forms will be stored in a password-protected file on the researcher's password-protected computer. Your response(s) will only appear in statistical data summaries. All materials will be destroyed after a five year period.

RIGHT TO WITHDRAW: You are under no obligation to participate in this study. You are free to withdraw your consent to participate at any time before you submit your survey form. If you have already submitted the online survey form, however, there will be no way to destroy your submitted data, as all surveys are submitted anonymously.

SUMMARY OF RESULTS: A summary of the results of this research will be supplied to you, at no cost, upon request.

VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent, for any reason, before I submit the survey. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may call Anne Doring at 412-901-756, or Dr. Misook Heo at 412-396-1662. I may also contact Dr. Linda Goodfellow, Chair of the Duquesne University Institutional Review Board, at 412-396-6326.

This study has been approved by Duquesne University Institutional Review Board. By clicking the **Next** button, I certify that I understand and agree to the above statement.

Appendix G

Standard Multiple Regression Output

Correlations

		KTotal	TTotal	STotal
Pearson Correlation	Total	1.000	.768	.734
	Total	.768	1.000	.778
	Total	.734	.778	1.000
Sig. (1-tailed)	Total	.	.000	.000
	Total	.000	.	.000
	Total	.000	.000	.
N	Total	36	36	36
	Total	36	36	36
	Total	36	36	36

Variables Entered/Removed[b]

odel	Variables Entered	Variables Removed	M ethod
	STotal, TTotal[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: KTotal

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

	.798[a]	.637	.615	.58187

a. Predictors: (Constant), STotal, TTotal

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	19.638	2	9.819	29.001	.000[a]
Residual	11.173	33	.339		
Total	30.811	35			

a. Predictors: (Constant), STotal, TTotal

b. Dependent Variable: KTotal

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.923	.481		1.920	.063
TTotal	.447	.150	.498	2.985	.005
STotal	.318	.153	.348	2.085	.045

a. Dependent Variable: KTotal

Coefficients[a]

Model	Correlations			Collinearity Statistics	
	Zero-order	Partial	Part	Tolerance	VIF
(Constant)					
TTotal	.768	.461	.313	.395	2.529

	STotal	.734	.341	.219	.395	2.529

a. Dependent Variable: KTotal

Collinearity Diagnostics[a]

Dimension odel	Eigenvalue	Condition Index	Variance Proportions		
			(Constant)	TTotal	STotal
	2.963	1.000	.00	.00	.00
	.027	10.406	.99	.10	.12
	.010	17.099	.00	.90	.88

a. Dependent Variable: KTotal