STUDENT PERCEPTIONS OF COMPUTER-MEDIATED COMMUNICATION TOOLS IN ONLINE LEARNING: HELPFULNESS AND EFFECTS ON TEACHING, SOCIAL, AND COGNITIVE PRESENCE

by

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ABSTRACT

SARA R. SALLOUM. Student perceptions of computer-mediated communication tools in online learning: Helpfulness and effects on teaching, social, and cognitive presence. (Under the direction of DR. JOHN A. GRETES)

Distance learning continues to be used in the context of teacher training in special education. Distance learning is experienced through computer-mediated communication (CMC) tools via the Internet, or online learning. Little research has been done to evaluate student perceptions of the helpfulness of CMC tools in online learning. This quantitative study utilizes an online survey of graduate and certification teachers in training for special education. The survey evaluates student perceptions of CMC tool helpfulness, social presence, teaching presence and cognitive presence. Descriptive and inferential statistical analyses are used to evaluate mean differences for different combinations of CMC tool usage and for possible relationships between tool helpfulness and social or teaching presence. Additional demographic variables of gender, level of study, registration status, concentration of study, prior online courses taken and years of teaching experience are also evaluated for possible relationships with social, teaching, and cognitive presence.

Results suggest that participants were comfortable with using CMC tools and perceived e-mail, discussion forums, news forums, web-conferencing, and text chat as helpful tools for social and teaching presence communications. Participants using discussion forums perceived higher teaching and cognitive presence than those using only web-conferencing. Participants using both discussion forums and web-conferencing perceived higher cognitive presence than those using only web-conferencing. Results of

standard multiple regressions indicated that 31% of the variance in teaching presence (24% of variance in social presence) was accounted for by knowing helpfulness scores on e-mail, discussion forums, and news forums. Discussion forums were most helpful for promoting teaching presence. E-mail was most helpful for promoting social presence.

There were no statistically significant mean differences among groups based on gender, level of study, registration status, concentration of study, or years of teaching experience. Results suggest that perceptions of teaching and cognitive presence may decline as the number of online courses taken increases.

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CHAPTER ONE: INTRODUCTION

This dissertation is a report of a quantitative study of student perceptions of the helpfulness of computer-mediated communication (CMC) tools in online learning. The study focuses on a population of students enrolled in teacher training courses in special education fields. The courses included in this study were delivered completely online.

First, this chapter presents the background of the study. Second, this chapter describes the need and purpose for the study. Third, this chapter states the problem and research questions. Fourth, this chapter describes the delimitations and assumptions of the study. Finally, this chapter provides definitions for key terms in the study.

Background of the Study

Distance learning.

Online learning has its roots in distance learning. Distance learning is defined as "a formal education process in which the student and instructor are not in the same place" (Parsad & Lewis, 2008, p. 1). Distance learning in the United States began with written correspondence courses through the postal service as early as 1873 (Larreamendy-Joerns & Leinhardt, 2006).

Distance learning in U.S. higher education began as correspondence courses through the postal mail service followed by broadcast instructional radio and then educational television (Bullock, Gable, & Mohr, 2008). As advances in educational technology improved, distance learning became a way to provide teacher preparation in educational fields such as special education (Spooner, 1996). Such distance learning

programs have been helpful in offering teacher training in rural areas, in recruiting personnel from traditionally under-represented groups, and in improving participation in less-supported programs (Ludlow, 2001).

Today, distance learning is experienced through computer-mediated communications (CMC) via the Internet (Parsad & Lewis, 2008), or online learning. The body of literature for online learning grows as educational institutions expand their offerings of online courses and programs and as advances in computer and web technologies provide new ways to communicate and collaborate online. But, research into the effectiveness of computer-mediated communication (CMC) technology for teacher education in special education is lacking. There is a need to understand relationships between CMC technology and student perceptions about learning.

Online learning.

Online learning provides opportunities for students to participate in a course of study without having to be physically present on a particular campus or in a classroom. Through the Internet, students have access to educational content and participative learning such that "anyone can now learn anything from anyone at anytime" (Bonk, 2009, p. 7). Online learning is especially appealing to older, non-traditional students (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006) who cannot commit to full time higher education or cannot relocate to a campus setting to participate due to work or family responsibilities.

Online learning is growing at a rapid rate in the United States. In an annual report on the state of online learning in U.S. higher education, Allen and Seaman (2010) reported that 4.6 million students were taking at least one online course during the fall

2008 term, representing a 17% growth rate over the prior year. During the 2006-07 academic year, 61% of 2-year and 4-year Title IV degree-granting institutions reported offering online courses to their students (Parsad & Lewis, 2008). For this same academic year, 52% reported offering online courses to graduate students.

Demand for online learning is expected to continue as emerging technologies provide more computer-mediated communication tools and greater access for learning. Continued growth is expected, especially for certification programs, associate degree programs and blended learning, which combines face-to-face instruction with online learning elements (Kim & Bonk, 2006).

Online learning can refer to various degrees of Internet-based instruction. Tallent-Runnels et al. (2006) have defined online courses as those delivered completely via the Internet and blended courses as those that combine online elements with traditional, face-to-face elements. Additionally, online courses can be synchronous or asynchronous (Palloff & Pratt, 2007). Synchronous learning occurs when participants engage in learning activities at the same time through computer-mediated communications (CMC) such as web conferencing, tele-conferencing, or instantaneous text chat. Asynchronous learning occurs when participants engage in learning activities at separate and independent times. Most asynchronous communication is text-based, utilizing tools such as e-mail, blogs, wikis, or discussion forums (Clark & Mayer, 2008).

Online learning is collaborative and interactive (Bonk, 2009; Palloff & Pratt, 2007). Through computer-mediated communication, online learners share knowledge, resources, and ideas. They discuss concepts and work together to solve problems or to complete projects. Over the next ten years, it is expected that collaboration, problem

solving, and discussions will be used more widely as pedagogical methods for online learning (Kim & Bonk, 2006).

Online learning communities.

Because of the collaborative nature of online learning, participating students need to communicate and interact with one another as an online learning community. An online learning community is the "classroom" made up of an instructor and course participants. Learning communities promote learning when characterized by effective communication and interaction (Tallent-Runnels et al., 2006). Students need continual feedback from course instructors and a strong rapport with fellow students (Gaytan & McEwen, 2007). Palloff & Pratt (2007) suggest the following indicators for an effective online learning community:

1. Active interactions with course content and with other participants
2. Student-to-student comments that promote collaborative learning
3. Discussions over questions and issues that lead to a shared construction of meaning.
4. Exchanges of resources
5. Student-to-student feedback that includes encouragement as well as critical evaluation

Because participants in an online learning community are not physically present together in a classroom, they rely on computer-mediated communication tools to communicate, interact, and collaborate with each other and with their instructor.

Computer-mediated communication tools.

There are many computer-mediated communication (CMC) tools available to support communication and interaction in online learning communities. E-mail may be the most commonly used and is supported by various providers, such as G-mail™, Yahoo™, Hotmail™, and others. In higher education settings, e-mail is often provided through an institution-wide system made available to all students and instructors. E-mail can be delivered to individuals or groups and may include attached files (Repman, Zinskie, & Carlson, 2005).

Online learning is commonly delivered via a learning management system such as Moodle™. Moodle™ is a web-based application for designing online courses. Moodle™ includes CMC tools, such as news forums and discussion forums, which instructors use to communicate with students and to encourage students to communicate and interact with each other. Through news forums, the instructor posts announcements and instructions to the entire learning community. Students read the news forums on the course web page or have news forum posts sent directly to their e-mail accounts (Menges, 2009).

Through discussion forums, students post ideas, information, and opinions for the entire community to read. Typically, an instructor or course facilitator will pose topics, problems, or questions for participating students to address. Students post their comments in response to the instructor's prompt and then post replies to one another. The goal of the discussion forum is to generate a discussion that will build knowledge and add to the learning of others in the class (Repman et al., 2005).

E-mail, news forums and discussion forums are asynchronous CMC tools as participants can use them at different times (Palloff & Pratt, 2007). The instructor or a student may post a comment or send a message hours or days before the recipient(s) read it.

Synchronous CMC tools, such as web-conferencing (i.e., Wimba™) or voice over Internet protocols (i.e., Skype ™), require participants to engage with the instructor and/or other students at the same time (Palloff & Pratt, 2007). These tools include video and audio technologies that allow participants to see and hear the instructor as he or she delivers instruction live. In Wimba™ web-conferencing, multiple participants can view and listen at the same time. Wimba™ and Skype™ also include synchronous text chat as an additional media for participants to communicate with each other. A student types a message to the instructor or another student and the recipient receives and reads the message instantaneously.

Among CMC tools, there are many options available to support communications and interactions in online learning environments. Some may be more helpful than others for creating learning communities and for promoting learning. Student perceptions about the helpfulness of CMC tools may provide insights into the effectiveness of different CMC tools for online learning.

Community of inquiry theoretical framework.

Any research into online learning requires a theoretical framework. The Community of Inquiry theoretical framework is a communication model for online learning comprised of three key factors: teaching presence, social presence, and cognitive presence (Garrison, Anderson, & Archer, 2000).

Teaching presence refers to the design and facilitation of the learning experience (Garrison et al., 2000, p. 89). A high perception of teaching presence is characterized by indications of effective course design and organization, by indications of effective facilitation of learning activities, and by indications of effective direct instruction. Participants who perceive high teaching presence find the course design and organization conducive to learning. They perceive that the instructor effectively facilitates their discussions and activities. They also perceive that the instructor provides useful content, resources, and feedback.

Social presence refers to the extent to which participants can perceive themselves as "real people" in the learning community. A high perception of social presence is characterized by affective expressions and indications of group cohesion among participants. Participants who perceive high social presence feel comfortable with sharing their ideas and feel that they are able to contribute to the group's learning. They acknowledge each other and encourage each other. They feel safe to disagree when necessary but still feel accepted as a member of the learning community. They perceive themselves as collaborators with one another.

Cognitive presence refers to the extent to which participants can "construct meaning." A high perception of cognitive presence is characterized by indications of information exchange, connecting of ideas, and application of concepts. Participants who perceive high cognitive presence indicate high interest and motivation. They engage in exploration, brainstorming, discussions, and reflections. They integrate new information and develop solutions to problems.

Prior research has shown that social, teaching, and cognitive presence are highly correlated and that both teaching and social presence appear to be influential predictors of cognitive presence (Archibald, 2010; Shea & Bidjerano, 2009). This means that factors that influence student perceptions of social and teaching presence may also, in turn, influence their perceptions of cognitive presence.

CMC tool helpfulness.

Social presence and teaching presence are facilitated directly through the use of CMC tools. Students and instructors communicate and interact with each other through CMC tools such as e-mail, news forums, discussion forums, web-conferencing, and text chat (Repman et al., 2005). Different CMC tools may be more or less helpful in promoting teaching or social presence. It is important to understand student perceptions of CMC tool helpfulness for promoting social and teaching presence and the effects of tool helpfulness on social and teaching presence. It is also important to understand how different CMC tool usage may affect student perceptions of social, teaching, and cognitive presence.

The Community of Inquiry model provides the theoretical framework needed to evaluate student perceptions of the helpfulness of CMC tools. Social presence, teaching presence, and cognitive presence serve as useful dependent variables to evaluate how the helpfulness of different CMC tools affects student perceptions of their online learning experiences.

Need and Purpose

Design and delivery of online learning continues to change in higher education as new CMC tools are introduced. CMC tools, such as e-mail, news forums, discussion

forums, and web-conferencing, have been introduced into online learning, but little research has been done to evaluate student perceptions of their helpfulness for learning, especially in the area of special education teacher training. Online course designers and instructors need to know which CMC tools are most helpful for students.

The purpose of this quantitative study is to understand student perceptions of CMC tool helpfulness for online learning. Specifically, the study evaluates student perceptions of CMC tool helpfulness for social and teaching presence; explores the effects of different CMC tool usage on social, teaching, and cognitive presence; and explores possible relationships between CMC tool helpfulness and social and teaching presence. Additionally, demographic background variables are evaluated for possible relationships with social, teaching, or cognitive presence.

Statement of Problem and Research Questions

Based on the Community of Inquiry theoretical framework, the effectiveness of online learning can be evaluated through student perceptions of social, teaching, and cognitive presence. Collectively, these factors describe a Community of Inquiry fostered through effective communications and interactions among students and their instructor.

Different CMC tools provide different media through which communications and interactions are facilitated. The usage, combination, and application of CMC tools may affect student perceptions of tool helpfulness for learning and student perceptions of social, teaching, and cognitive presence.

The research questions for this study are:

1. How do students perceive the helpfulness of different CMC tools for promoting teaching and social presence?

2. Is there a difference in student perceptions for the following factors between courses that do/do not include synchronous online meetings (web-conferencing):
    a. social presence?
    b. teaching presence?
    c. cognitive presence?
3. Are student perceptions of CMC tool helpfulness associated with student perceptions of social or teaching presence?
4. Do background demographic variables have an effect on social, teaching, or cognitive presence?

Delimitations and Limitations

This research study was conducted in the context of online learning offered at a large, public university in the Southeastern region of the United States. The study was limited to seven graduate level teacher training courses in the disciplines of special and gifted education, resulting in a highly homogenous group of students. This restriction limited the population under study to 161 online students, and the resulting sample size was relatively small. The courses were contained within one department of the university and were delivered entirely online through the Moodle™ learning management system. The study evaluated only those CMC tools used in the courses selected for inclusion in the study. Data were collected near the end of one semester (Spring 2011) through an online survey that assessed student perceptions of CMC tool helpfulness and student perceptions of social, teaching, and cognitive presence.

There were some conditions beyond the control of the researcher which limit generalizations for the study. Student participation in the survey was completely

voluntary; non-responders to the survey may have had different characteristics from those of responders. While the study was limited to the disciplines of special and gifted education, there were variations in course content, course design, and instructors which may have affected results. Variations in CMC tool usage by instructors were not evaluated to determine how different tools may have been used for different purposes. Though none were reported, technological issues may have affected the quality of CMC media used in the courses. Differences in student learning preferences were not assessed and may have influenced student perceptions of CMC tool usefulness.

Assumptions and Definitions

Underlying this study are the beliefs that the Community of Inquiry model provides the best theoretical framework for the proposed research and that the survey tool developed from this framework is valid and reliable. The Community of Inquiry model was developed from transcript analyses of asynchronous discussions and is supported by over ten years of empirical research (Garrison, Anderson, & Archer, 2010). The survey tool has been used in multiple studies in a variety of contexts and appears rigorous in terms of reliability and validity (Arbaugh et al., 2008; Archibald, 2010; Shea & Bidjerano, 2009; Swan et al., 2008). The Community of Inquiry model and related survey tool are discussed further in Chapter Two.

It is assumed that the usefulness of different CMC tools varies by tool characteristics and applications. Some tools may be more helpful than others for promoting social and teaching presence. Different tools and different combinations of tool usage may have different effects on teaching, social, and cognitive presence.

Definitions.

Terms specific to this study are defined as follows:

Online learning- Learning that takes place via the Internet where participants interact with instructors, content, and other participants through computer-mediated communications.

Online community- A group of students and instructor who communicate and interact though computer-mediated communication tools to achieve learning goals or to complete a course of study.

Synchronous online learning- Interactive online learning that occurs at the same time, involving more than one participant and/or instructor.

Asynchronous online learning- Interactive online learning that occurs at separate, independent times resulting in time gaps among participants and instructors.

Computer-mediated communication (CMC)- Communications that are delivered via computer based applications such as e-mail, news forums, discussion forums, web-conferencing (Wimba™), text chat, and voice over Internet (Skype ™).

Social presence- The extent to which students perceive themselves as "real people" engaged in "real" communications and interactions in an online learning environment.

Teaching presence- The extent to which students perceive the instructor's activities in the design and facilitation of the learning experience in an online learning environment.

Cognitive presence- The extent to which students perceive an ability to "construct meaning" in an online learning environment.

Summary and Organization

Online learning is very prevalent in higher education and is expected to continue to grow as innovations in Internet technology provide greater access and participation among learners. Advancements in Internet technologies offer a variety of computer-mediated communication (CMC) tools to facilitate communication and interaction in online learning environments, but there is little research on student perceptions of CMC tool helpfulness and their effects on teaching, social, and cognitive presence. This study adds to the base of research on communities of inquiry and explores student perceptions of CMC tool helpfulness in the context of online learning for teachers training in special education.

This introduction is followed by Chapter Two, a literature review of prior research related to the key elements of the current study. Chapter Three describes the research design, population and sampling plan, data collection tools and process, and data analysis methods. Chapter Four presents the results and key findings of the data analysis with respect to the research questions and hypotheses. Chapter Five includes a discussion and interpretation of results, draws conclusions regarding the research questions, and suggests implications of the study for further research and practice in online learning.

CHAPTER TWO: LITERATURE REVIEW

Introduction

Online learning has its roots in distance learning. Distance learning is defined as "a formal education process in which the student and instructor are not in the same place" (Parsad & Lewis, 2008, p. 1). Distance learning in the United States began with written correspondence courses through the postal service as early as 1873 (Larreamendy-Joerns & Leinhardt, 2006).

Distance learning in U.S. higher education began as correspondence courses through the postal mail service followed by broadcast instructional radio and then educational television (Bullock et al., 2008). As advances in educational technology improved, distance learning became a way to provide teacher preparation in educational fields such as special education (Spooner, 1996). Such distance learning programs have been helpful in offering teacher training in rural areas, in recruiting personnel from traditionally under-represented groups, and in improving participation in less-supported programs (Ludlow, 2001).

Bates (1994) describes three generations of educational technology advancements. The first generation was one-way correspondence teaching aimed at the general public. It used a single technology, such as television and was sometimes supplemented with print materials. The second generation used an integrated multi-media approach which was still mostly printed material. However, the one-way print media was integrated with two-way correspondence with tutors. The third generation of educational

technology uses telecommunications and computers, providing greater two-way communication between teachers and students.

Today, distance learning is experienced through computer-mediated communications (CMC) via the Internet (Parsad & Lewis, 2008). The body of literature for online learning grows as educational institutions expand their offerings of online courses and programs and as advances in computer and web technologies provide new ways to communicate and collaborate online. But, research into the effectiveness of computer-mediated communication (CMC) technology for teacher education in special education is lacking. There is a need to understand relationships between CMC technology and student perceptions about learning.

This chapter provides a review of literature focusing on three streams of research. First, this chapter reviews research literature of online learning in the context of teacher training in special education because this is the population under study. The literature reviewed for this context includes theoretical foundations, practical considerations, and empirical studies.

Second, this chapter reviews research on computer-mediated communication (CMC) tools. This section discusses how CMC tools are employed in online learning, their media characteristics, their influence on learning, principles for media designs of online learning, and learner perceptions of CMC in online learning.

Third, this chapter describes research on the Community of Inquiry (CoI) model of online learning, its theoretical framework, and the development of the survey instrument that will be employed for data collection in the current study.

Finally, this chapter summarizes the research literature relevant to the current study and identifies gaps that the current study proposes to fill.

Online Learning and Teacher Training in Special Education

Because this study focuses on a population of students enrolled in teacher training courses for special education, this literature review includes research for this discipline in the context of online learning.

Distance learning for teacher training in special education.

Like online learning in general, online learning for teacher training in special education has its roots in distance education. In the late 1990s, the growing need for trained teachers in special education led to a distance learning program at a large, southeastern university. In 1999, Spooner, Jordan, Algozzine and Spooner conducted a study to explore student perceptions of participating in special education teacher training courses from a distance. The participants were graduate level students enrolled in courses to prepare them for teaching students with severe disabilities.

Classes for two different courses were offered on campus and at a distance through two-way television on a weekly basis. A survey instrument was used to compare student perceptions of the course, instructor, organization, teaching, and communications between the two learning experiences. Survey results indicated no statistically significant differences between treatments, except for organization. These findings were favorable for distance learning and encouraged further efforts to deliver special education training to remote learners (Spooner, Jordan, Algozzine, & Spooner, 1999).

Online learning for teacher training in special education.

Through advancements in educational technology over the past decade, distance learning for teacher training in special education is now delivered online via the Internet. A literature search of research studies of online learning in special education teacher training resulted in very few journal articles. The following sections will present literature specific to special education teacher training that includes a model for online learning, practical design considerations, and recent empirical studies.

Model for online learning.

Johnson (2004) explored theories of instruction, learning, and instructional design to identify factors for a model of online learning in the context of special education teacher training. The model consists of input factors and decision options, all of which are represented on continuum scales. Input factors include course goals, instructional intent, nature of content, content structure and complexity, technology resources, and learner characteristics. Decision options include learning objectives, task orientation, teacher role, meta-cognitive goals, and course scheduling and pacing. In using this model for course development, Johnson (2004) suggests the following steps:

1. Describe the course in relation to the program of study.
2. State learning objectives with respect to knowledge, skills, and disposition.
3. Consider the nature of the course information and structure.
4. Define learner characteristics
5. Select technology resources that support effective course delivery and learning.

With respect to the selection of CMC tools, Johnson asserts that media decisions should follow other online course considerations: "For online course development, technology and media decisions should follow instructional design, and instructional design should be based on consideration of input factors such as nature of the content to be learned, learner characteristics and needs, and the goals of instruction" (2004, p. 209).

For Johnson (2004), the CMC tools selected for online learning should be those that best support the instructional design of the course, that deliver the course most effectively, and that maximize learning.

Practical considerations for online courses.

When planning and delivering online courses in special education, there are various factors to consider. Drawing from professional literature and personal experiences, Collins, Schuster, Ludlow, and Duff (2002) recommend the following:

1. Student support services that are adequate, flexible and sensitive to the needs of distance learners.
2. Technology assistance that provides orientations, access to continuous support, and trouble-shooting resources.
3. Course design that includes activity-based learning, appropriate content, comfortable pacing and adequate time for student reflections, interactions, and instructor feedback.

These recommendations concur with Johnson's conclusion that CMC technology should support overall course and learning goals.

Empirical research.

Researchers in special education are beginning to evaluate how instruction can be delivered to teachers via web-based technologies. A search for empirical research of online learning for teacher training in special education produced few studies, and most of them are characterized by small sample sizes and focus on graduate level courses. None of the studies in this review employed random selection or assignment. But, a variety of online learning issues have been addressed and are presented in the following sections.

Online learning and student perceptions.

Jordan et al. (2004) conducted a small study of student perceptions of learning and technology skills gained from a course enhanced with computer-mediated communication (CMC) tools. Web-enhanced learning is also known as hybrid or blended learning as it supplements traditional, face-to-face instruction with web-based, CMC tools.

Participants (n=26) were graduate students enrolled in two different courses that included content on ADD/ADHD. One course was delivered by traditional, face-to- face lectures while the other added CMC tools such as text chat, progress tracking, evaluation and grade management, navigation tools, course calendar, and home pages through WebCT™, a web-based learning management system. Pre- and post-test surveys provided information on self-reported gains in ADD/ADHD knowledge and technology skills.

Results suggest that students perceived comparable knowledge gains for both course delivery formats and that those enrolled in the web-enhanced course perceived

gains in technology skills. These findings suggest that web-based instruction can be effective for special education teacher training and can enhance technology skills needed for accessing and navigating web resources on special education topics, such as ADD/ADHD.

Online learning and social presence.

Mykota and Duncan (2007) evaluated student perceptions of social presence in four special education online courses offered to post-baccalaureate teachers (n= 73) with at least one year of teaching experience. They describe social presence as "an environment where learners are at ease and experience comfort in the communications with others" (Mykota & Duncan, 2007, p. 158).

The courses employed three text-based CMC tools: e-mail, discussion boards, and text chat. Student perceptions of social presence were evaluated using a survey instrument developed by Yen and Tu (2008). The survey instrument measured social presence based on statements about CMC tools and communication, affective expressions, relationship building, privacy, interactions, and usage skills. Demographic items on age, gender, years of teaching, previous online courses, and self-rated CMC proficiency were included in the survey. Multiple linear regression was used to identify factors associated with social presence.

Results indicate that the number of prior online courses and student perceptions of CMC proficiency were moderately correlated with social presence. The study evaluated CMC tools in general, but did not provide results for individual tools.

Synchronous vs. asynchronous CMC tools.

CMC tools can be synchronous or asynchronous. Synchronous tools allow participants to communicate and interact spontaneously during the same time period. Asynchronous tools allow participants to communicate and interact independent of time.

Skylar (2009) designed her research to study differences between student perceptions of synchronous, interactive lectures via web-conferencing and student perceptions of asynchronous, text-based lecture notes. Pre-service general education and special education teachers participated in hybrid courses which alternated weekly lectures between the two treatments. All participants experienced both types of lectures throughout the course; no control group was included. All other course elements were identical, including the instructor.

The synchronous lectures were delivered via Elluminate Live™, a web-based application that offers two-way audio, video, virtual breakout rooms, text chat, application sharing, web tours, raising hands features, virtual white boards, and class polling. All lectures were archived to allow later viewing, so not all students participated synchronously. The asynchronous "lectures" were delivered via text-based notes or PowerPoint™ presentations. Weekly assignments included text book readings, quizzes, and communications via e-mail and text-based discussion forums. Pre- and post-tests were used to assess knowledge of course content and self-assessed computer literacy. A survey was used to assess student preferences between lecture delivery modes, student learning perceptions, and satisfaction with technology features.

Only descriptive data were reported. Means of knowledge gained were similar between treatments, but differences were not evaluated for statistical significance. Survey

results indicated that the majority (73%) of respondents preferred lectures via web-conferencing over asynchronous lecture notes. Most reported that web conferences aided their understanding (88%) and enabled them to perform better on quizzes (81%). The results of this study suggest that while gains in knowledge may be similar for synchronous and asynchronous CMC tools, students may associate greater learning effectiveness with web-conferencing than with asynchronous lecture notes.

Face-to-face, online or hybrid learning.

Instruction can be delivered face-to-face, online, or through a hybrid that includes both face-to-face and online elements. These three modes of instruction were evaluated in a quasi-experimental study of undergraduate students enrolled in an introductory course on special education (O'Brien, Hartshorne, Beattie, & Jordan, 2010).

Course participants self-selected into the traditional, face-to-face course (n= 159), the online course (n= 69), and the hybrid course (n=69). Two instructors, each with a broad knowledge of special education, facilitated the courses. One instructor had extensive experience with online learning and led the online and hybrid courses. In the traditional course, instruction was delivered face-to-face. The hybrid course also provided face-to-face lectures but included web based tools for comprehension quizzes, learning modules, and organizational notes through the web-based Blackboard™ learning management system. The online course included archived videos of the classroom lectures, comprehension quizzes, interactive text-based discussion forums, and learning modules and notes. Student perceptions of self-efficacy, learning, and disposition were evaluated through a questionnaire and focus group interviews. Student academic performance was evaluated by final course grades.

The three modes of course delivery were comparable for student perceptions of learning effectiveness. The online course was considered the most flexible, but was perceived as significantly less effective than the traditional course for generating self-efficacy and a sense of preparedness for teaching students with special needs. These results suggest that online delivery of courses may be as effective as face-to-face delivery for learning effectiveness but may be limited in its ability to generate teacher confidence and sense of preparedness for applying knowledge gained.

Summary of research for online learning and teacher training.

Online learning in special education teacher preparation has developed through a history of distance learning. A model for effective online course design considers input factors and decision options according to course goals, course content, learner characteristics, and available technology resources before specific CMC tools are selected. Research of online special education courses, though limited in volume, consistently indicates that effective learning can be accomplished through web-based CMC tools. Recent empirical studies suggest that online learners can gain technology skills and may prefer synchronous web-conferencing for course instruction. Perceptions of social presence may depend on experience levels with online learning and proficiency with CMC tools. When compared with face-to-face learners, online learners may perceive less self-efficacy and sense of preparedness to apply knowledge and skills learned. More research is needed to further study these findings and to explore the myriad of factors that CMC technology brings to online learning for training teachers in special education.

Computer-Mediated Communications in Online Learning

Edgar Dale defines communication as "the sharing of ideas and feelings in a mood of mutuality" (1969, p. 10). Using this definition, computer-mediated communication is the sharing of ideas and feelings in a mood of mutuality, but through computer-mediated communication tools.

Advances in web technology have generated a multitude of computer-mediated communication (CMC) tools that are finding their way into online learning. Web applications include discussion forums, video based blogs (Vlogs), voice over Internet protocols (VoIP), web-conferencing, podcasts, wikis, video streaming, virtual worlds, blogs, and social networks (Bonk, 2009). Because online learning continues to adapt to rapidly changing web technologies, research studies on CMC tools and their effects on learning are highly varied, tend to be descriptive in nature, and are often limited to small sample sizes (Tallent-Runnels et al., 2006). This section of the chapter introduces some of the CMC technologies that support online learning, describes different media characteristics and their impact on learning, reviews research-based principles for the design, development and evaluation of learning delivered through CMC, and discusses ways that CMC supports collaborative learning. Finally, this section reviews recent research on student perceptions of CMC tools in online learning.

CMC technologies that support online learning.

There are a variety of CMC tools that are used in online learning. Repman, Zinskie, and Carlson (2005) categorize CMC tools into two types. Type one CMC tools are asynchronous tools that are independent of time. Examples include e-mail, discussion

forums, and blogs. Type two CMC tools are synchronous, allowing participants to communicate at the same time. Examples include text chat and web-conferencing.

E-mail.

E-mail is a simple electronic message that a user types onto a screen and can send to one or to many recipients. In educational settings, e-mail is often used by instructors to provide class information, to answer student questions, to transmit assignments, and to provide feedback. E-mail requires a minimal level of computer literacy and allows for the attachment of other files. E-mail also provides direct access to the instructor. There are some drawbacks to using e-mail in educational settings as it can foster student dependency on the instructor. Students may consider it easier to ask questions of the instructor via e-mail rather than search for resources on their own (Repman et al., 2005).

Discussion forums.

Discussion forums are also known as discussion boards, threaded discussions, and electronic bulletin boards. Typically, an instructor posts a topic or question. Students individually post responses to the topic or question and then proceed to comment on the posts of other students. In educational settings, discussion forums facilitate interaction among students participating in group work, case studies, or projects. Discussion forums can also be used for role playing, debates, resource sharing, and interactions with outside experts. Discussion forums can encourage higher order thinking and reflection, but may be underutilized if topics are uninteresting or if students are not motivated to participate (Repman et al., 2005).

Blogs**.**

Blogs are informal journals posted on a web page. Individual journal entries may have titles or short descriptions and can include text, graphics, links, audio-visual files, or photos. In educational settings, blogs can be used to create student portfolios of projects and assignments. They can also be used to create a class web site or to provide collaborative writing spaces. Blogs are more flexible than e-mail or discussion forums, allowing multiple participants to contribute a variety of materials. However, the unstructured, informal nature of blogs can result in unfocused communication and concerns about privacy. Blogs are more complicated and require greater computer literacy to use (Repman et al., 2005).

Text chat.

Text chat is a synchronous, text-based communication tool. Participants type short messages to each other that can be seen instantly by all the participants. Text chat can be one-to-one or one-to-many communication. In educational settings, text chat can be a means to provide virtual office hours, allowing students to have two-way text communication with an instructor. It can also be used for answering questions, brain storming, and problem solving. In conjunction with web-conferencing, text chat allows participating students to raise questions and to make comments during the conference. The immediacy of text chat communication fosters interaction and aids in the development of social relationships. The synchronous nature of text chat has some technical requirements and can be interrupted by poor Internet connections. It is best used for one-to-one or one-to few communications. With larger groups, text chat can become

disorganized and confusing, especially if multiple conversations are going on (Repman et al., 2005).

Web-conferencing.

Web-conferencing is a synchronous CMC tool that allows audio and visual interactions among individuals or groups through the Internet. In educational settings, web-conferencing provides live, face-to-face interactions among students and their instructor. It can be useful for practicing language speaking, for team teaching between locations, for presenting lectures and resources, for observing demonstrations, and for sharing experiences. Because of its "real time" nature, web-conferencing most closely mirrors traditional, face-to-face classroom experiences. The technology for web-conferencing can be complicated, requiring multiple steps to set up and participate. It requires high speed Internet access and may require special software (Repman et al., 2005).

All of these CMC tools hold great potential in terms of the impact they can have in online learning. They represent a wide variety of media characteristics and applications that need to be researched and evaluated for appropriate contexts and application.

Media characteristics and their impact on learning.

Wilbur Schramm has been described as the founder of communication (media) research (Chaffe & Rogers, 1997). It was his view that media could teach as well as or better than a classroom teacher, but that the process of media selection was difficult (Schramm, 1977). He exhorted researchers to ask the "smaller questions" about media. He noted that there is plenty of evidence that learning can occur through media, "but very

little evidence as to which medium, in a given situation, can bring about the most learning" (Schramm, 1977, p. 43).

Media provide channels through which different modes of communication are delivered (Fahy, 2004). The term media refers to the form of communication *delivery*, while mode refers to the *form* of communication, as in text, audio, or visual. Text mode can be delivered through various media, such as paper, electronic documents, or screen projections, but it must always be read to be received and understood. Likewise, audio mode content can be stated, recorded, and downloaded through different media, but it must be heard to be received.

There are various types of media through which communication is delivered. Printed text continues to the most familiar and the most used media form. In the context of education, the strengths of print include low cost, ease of production, stability, familiarity, and convenience. But, reading text is also limited to providing passive learning, is static in nature, and is less effective for low-functioning readers (Fahy, 2004).

Still graphics provide visual information that can increase motivation, aid understanding, assist recall, and enable higher order thinking. Typically production and distribution costs are low, but when delivered via CMC, low screen resolution and variations in color displays can become issues (Fahy, 2004).

Audio content in educational settings can aid recall, help retention, and lead to concept formation. The sound of a human voice increases social presence and may provide motivation to listening learners. But, audio alone has a limited effect on learning and is best used in conjunction with video and/or data when both relationship and information exchange needs are present. CMC tools include both one-way and two-way

media options for audio that are inexpensive and easy to reproduce. One disadvantage of audio CMC for learners is limited control over audio content; they must listen repeatedly as they seek to locate specific portions of content (Fahy, 2004).

Video and animation are powerful media tools that foster social presence and are especially useful in teaching content that is abstract, time-related, hazardous, or unfamiliar. As with audio, CMC tools can deliver one-way or two-way options but require significant Internet bandwidth and more expensive software applications to create, deliver, and view content. Other issues associated with video include greater skill sets required for instructors, determining optimum parameters such as session length and group sizes, developing quality materials, and providing adequate technical design and support (Fahy, 2004).

As media technologies continue to develop and expand in usage, research is needed to understand how to utilize CMC tools effectively in online learning. Some research has generated key principles for the design, development, and evaluation of learning delivered through technology.

Research-based principles for learning delivered through technology.

With respect to learning delivered through technology, Clark and Mayer (2008) state that "…to be effective, instructional methods and the media elements that deliver them must guide learners to effectively process and assimilate new knowledge and skills" (2008, p. 16). They distinguish between instructional methods which are employed to initiate, facilitate, and evaluate learning and media which offer different ways of delivering the instruction.

Four key assumptions.

Based on their beliefs that learning delivered through technology should be based on cognitive theory and should be supported by valid research, Clark and Mayer (2008) established four key assumptions for a model of multiple-media learning:

1. Dual channels- Learners receive and process visual and audio/verbal information through different cognitive channels.
2. Limited capacity- Learners can process limited amounts of information through each channel at the same time.
3. Active processing- Learning happens when participants actively engage in receiving, organizing, and applying information to prior knowledge.
4. Transfer- Learners must be able to retrieve information from memory.

The selection, organization, and integration of verbal and visual information impact the demands on learners' cognitive processing. Visual and audio information are processed through different channels with limited capacity. Too much information can be overwhelming and even distracting to the learner.

Active processing involves students actively engaging in receiving information through the two channels. There are three kinds of active processing: essential, generative, and extraneous. Essential processing focuses learners on specific learning objectives. It provides learners with essential information for learning. Generative processing motivates learners to understand and apply information. They take the information that they receive and use it in productive ways. Extraneous processing occurs when learners are presented with information that does *not* support learning objectives. Rather, the information distracts them from the learning objectives. The challenge for

course designers and instructors is “to create learning environments that minimize extraneous cognitive processing, manage essential processing, and foster generative processing” (Clark & Mayer, 2008, p. 37).

Key principles.

Based on research studies, Clark and Mayer (2008) have developed some key principles for designing, developing, and evaluating learning delivered through technology:

- The multi-media principle suggests that graphics of visual information should accompany verbal (text or audio) information so that learners can utilize both channels for cognitive processing at the same time.
- The contiguity principle recommends that text should be appropriately placed near graphics to aid learners in connecting information between channels.
- The modality principle refers to the use of audio narration rather than text when presenting graphics. This allows the learner to receive information through two channels rather than overloading the visual channel with all the content.
- The redundancy principle cautions against including text in addition to graphics and narration because learners may focus their attention on reading the text and tune out the audio narration.
- The coherence principle limits extraneous background sounds, music, graphics, or extraneous text to minimize extraneous cognitive processing.
- The personalization principle recommends the use of personal and polite conversational styles of communication to promote social presence.

- The segmentation and pre-training principle suggests breaking lessons into smaller, more manageable parts to make sure that learners know key terms and descriptions before trying to process complex concepts or processes.
- The principle of worked examples suggests providing, explaining, and reviewing step-by-step examples to illustrate concepts and skills. Learners should be encouraged work through examples with less and less guidance from the instructor.
- The principle of practice recommends providing opportunities for learners to apply knowledge to new situations or to practice new skills while receiving explanatory feedback.

These principles address both instructional methods and media for learning through technology and can inform research of CMC tools utilized in online learning and of their helpfulness for effective learning.

Computer-supported collaborative learning.

Collaboration among learners is an essential element of effective learning environments (Ally, 2004; Jonassen, Davidson, Collins, Campbell, & Haag, 1995). Participants in an online learning environment need ways to share information, discuss ideas, provide feedback, solve problems, and build knowledge. Collaboration in online learning is referred to as computer-supported collaborative learning (CSCL) and can be defined as "collaborative engagements among teams of two to five members using synchronous and/or asynchronous tool facilities in ways that support an instructional goal…" (Clark & Mayer, 2008, p. 262).

Computer-mediated communication (CMC) enables conversation and collaboration through both synchronous and asynchronous tools. Synchronous CMC tools are those that allow participants to communicate spontaneously or at the same time. Some examples of synchronous CMC tools are web–conferencing (supported by audio and/or video), virtual whiteboards, and chat (Greener, 2009; Repman et al., 2005). These tools are useful for virtual lectures, meetings, or group breakout sessions. Communication is interactive in real time and requires participants to be online at the same time.

Asynchronous CMC tools are those that allow participants to communicate independently at differing times and are mostly text-based. Examples of asynchronous CSCL tools are blogs, e-mail, and discussion boards (Greener, 2009; Repman et al., 2005). These tools are useful for keeping journals, responding to questions and ideas posted by others, sharing information, and collaborating on documents or web pages. Synchronous tools are believed to promote social presence while asynchronous tools are perceived to encourage more reflective thought (Clark & Mayer, 2008).

When considering different CMC tools, Clark and Mayer (2008) note that collaborative learning outcomes depend on many factors such as group size, group composition, type of assigned task, learners' prior knowledge, learners' motivation, as well as the technology used. For effective collaborative learning, they recommend forming heterogeneous groups of two to five participants and assigning roles that encourage active participation. They encourage the assignment of projects with sufficient instructions to provide guidance and to minimize cognitive loads. In selecting CMC tools, they suggest using asynchronous tools for learning that requires reflection and

independent research and using synchronous tools for learning that requires synergy, spontaneity, and social presence.

An additional consideration for CMC tool selection is learner control (Clark & Mayer, 2008). Typically, asynchronous CMC tools allow learners more control over content sequencing, pacing, and optional elements. Greater learner control is considered best for learners with high levels of prior knowledge and strong meta-cognitive skills. Some researchers believe that learning can be enhanced by giving learners control over their interactions with media and by prompting more reflection (Means, Toyama, Murphy, Bakia, & Jones, 2009).

Learner perceptions of CMC.

As various CMC tools are introduced into online learning experiences, it is important to understand learner perceptions regarding the appropriate use and effectiveness of different tools. Online course instructors cannot easily determine whether the instructional methods and media employed are effectively facilitating the learning process (Larreamendy-Joerns & Leinhardt, 2006). Some researchers have begun to explore student perceptions of instructor immediacy, collaboration, technology preferences, and learning perceptions (Chou, 2001; Giesbers, Rienties, Gijselaers, Segers, & Tempelaar, 2009; Griffiths & Graham, 2010; Havard, Du, & Xu, 2008; Rockinson-Szapkiw, Baker, Neukrug, & Hanes, 2010; Teng & Taveras, 2004; Yamada, 2009).

Student perceptions of synchronous CMC tools.

In a mixed-methods, formative evaluation study, Chou (2001) focused on the synchronous aspects of an online course to determine student perceptions of different CMC tools. The study was fairly limited as there were only fifteen participants enrolled

in a single course over a six week period. Participants engaged weekly in text-based discussions, twice in an enhanced virtual environment that utilized avatars, and once in an audio-video conference. A semantic scale survey was administered to measure student perceptions of the different CMC tools.

The weekly text-based discussions received the highest ratings, followed by the virtual environment and audio-video conference, respectively. Chou (2001) acknowledged that student comfort levels with CMC tools increase with practice and offered the following suggestions for the design of synchronous learning environments:

1. Consider bandwidth when selecting CMC tools as lower bandwidth negatively impacts audio/video quality.
2. Effective CMC tools should be easy to navigate.
3. Students respond best to easy access; minimize the number of mouse clicks.
4. Students prefer non-intrusive virtual environments for small group interactions.
5. Students respond well to affective affirmation and positive feedback accompanied by facial expressions (real or virtual).
6. Game-like learning experiences and enhanced graphics add enjoyment to learning.
7. CMC tools that offer the ability to project appearances and moods provide humanizing and sensing qualities to online learning experiences.
8. Audio/video tools must be of good quality.
9. Students are more likely to engage in discussions when they sense they are part of the group and can collaborate with others.

Yamada (2009) conducted an experimental, comparative study of language learning using different synchronous CMC media. The purpose of the study was to explore relationships among media, student perceptions, and learning performance. Non-native English speaking university students (n=40) were randomly assigned to one of four groups, each utilizing a different CMC tool: video-conferencing, audio-conferencing, text chat plus images, and text-only chat. Within each group, pairs were randomly assigned, and all pairs/groups were given the same fifteen minute project assignment: to select a new teacher.

Quantitative data were collected through a questionnaire that rated student perceptions. Perceptions of partner presence, ease of communication, and consciousness of second language learning were designated as independent variables. Perceptions on the ease of communication in English, consciousness of natural communication, and confidence in grammatical accuracy were designated as dependent variables. Statistical analyses included two-way ANOVA and path analysis. Communications within pairs of students were recorded via video and were qualitatively analyzed.

Yamada (2009) provides insights into student perceptions of different media, suggesting that different CMC tools are useful for different learning tasks. Key findings suggest that the inclusion of participant image and voice enhances the perception of presence. Filler expressions, gestures, and social cues obtained from image and voice can assist in solving communication problems and in assessing a partner's level of comprehension. The use of voice appears to promote self-correction as a speaker will revise or restate information that a partner does not understand. Text chat, a medium that

is more reflective in nature, appears to enhance awareness of grammatical accuracy and allows more time to modify errors.

Student perceptions of audio/video media suggest a mixed effect on social presence. Audio/video media encourage natural communication and facilitate comprehension of communicated messages. But, the immediacy of this medium can also create a sense of pressure and threaten confidence in accuracy.

Student perceptions of asynchronous video.

As noted earlier in this chapter, video CMC can be synchronous or asynchronous. Griffiths and Graham (2010) focused their case study research on asynchronous video to maximize the flexibility of time and to minimize the technical challenges of synchronous streaming. Their assumption was that asynchronous video can still convey verbal and non-verbal elements of communication even without the spontaneity of synchronous participation.

Both instructors and students produced videos and exchanged them through e-mail or through a video blog site. The instructors communicated personal introductions, course goals, and objectives; presented instructional content; and provided class and individual feedback. Students communicated responses to discussion questions, commented on video content of fellow students, and reflected on course progress and motivation. Qualitative data were collected from instructor journals, notes, student course evaluations, and interviews.

Key findings of student perceptions suggest that the use of video enhances instructor immediacy and serves to establish positive and motivational relationships with

students. Students perceived instructor feedback as more personal and attentive to their needs (Griffiths & Graham, 2010).

Instructors also perceived an enhanced personal connection with students. They believed that student responses via video were rich in tone and context, making it easier for instructors to discern student knowledge and comfort levels. They also reported enhanced student collaboration as students learned from each other via video. The findings of this study provide insights into how one CMC tool, video, can enhance an asynchronous online learning environment.

Student perceptions of synchronous vs. asynchronous CMC tools.

In a quantitative study of pre-college students (n=133), participants self-selected into one of two learning environments: asynchronous only (A-group) and asynchronous plus synchronous (A+S group) (Giesbers, Rienties, Gijselaers, Segers, & Tempelaar, 2009). The A-group was limited to text-based discussions while the A+S group experienced weekly synchronous video web-conferences in addition to text-based discussions. The web-conferences were used to help participants get acquainted with each other, discuss the course design and goals, and discuss weekly assignments.

Giesbers et al. (2009) used a pre-course survey to measure student motivation (intrinsic vs. extrinsic) and perceptions of online learning. An end of course survey was administered to evaluate student perceptions on course assessments, course design, course materials, goals and tasks, group collaboration, instruction, and overall learning satisfaction. Demographic data for age, gender, and hours spent on course work were also collected. Results indicated no differences between groups for age, gender,

communication technology skills, or prior experience with online learning. Only a slight difference was reported for motivation types.

The A+S group rated course design and course materials lower than the A group, but rated instruction higher. No differences were noted between the groups for the other variables. Overall, Giesbers et al. (2009) concluded that the addition of the web-conferencing tool provided no added benefit for participants in the study, even though instruction was perceived as better. They suggested that the richer learning environment of web-conferencing may have been more distracting than helpful and that the A+S group may have been overburdened by the additional requirement of participation in web-conferencing. It is also possible that students perceived the web-conferencing as a redundant course element as it provided no added benefit to the learning process beyond what was provided through asynchronous course elements.

Another quantitative study (n=347) compared student perceptions of social presence, teaching presence, cognitive presence, and learning between asynchronous and synchronous learning environments (Rockinson-Szapkiw, Baker, Neukrug, & Hanes, 2010). An online survey was administered to students enrolled in forty-two online graduate and undergraduate courses at fifteen higher education institutions. The survey instrument included Community of Inquiry (discussed later in this chapter) survey items, perceived learning items, demographic items, and course experience items. Additional qualitative data was collected through open questions included in the survey instrument.

Data analyses included MANOVA for evaluating social, teaching, and cognitive presence and independent t-tests for evaluating differences in learning perceptions. When means for social presence, teaching presence, and cognitive presence were combined, the

difference between the synchronous and asynchronous groups was statistically significant. Taken individually, however, the differences in means between the groups for teaching presence and for cognitive presence were not statistically significant. The difference in means for social presence was statistically significant but with a small effect size. The difference in means between groups for learning perception was not statistically significant. These results seem to support the conclusion of Giesbers et al. (2009) that the addition of video-conferencing to an online learning environment appears to have little effect on student perceptions. However, the broad sampling across various courses and institutions may have introduced several confounding variables related to course disciplines, course designs, learning philosophies, instructional methods, and differences in CMC tools and learning management systems.

When given a choice, student preferences for asynchronous vs. synchronous CMC media depend on a variety of factors (Havard, Du, & Xu, 2008). In a small, mixed-methods study, graduate students (n=26) chose between asynchronous discussion forums and synchronous text chat (both text-based CMC tools) depending on the collaborative tasks assigned. Students selected asynchronous discussion forums (ADFs) at project initiation to establish topics and direction. Using ADFs solicited participation from all group members, reduced ambiguities, and provided mutual understanding among group members. Synchronous text chat was selected to assign project roles, to discuss project tasks, and to provide immediate feedback.

Factors influencing student preferences included convenience, flexibility, efficiency, and privacy. ADFs were considered more flexible and convenient in terms of time and scheduling. They do not require everyone to be online at the same time and they

allow time to reflect and think about responses before posting them. However, ADFs were viewed as less private because all posts could be viewed by all group members. These findings suggest that ADFs are effective CMC tools for information sharing and that text chat is effective for creating social presence and providing immediacy (Havard et al., 2008).

Summary of CMC research.

In summary, there exists a wide variety of CMC tools that can support online learning by delivering instructional content through different modes and media. Appropriate selection of CMC tools must consider many factors including the effects on cognitive processing and collaboration, technological demands and limitations, flexibility vs. stability, instructor training requirements, and learners' perceptions.

Learners process visual and audio/verbal information through different channels that can be overloaded with too much content or media. Research based principles that guide the design and use of media suggest that multi-media engage both channels in ways that maximize essential and generative processing. Redundancy and extraneous processing should be minimized.

Different types of media support different types of learning tasks. Synchronous media enhance social presence and spontaneous collaboration while asynchronous media support critical thinking and reflective collaboration. Asynchronous media also support learner control of the learning process in terms of content sequencing, pacing, and time flexibility.

Learners' perceptions are affected by the amount and combination of CMC tools used in online learning. Video/audio CMC tools seem to improve perceptions of social

and teaching presence. The simple addition of more media tools is not always perceived as beneficial and may be detrimental. Some media, such as asynchronous discussion forums, are perceived as useful for information sharing, and other media, such as text chat, are perceived as useful for group communication and decision-making. Learner perceptions are also influenced by familiarity and comfort levels with different media.

The Community of Inquiry Model

This current study is an evaluation of CMC tools and student perceptions of their helpfulness for online learning. Good research requires a sound theoretical framework from which to develop research questions, to guide methodology, and to evaluate results (Gay, Mills, & Airasian, 2006). Two educational theories that have guided online learning designs are cognitive theory and constructivist theory (Ally, 2004). In an online learning environment, cognitive theory suggests that information should be delivered via different modes of communication to assist cognitive processing and memory retention. It also suggests that reflection, collaboration, application, and meta-analysis activities enhance learner cognition.

Constructivist theory suggests that effective online learning is active, not passive; allows learners a level of control over learning experiences; encourages collaboration and cooperation among learners; and promotes interaction and social presence. While there is no single educational theory specific to online learning, the framework for a model has been developed from these cognitive and constructivist theories: the Community of Inquiry (CoI) Model (Garrison, Anderson, & Archer, 2000).

The CoI model.

Based on the assumption that effective learning requires a sense of community and opportunities for collaboration and discussion, the CoI model was developed in the late 1990s in response to concerns about the effectiveness of online learning in higher education settings. At that time, online learning was similar to traditional distance learning in that little or no face-to-face interactions occurred among instructors and students (Larreamendy-Joerns & Leinhardt, 2006). Computer-mediated communications (CMC), such as e-mail and asynchronous discussion boards, had been considered inadequate for generating critical thinking because participants were limited to text-based communication.

In contrast, the developers of CoI suggested that asynchronous, text-based communication provided more time for reflection, tended to be more complex and explicit, and were associated with careful, critical thinking (Garrison, Anderson, & Archer, 2000). They developed a theoretical framework to describe and evaluate the learning process in an asynchronous, text-based learning environment delivered through computer conferencing.

CoI theoretical framework.

A community of inquiry is a group of students and at least one instructor who engage in discussions focused on constructing knowledge or solving a problem (Garrison et al., 2000). The CoI model assumes that the best learning experience is "a collaborative communication process for the purpose of constructing meaningful and worthwhile knowledge" (Garrison et al., 2000, p. 92).

The model shown in Figure 1 consists of three elements that interdependently promote effective learning: social presence, teaching presence, and cognitive presence. Social presence refers to the extent to which participants are able to express themselves personally and to experience a sense of belonging to the learning community. Teaching presence refers to the extent to which the instructor effectively designs and facilitates the learning process. Cognitive presence refers to the extent to which participants can create meaning through the learning process of inquiry and discussion. These three elements overlap to create an effective educational experience in a learning community environment.

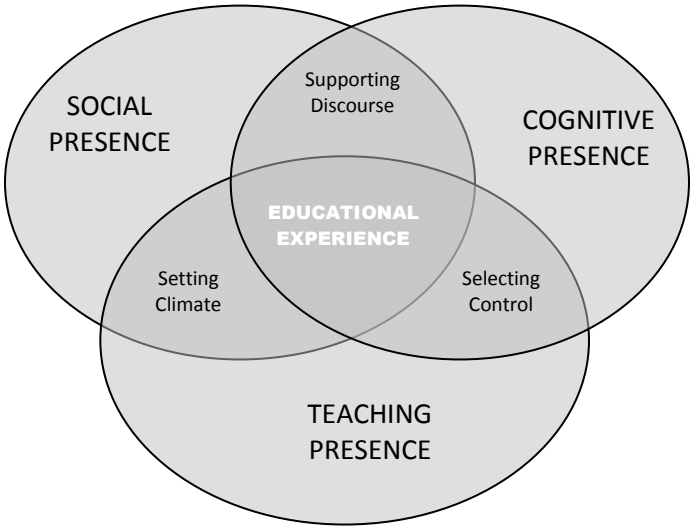

Figure 1. Community of Inquiry Model. From "Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education," by D. R. Garrison, T. Anderson and W. Archer, 2000, The Internet and Higher Education, 2(2-3), p. 86. Copyright (2000) by D.R. Garrison. Reprinted with permission.

Each element of the CoI model is defined by categories with designated indicators (see Table 1). Social presence includes three categories: emotional expressions, open communication, and group cohesion. Teaching presence includes categories of

instructional management, building understanding, and direct instruction. Cognitive presence categories reflect a process of four steps: triggering event, exploration, integration, and resolution. Examples of indicators for these categories are provided in Table 1.

Table 1.

Community of Inquiry Indicator Examples

Elements	Categories	Example Indicators
Cognitive presence	Triggering event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Apply new ideas
Social presence	Emotional expression	Emotions
	Open communication	Risk-free expression
	Group cohesion	Encouraging collaboration
Teaching presence	Instructional management	Defining and initiating discussion topics
	Building understanding	Sharing personal meaning
	Direct instruction	Focusing discussion

From "Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education," by D. R. Garrison, T. Anderson and W. Archer, 2000, The Internet and Higher Education, 2(2-3), p. 89. Copyright (2000) by D.R. Garrison. Reprinted with permission.

Content analysis research.

Indicators for the CoI model elements and categories were developed and evaluated through content analysis research studies (Anderson, Rourke, Garrison, & Archer, 2001; Garrison, Anderson, & Archer, 2001; Rourke, Anderson, Garrison, & Archer, 1999). Separate studies were done for each of the three elements: social presence, teaching presence, and cognitive presence. In these seminal studies, coding instruments

with indicators for each category were developed based on prior research of media, teachers, and group interactions. The instruments were then used to analyze the content of transcripts from asynchronous, text-based computer conferences, and indicators were modified based on findings. Methodological issues of unit of analysis and inter-rater reliability were addressed in all three studies. The following paragraphs describe each element of the model and the indicators that have been researched.

Social presence.

Social presence provides support to the learning process by making group interactions enjoyable and inclusive. In order for a community of learners to communicate effectively, participants need to bond with the group and feel accepted and heard.

Through quantitative content analysis of transcripts from computer-mediated discussions, three types of social presence have been identified: affective, interactive, and cohesive (Rourke, Anderson, Garrison, & Archer, 1999). Affective indicators include expressions of emotion (including emoticons), use of humor, and self-disclosure. Interactive indicators reflect an environment of open communication typified in statements that continue a thread of discussion, quote statements of others, reference others, ask questions, compliment or express appreciation of others, or express agreement. Cohesive indicators reflect collaborative activity through statements that address others by name, make trivial social comments, and use inclusive terms.

Collectively, low frequencies of these indicators suggest a cold, impersonal learning environment, while high frequencies suggest a warm, collegial environment. In this seminal study on social presence, Rourke et al. (1999) employed a measure of social

density to adjust for differences in word counts among transcripts. They determined that the instrument effectively measures differences in social presence and that social presence can decrease as a conference progresses.

Teaching presence.

Teaching presence affects student satisfaction, student perceptions of learning, and the group sense of community. Teaching presence is defined as the "design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001, p. 5).

In a study to assess teaching presence in asynchronous, text-based learning, Anderson et al. (2001) classified three categories of teaching presence: design and organization, facilitation, and direct instruction. Indicators for design and organization include course structure, schedule, content, learning activities, and assessments. Indicators for facilitation include identifying points of agreement or disagreement, building consensus, encouraging participation, and keeping discussions on topic. Indicators for direct instruction include providing content, correcting misconceptions, adding viewpoints or resources, summarizing discussions, scaffolding learning, and providing meta-cognitive awareness.

In this study (Anderson et al., 2001), two coders performed content analysis using these indicators on transcripts from two graduate level courses. Results indicated that direct instruction was most frequently noted, followed by facilitation. Design and organization was less frequently noted because these activities are generally completed prior to the discussion activity. The coding tool successfully measured significant

variations in teaching patterns between the two courses studied. Anderson et al. (2001) suggest that differences in teaching style, educational philosophy, class size, and familiarity with technology may explain the variations. They proposed additional uses for the tool as a diagnostic instrument to assess teaching presence and as a research tool to study variables affecting teaching presence.

Cognitive presence.

Cognitive presence is defined as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison, Anderson, & Archer, 2001, p. 11). It refers to the conditions and processes that enable participants in a community of inquiry to build and apply knowledge through a collaborative and constructivist approach to learning.

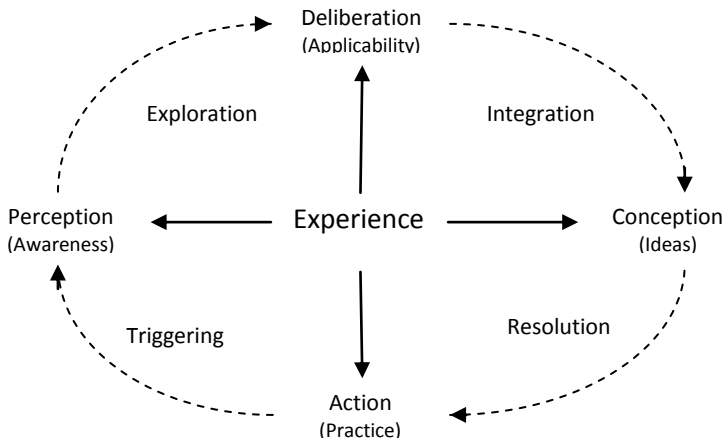

Figure 2. Practical Inquiry Model. From "Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education," by D. R. Garrison, T. Anderson and W. Archer, 2000, The Internet and Higher Education, 2(2-3), p. 99. Copyright (2000) by D.R. Garrison. Used with permission.

Garrison et al. (2001) developed a Practical Inquiry model (see Figure 2) to define four phases of cognitive presence: triggering event, exploration, integration, and

resolution. Indicators for each phase were used to create a coding template for transcript content analysis. Indicators for a triggering event are statements that introduce a problem or express a sense of puzzlement. Indicators for exploration are expressions of divergent ideas, exchanges of information, suggestions, brainstorming, or unsupported opinions. Indicators for integration are evidence of converging ideas, synthesis of information, or proposed solutions. Finally, indicators for resolution suggest that a problem is solved or a consensus is reached as evidenced by practical applications and testing or defending of solutions.

As in the other studies, Garrison et al. (2001) used a coding instrument to conduct content analysis on transcripts of asynchronous computer conferences. The unit of analysis for this study was at the message level, which was believed to be more objective and easier to identify and code. Results of the content analysis found that most indicators reflect the exploration phase of cognitive presence. Lower frequencies of the integration and resolutions phases were attributed to less focus on advanced inquiry, lack of instructor facilitation, and effects of the communication medium. The researchers also noted that the model of Practical Inquiry might be best suited for applied knowledge learning contexts.

These early studies of CoI provided a quantitative methodology for transcript content analysis. They were appropriate for exploratory and descriptive studies, but the methodology was very labor intensive and time consuming. The need was identified for a survey tool that could be used in quantitative studies of larger samples and across varied contexts.

CoI survey instrument research.

Beginning in 2003, researchers began to explore the development of a survey tool to evaluate student perceptions of the CoI elements quantitatively (Arbaugh et al., 2008; Arbaugh, 2008; Swan et al., 2008). Arbaugh (2008) developed a twenty-two item survey to evaluate CoI elements in asynchronous online MBA courses. The survey expanded to thirty-four items for a multi-institutional study to develop a valid, psychometrically sound instrument (Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, & Swan, 2008). The online courses included in the multi-institutional study were designed and delivered utilizing CoI concepts. Instructors presented learning units with broad topics and facilitated threaded discussions as integral parts of each course unit.

Arbaugh et al. (2008) administered the survey to graduate students (n=287) across four institutions of higher education in the US and Canada. Principal components analysis verified the three subscale structure of the model. The three elements, social presence, teaching presence, and cognitive presence, accounted for 61.3% of the total variance in scores. A Scree plot supported the three factor model, and internal reliability was measured using Cronbach's alpha. Results supported the construct validity and gave evidence of overlap among the three elements. External validity was supported by the multi-institutional sample but limited to graduate level courses in only two disciplines, education and business.

Relationships among social, teaching, and cognitive presence.

Another validation study of the survey was conducted to investigate relationships among social, teaching, and cognitive presence (Shea & Bidjerano, 2009). The survey was administered to a random sample (n=2159) of participants in a fully online learning

network. The sample was characterized by broad demographics across thirty public institutions. Confounding variables of course management system, faculty, technology infrastructure, and help-desk features were controlled.

Using factor analysis, Shea and Bidjerano (2009) affirmed the three factor solution, reporting that social, teaching, and cognitive presence combined explained 63% of the total variance. Structural equation modeling results demonstrated direct effects between elements as measured by standardized path coefficients: teaching to cognitive (0.49), teaching to social (0.52), and social to cognitive (0.52). Both teaching and social presence appeared to be influential predictors of cognitive presence. Chi-square automatic interaction detection (CHAID) was used to evaluate individual survey items, and results indicated that 70% of the variance in cognitive presence was based on reports of instructor effectiveness in fostering teaching and social presence.

Similar results were obtained and reported in a preliminary report by Archibald (2010). Participants (n=189) were surveyed at two higher education institutions across various academic levels in the discipline of research methods. Hierarchal multiple regression results found the three elements highly correlated, with 69% of the variance for cognitive presence explained by teaching and social presence. It appears that the elements of CoI are inter-dependent and thus should be studied collectively whenever the survey instrument is employed. It also appears that cognitive presence is highly dependent upon teaching and social presence.

CoI survey across multiple disciplines.

The CoI survey was evaluated across multiple disciplines in a study designed to measure how the three elements vary for different courses of study (Arbaugh, Bangert, &

Cleveland-Innes, 2010). The survey was administered at two US institutions: a mid-size western university (n=1173) and a midwestern university MBA program (n=409). Course disciplines included education, nursing, business, allied health and technical, engineering, science/math, organizational behavior, human resource management, project management, operations management, information systems, finance, accounting, ethics, and professional development. Demographics were collected for gender, age, academic level, and prior experience with online learning. Factor analysis was used to assess the instrument construct validity, and results supported the three factor solution for the three defined elements with Cronbach's alpha ranging between 0.87 and 0.96. Two-way ANOVA was used to evaluate effects of course discipline and delivery mode (online vs. blended).

Arbaugh et al. (2008) found that the main effect of course discipline was statistically significant for all three elements: social, teaching, and cognitive presence. Post hoc analyses found that students enrolled in allied heath and technical courses rated all three elements higher than those enrolled in nursing, business, engineering, science/math, social sciences, and "other" courses. No significant differences in ratings were found between allied health courses and education courses, but education courses were rated significantly higher than engineering courses. Among the MBA students, teaching presence was rated higher for marketing and "other" courses; non-quantitative courses were rated higher in cognitive presence than quantitative courses; and minimal differences were reported among courses for social presence.

Arbaugh et al. (2008) concluded that the CoI model may be more applicable to courses/disciplines characterized by multiple or competing paradigms (i.e., education)

than to courses/disciplines characterized by a single or dominant paradigm (i.e., science/math). Additionally, based on the constructivist assumptions of CoI, the model may be more applicable to disciplines that apply knowledge (i.e., health) than to those focused on knowledge acquisition (i.e., biology).

Student perceptions of learning and satisfaction.

The CoI survey instrument has also been used to predict student perceptions of learning and satisfaction with course delivery systems. Arbaugh (2008) administered the survey to a volunteer sample of 656 students (54.7% response rate) enrolled in MBA online courses delivered primarily through asynchronous interactions by two different course delivery systems. Independent variables of social, teaching, and cognitive presence were studied for possible correlations with student perceptions of learning and satisfaction with course delivery system.

Results suggest that teaching and social presence are positively associated with perceived learning and course delivery system satisfaction. Cognitive presence is positively associated with perceived learning, but is not a significant predictor of satisfaction with delivery system. Teaching and cognitive presence are primary predictors of perceived learning, with social presence acting as a moderating variable. Social presence is a strong predictor of satisfaction with learning delivery medium.

Summary of CoI instrument research.

In summary, research supports the reliability and validity of the CoI survey instrument. It supports the internal reliability and the three-factor construct of social presence, teaching presence, and cognitive presence. The elements are highly correlated, inter-dependent, and teaching presence and social presence are strong predictors of

cognitive presence. Research supports the instrument's external validity but suggests that the CoI model is most suited for surveying courses characterized by multiple paradigms and applied disciplines. Teaching and cognitive presence may be predictors of perceived learning, and social presence may be a predictor of student satisfaction with course delivery systems.

Reviews of research on CoI.

Two literature reviews of research on the CoI model have been conducted by different teams of researchers. Two of the model developers provided a general review, and another team provided a critical review.

A general review of CoI research.

Garrison and Arbaugh (2007), two of the model developers, did not describe the methodology employed for their literature search nor any criteria for inclusion. Based on the studies cited in their review, social presence appears to be the most studied element of the model. Studies of social presence suggest that there are strong relationships between social presence and learning outcomes, that cultivation of social presence enhances learner satisfaction, and that collaborative activities increase social presence and the sense of online community. Some research indicates that social presence indicators rise and fall in frequency over time. The authors propose that the types of discussions, the nature of learning tasks, or gender may be factors that influence these shifts. Additional questions yet to be answered are whether high levels of social presence might detract from cognitive presence and whether social presence progresses naturally without reinforcement.

Garrison and Arbaugh (2007) cited cognitive presence as the most difficult element to study. They noted that participant interaction is critical for promoting cognitive presence and that interaction can be affected by course or discussion formats and by group composition. Research suggests a difficulty in moving participants beyond the exploration phase, in which students exchange information, toward the integration and resolution phases, in which students apply and integrate knowledge (see Figure 2). Garrison and Arbaugh (2007) attribute this difficulty to a lack of teaching presence, the nature of the assigned task or question, the level of collaboration required, ineffective course design, or insufficient facilitation.

No findings on teaching presence were discussed in the review, but suggestions were offered for future research. Garrison and Arbaugh (2007) call for more research to enhance the rigors of methodology and data analysis, to study relationships and interactions among the three elements of CoI, and to test the model in disciplines other than education. They also suggest how the model may be used to address practical pedagogical issues, such as best practices for creating social presence and utilization of new technologies.

A critical review of CoI research.

Rourke and Kanuka (2009) conducted a literature review of empirical studies of CoI with the express purpose of evaluating the extent to which "deep and meaningful learning" occurs. The mixed methods, case study methodology was clearly described. Literature selection focused on learning as studied via the CoI model, using the developers' names to locate key articles from three databases. Once a summary database was created, they developed constructs and proposed causal linkages using deep,

meaningful learning as the dependent variable and the three elements of the model as independent variables. Results of their analysis were compared with other empirical work on deep and surface learning and with studies in educational assessment. They invited other researchers, including the model developers, to corroborate their findings.

According to Rourke and Kanuka (2009), most of the forty-eight empirical studies reviewed did not evaluate learning at all. Five measured student perceptions of learning; one measured learning using Brigg's SOLO taxonomy; and one measured learning using Bloom's taxonomy. Based on these results, they conclude that the CoI model fails in three ways: as a program of research, as a model for e-learning, and as a model to encourage deep and meaningful learning.

Because the model depends on student perceptions and self-reporting, Rourke and Kanuka (2009) dismiss its ability to assess learning. They suggest that learning is best measured by other tools, such as Brigg's SOLO taxonomy, concept-mapping, and testing techniques. They claim that the model is unable to identify clear instances of cognitive presence due to the infrequency of indicators and the preponderance of indicators occurring at the exploration level and not at the integration and resolution levels. Finally, they conclude that deep and meaningful learning does not arise at all in the CoI model.

Response to the critical review of CoI research.

Another team of seven researchers, including the original developers of the CoI model, responded to the Rourke and Kanuka (2009) review in the same journal (Akyol, Arbaugh, Cleveland-Innes, Garrison, Ice, Richardon & Swan, 2009). The response clarified the central claims of the CoI model and addressed concerns about the methodology employed in the Rourke and Kanuka (2009) review.

Akyol et al. (2009) assert that the focus of the model is on the educational process based on a constructivist approach to learning. Thus, the model describes how knowledge is constructed, not how objective outcomes are realized. The authors challenged the review methodology of Rourke and Kanuka (2009), noting that not all studies of CoI were included, that studies were taken out of context, and that the measurements used for learning were very limited. They argue that self reports of learning perceptions via a survey instrument should not be discounted as they are helpful in assessing whether cognitive presence has been attained. Such a tool serves to increase the generalizability of CoI research.

The controversy among these reviews is rooted in different objectives. When using the CoI model and the survey instrument developed from its elements, researchers must remember the constructivist assumptions that undergird its theoretical framework. Learning is a process with outcomes, but outcomes cannot be attained apart from an effective process. The CoI model of online learning is theoretically sound, and the survey instrument is valid and reliable for researching student perceptions of the learning process as defined by social, teaching, and cognitive presence.

Summary of CoI research.

The CoI model was developed from cognitive and collaborative theories of education. The model's three elements, social presence, teaching presence, and cognitive presence, have been empirically researched and validated through transcript content analyses based on indicators for each element. More recently, a thirty-four item survey instrument has been developed to evaluate student perceptions of the three elements. Multiple studies have been done to establish the validity and reliability of the survey and

have shown the three elements to be inter-dependent. The CoI model is most suited for researching applied disciplines for which multiple paradigms may exist. Not intended for measuring objective outcomes, the model, based on constructivist assumptions, effectively measures student perceptions of the learning process and is a suitable instrument for the present study of online learning.

Rationale for Current Study

While the need remains for distance learning in teacher training, online learning in the discipline of teacher training for special education has been minimally researched. Prior research suggests that effective learning can be accomplished through computer-mediated communication tools, but the studies are few. More studies are needed to understand how the use of CMC tools can be used effectively for providing instruction that delivers knowledge, skills, and dispositions needed for teacher training in special education.

Advances in educational technology have introduced a wide variety of CMC tools that are being used in greater numbers and combinations for online learning. Some examples of CMC tools include e-mail, discussion forums, blogs, text chat, and web-conferencing. The different media characteristics of these tools may impact learning in different ways. Early research suggests that the usage of CMC tools affect student perceptions of online learning, but little research has been done to understand how learners perceive the helpfulness of CMC tools for their learning.

The CoI model provides a sound theoretical framework and a reliable survey tool for evaluating student perceptions of online learning environments. The model includes three inter-dependent elements of social presence, teaching presence, and cognitive

presence that collectively measure perceptions of the learning process. These three elements have been found to be highly correlated. A valid survey instrument has been developed that may be useful in evaluating the effects of different CMC tools on student perceptions of online learning. No research studies were found that utilize the CoI model as a framework for online learning in the context of teacher training in special education.

Using the CoI theoretical framework, this study evaluates the online experiences of teachers in training for special education. The purpose of this study is to evaluate how students perceive the helpfulness of CMC tools for online learning and to determine whether CMC tool helpfulness is related to student perceptions of teaching, social or cognitive presence.

The next chapter presents the methodology for the study, including the variables, research questions, hypotheses, study design, participants, instrumentation, and data collection and analysis procedures.

CHAPTER THREE: METHODOLOGY

Using the CoI theoretical framework, this study evaluates the online experiences of teachers in training for special education. The purpose of this quantitative study is to evaluate how students perceive the helpfulness of CMC tools for online learning and to determine whether CMC tool helpfulness is related to student perceptions of teaching, social, or cognitive presence. Specifically, this study evaluates student perceptions of CMC tool helpfulness for social and teaching presence; explores the effects of different CMC tool usage on social, teaching, and cognitive presence; and explores possible relationships between CMC tool helpfulness and social and teaching presence.

This chapter presents the research methodology for the study. The chapter is divided into sections that present the variables, research questions, study design, participants, instrumentation, data collection, data analysis, and a chapter summary.

Variables.

Dependent variables.

The dependent variables for this study are social, teaching, and cognitive presence. Social presence evaluates the extent to which students perceive themselves as real people engaged in communications and interactions with others. Teaching presence evaluates the extent to which students perceive the instructor's design and facilitation of the learning experience. Cognitive presence evaluates the extent to which students perceive an ability to construct meaning.

Independent variables.

The independent variables are student perceptions of CMC tool helpfulness and different combinations of CMC tool usage. Additional background demographic variables are evaluated to determine possible associations with the dependent variables.

CMC tool helpfulness.

CMC tools are used to facilitate communications and interactions among students and between students and teachers. The CMC tools included in this study are e-mail, news forums, discussion forums, Wimba™ web-conferencing, phone, and Skype™ (voice over Internet). Some tools may be more helpful than others for different communications and interactions.

The Community of Inquiry (CoI) instrument measures social and teaching presence based on communication and interaction factors. The CoI instrument measures social presence by assessing perceptions about affective expression, open communication, and group cohesion. The CoI instrument measures teaching presence by assessing perceptions about organization, facilitation, and direct instruction. It is expected that these perceptions are directly influenced by the interactions and communications that take place among students and between students and instructors through CMC tools. This study evaluates CMC tool helpfulness for communications and interactions associated with promoting social and teaching presence. Individual scale scores were developed for CMC tool helpfulness for social and teaching presence, respectively.

However, in the CoI instrument, cognitive presence is not evaluated based on communication and interaction factors. Evaluation of cognitive presence is based on student responses to questions about interest, exploration, integration, and resolution

factors. For this reason, CMC tool helpfulness for cognitive presence is not measured as an independent variable with its own scale score.

CMC tool usage.

As noted in chapter two, various CMC tools are used in the design and facilitation of online courses. Of particular interest to this study is the usage of Wimba™ web-conferencing. Does the inclusion of synchronous web-conferencing have an effect on social, teaching, and/or cognitive presence? Means for the dependent variables are compared between participants who used Wimba™ and those who did not use Wimba™.

Background variables.

To assess possible associations with the dependent variables, this study evaluated the effects of gender, level of study, registration status, discipline concentration, prior online course experience, and prior years of teaching.

Research Questions and Hypotheses

There are four main research questions for this study.

Research question one.

How do students perceive the helpfulness of different CMC tools for promoting teaching and social presence?

The researcher developed a series of survey questions to assess CMC tool helpfulness for promoting social presence and teaching presence. Four questions were developed to assess helpfulness for teaching presence, and two questions were developed to assess social presence. Additionally, participants were asked to assess comfort levels with the different CMC tools included in the study.

Research question two.

Is there a difference in student perceptions for the following factors between courses that do/do not include synchronous online meetings (web- conferencing):

a. social presence?
b. teaching presence?
c. cognitive presence?

Participants were divided into different groups based on their usage of Wimba™ web-conferencing. Means for social, teaching, and cognitive presence were compared across groups.

Hypotheses.

The following hypotheses were tested:

Null: There is no difference among the means for student perceptions of social (teaching, cognitive) presence for courses that utilize Wimba™, for courses that utilize discussion forums, and for courses that utilize both.

$\mu_{SP\_WMBA} = \mu_{SP\_DF} = \mu_{SP\_Both}$

$\mu_{TP\_WMBA} = \mu_{TP\_DF} = \mu_{TP\_Both}$

$\mu_{CP\_WMBA} = \mu_{CP\_DF} = \mu_{CP\_Both}$

Alternate: There is a significant difference between at least one pair of the social (teaching, cognitive) presence means for courses that utilize Wimba™, for courses that utilize discussion forums, and for courses that utilize both.

$\mu_{SP\_x} =/= \mu_{SP\_y}$ for at least one pair

$\mu_{TP\_x} =/= \mu_{TP\_y}$ for at least one pair

$\mu_{CP\_x} =/= \mu_{CP\_y}$ for at least one pair

Key: SP= social presence; TP=teaching presence; CP=cognitive presence; WMBA= Wimba™ web conference meetings; DF= discussion forums; Both= Wimba™ + discussion forums

Research question three.

Are student perceptions of CMC tool helpfulness associated with student perceptions of social or teaching presence?

Prior research has shown that social, teaching, and cognitive presence are highly correlated and that both teaching and social presence appear to be influential predictors of cognitive presence (Archibald, 2010; Shea & Bidjerano, 2009). Social presence and teaching presence are facilitated through the CMC tools used. Different tools may be more or less helpful in promoting teaching or social presence. It is important to understand possible relationships between student perceptions of CMC tool helpfulness for promoting social and teaching presence and their overall perceptions of social and teaching presence. This study explored possible relationships between CMC tool helpfulness and overall social and teaching presence according to the model displayed in Figure 3.

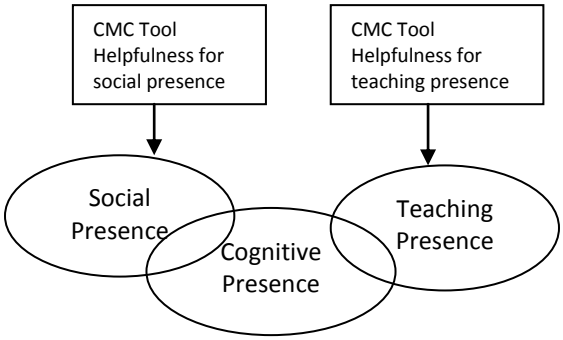

Figure 3. Model of relationships: CMC tool helpfulness and social and teaching presence.

The two independent variables for this research question are CMC tool helpfulness for social presence and CMC tool helpfulness for teaching presence. Relationships were explored between CMC tool helpfulness for social presence communications and overall social presence perceptions and between CMC tool helpfulness for teaching presence communications and overall teaching presence perceptions.

Research question four.

Are background demographic variables associated with social, teaching, or cognitive presence?

Background demographic variables were studied to determine any possible associations with the dependent variables of teaching, social, and cognitive presence. These variables included gender, level of study, registration status, concentration, prior experience with online learning, and teaching experience.

Design of Study

The context for the study is online learning at a large public university in the southeastern United States. To minimize the effects of variations across different schools, departments, disciplines, and course designs within the university, one department of graduate level study was selected for inclusion in this study. The selected department offers certificate and masters level courses to teachers in training for special or gifted education. This department has been offering distance education since the early 1990s and online courses for about six years. Most of the online instructors included in this study have multiple years of teaching experience with online courses.

During the spring 2011 semester, seven online courses in special or gifted education teacher training were selected for inclusion in the study. The criteria for inclusion were graduate level courses that were delivered entirely online. Courses that monitored internships were excluded. The courses varied in terms of content, instructor, and concentration, but all were part of the same department and utilized similar CMC tools to varying degrees. All of the courses were supported by the same technology support staff and were delivered via the Moodle ™ learning management system.

The seven courses were facilitated by eight different instructors, all of whom had facilitated at least one online course prior to the study. Seven of the instructors had facilitated three or more prior online courses, and one instructor had facilitated one prior course.

The CMC tools utilized by instructors varied among the courses included in the study. All instructors in the study self-reported some usage of e-mails (individual and group), discussion forums, and phone calls. All but one instructor utilized news forums. None of the instructors reported usage of voice over internet protocol (i.e.: Skype™) tools.

Among the instructors and their courses, there were two distinct groups: those that included regularly scheduled web-conferences via Wimba™ and those that did not include such conferences.

Participants

The participants for the study were pre-service or in-service teachers seeking certification or a master'ss degree in special or gifted education and who were enrolled in at least one of the graduate level online courses included in the study. Neither random

selection nor random assignment were employed. All students (n= 161) enrolled in the online courses included in the study were invited to participate. Participation in the study was completely voluntary and confidential.

Most of the participants were female (85%), most were enrolled in certification level courses (81%), and most were registered as part time students (89%). A little more than half of the participants were enrolled in the gifted education training program (54%), and those enrolled in special education training were split between general (24%) and adaptive (17%) programs. Most participants (83%) had taken at least one prior online course, and over one third (35%) had taken four or more prior online courses. Teaching experience among the participants ranged from none (20%) to more than three years (54%).

Instrumentation

A survey instrument was developed and used to collect data from participants in the study. The instrument consisted of three main parts:

1. Community of Inquiry (CoI)- 34 items
2. Computer mediated communication (CMC) tool helpfulness- 7 items
3. Demographic background variables -9 items

The CoI questions were taken from the instrument developed by Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, and Swan (2008) which assesses perceptions of social, teaching, and cognitive presence. The CMC tool helpfulness questions were developed by the researcher and focused on student perceptions of CMC tool helpfulness for teaching presence (four items), for social presence (two items), and

for student comfort with tool usage (one item). Survey items on CMC tool helpfulness included “did not use” as a response choice, as not all students utilize all tools.

Both the CoI and CMC survey items utilized a five point Likert scale (1= strongly disagree; 2= disagree; 3= undecided; 4= agree; 5= strongly agree). The demographic survey items were developed by the researcher and focused on gender, level of study, concentration of study, registration status, prior online learning experience, and teaching experience.

The survey was administered online via Survey Share ™. All but the final question of the survey were close-ended, and participants were instructed to select their responses by clicking on radio buttons or checkboxes. The questions were written using simple and clear terminology to enable participants to understand and to select the most appropriate responses. The final survey item solicited open answer comments. The entire survey was field tested by four students with online learning experience who provided feedback regarding survey length, terminology, organization, and navigation. The consisted of 53 items and 21 web pages. The complete survey instrument is presented in Appendix A.

Data Collection

Prior to the administration of the survey, the researcher obtained approval from the Institutional Review Board (IRB) at the sponsoring university (see Appendix C). All survey questions and invitations to participate were submitted for approval before commencement of the study.

All eight instructors of the seven online courses included in the study agreed to invite their students to participate. The researcher provided a script with a link to the

online survey for the instructors to e-mail to their students two weeks prior to the end of the spring 2011 semester. The researcher sent a second e-mail request to non-respondents one week later and a final e-mail request at the end of the semester. The survey stopped accepting responses two months after the initial invitation to participate. No incentives were offered to participants.

To begin the survey, participants entered an e-mail address. The opening page of the survey confirmed the survey title and purpose, provided instructions for completion, communicated the confidential nature of responses, and provided an estimate of time for completion. The opening page also explained that participation was completely voluntary and that consent was implied by survey completion. Participant institutional e-mail addresses served as access codes to the survey for purposes of monitoring responses and identifying non-responders. Survey Share™ provides this feature for tracking responses without associating e-mail addresses with individual survey responses, so confidentiality was maintained.

All survey items required responses, and one open answer item was included to provide participants with the opportunity to share additional information if desired. The closing page of the online survey expressed appreciation for participation and provided contact information to address respondent inquiries.

Data Analysis

The 93 completed survey responses were downloaded from the Survey Share™ web site into an Excel™ file and then imported into SPSS (version 15). Each survey item was analyzed for completeness, frequency distribution, and potential outliers. Two surveys exhibited the unusual pattern of identical responses across all items, suggesting

that the respondents chose not to consider the survey items individually in selecting their responses. The data from these two surveys were excluded from further analysis.

Variables.

The dependent variables for this study are scale scores for teaching presence, social presence, and cognitive presence as defined by the CoI instrument. Teaching presence (TP) measures student perceptions of the extent to which the instructor effectively designs and facilitates the learning process. A teaching presence scale score was calculated as the mean of thirteen items in the CoI survey instrument. Social presence (SP) measures student perceptions of the extent to which they are able to express themselves and to experience a sense of belonging to the learning community. A social presence scale score was calculated as the mean of nine items in the CoI survey. Cognitive presence (CP) measures student perceptions of the extent to which they can create meaning through the learning process. A cognitive presence scale score was calculated as the mean of twelve items in the CoI survey.

Cronbach's alpha was used to assess the internal consistency of the items which comprise the social presence, teaching presence, and cognitive presence scale scores. Alpha values greater than or equal to 0.90 were considered excellent; alpha values of 0.80 to 0.90 were considered good (George & Mallery, 2003).

The independent variables for this study are CMC tool usage and CMC tool helpfulness. The computer mediated communication (CMC) tools included in this study were e-mail, news forums, discussion forums, Wimba™ web-conferencing, text chat, phone, and Skype™ (voice over internet). Participants responded to three types of questions about CMC tool helpfulness in the survey instrument:

1. CMC tool helpfulness for teaching presence communications (4 items)
2. CMC tool helpfulness for social presence communications (2 items)
3. Comfort in using CMC tools

Two variables were formulated as scale scores to evaluate the helpfulness of each tool. The helpfulness for teaching presence communications was calculated as the mean of four items in the survey, and the helpfulness for social presence communications was calculated as the mean of two items. The individual items associated with each variable are indicated in the survey instrument presented in Appendix A.

Other background variables included gender, level of study, registration status, concentration, prior experience with online learning, and teaching experience. These variables were studied to determine any possible associations with the dependent variables of teaching, social, and cognitive presence.

Statistical analyses.

Descriptive statistical analysis was used to evaluate each of the variables for central tendency, variability, and frequencies. Correlations were analyzed to identify possible relationships among the variables in the study. Descriptive statistics were also used to address research question one.

Inferential statistics were employed to address research questions two, three, and four. The inferential statistics used included t-tests and one-way ANOVA to evaluate mean differences between and among groups. Homogeneity of variances was evaluated in conjunction with means testing. Tukey's HSD test was performed as a post hoc procedure to determine specific mean differences. Effect sizes were also evaluated.

Multiple regressions were applied to determine associations and relative contributions to the variance accounted for by each model.

Research question one.

How do students perceive the helpfulness of different CMC tools for promoting teaching and social presence?

To measure student perceptions of CMC tool helpfulness, scale scores were calculated to measure the helpfulness of each CMC tool, and reliability was evaluated using Cronbach's alpha. Means were calculated to measure central tendency, and standard deviations were calculated to measure variations. Frequency distributions were evaluated for normalcy, and box plots were generated to determine possible outliers.

Research question two.

Is there a difference in student perceptions for the following factors between courses that do/do not include synchronous online meetings (web- conferencing):

a. social presence?

b. teaching presence?

c. cognitive presence?

Research question two evaluates three groups of CMC tool usage. Group one utilized Wimba™ synchronous web-conferencing but did not utilize asynchronous discussion forums. Group two utilized asynchronous discussion forums but did not utilize Wimba™. Group three utilized both Wimba™ and discussion forums. One-way ANOVA was used to determine possible mean differences among the groups.

Research question three.

Are student perceptions of CMC tool helpfulness associated with student perceptions of social or teaching presence?

Pearson correlation coefficients and multiple regressions were used to evaluate research question three. Each of the scale scores for CMC tool helpfulness was evaluated for possible correlations with the scale scores for social and teaching presence. Standard multiple regressions were applied to highly correlated variables to determine associations and relative contributions to the variance accounted for by each model.

Research question four.

Are student demographics associated with student perceptions of social, teaching, or cognitive presence?

T-tests and one-way ANOVA were used to evaluate research question four. The main purpose for these statistical analyses was to determine whether these background variables have any associations with the dependent variables of social, teaching, and cognitive presence. Gender, level of study, and registration status were evaluated using t-tests, as each variable consisted of two groups. Concentration, prior experience with online learning, and prior teaching experience were evaluated using one-way ANOVA.

Summary of Methodology

This chapter presented the research methodology for the study. The purpose of the study is to understand student perceptions of computer mediated communication (CMC) tool helpfulness for online learning. Four research questions were developed to study how students perceive the helpfulness of CMC tools, the differences in perceptions among groups that utilize synchronous and/or asynchronous CMC tools, the possible

relationships among perceptions of CMC tool helpfulness and social, teaching, and cognitive presence, and which background demographic variables may have any association with social, teaching, or cognitive presence.

The participants of the study were graduate level students enrolled in special or gifted education teacher training courses that were delivered entirely online through a large, public university in the southeastern U.S. An instrument was developed to survey participants about their perceptions of online learning and about the CMC tools utilized in their courses. The survey was conducted online through Survey Share™ during the last three weeks of the courses.

Data from the survey were downloaded and statistically analyzed via SPSS. Scale scores were calculated for the dependent variables: social, teaching, and cognitive presence. Scale scores were also calculated for the independent variables for CMC tool helpfulness. Reliability for all scale scores was tested using Cronbach's alpha.

Descriptive statistical analyses included frequency distributions, means for central tendencies, and standard deviations for variability. Possible correlations among variables were analyzed using Pearson's coefficient.

Inferential statistical analyses included tests for homogeneity of variances, t-tests, one-way ANOVA, Tukey's HSD test, and effect sizes. Standard multiple regressions were applied to determine associations and relative contributions to the variance accounted for by each model.

Chapter three has presented the methodology for the study. The following chapter presents the results of the study, including survey response rates, descriptive and inferential statistical results, and demographic descriptive results.

CHAPTER FOUR: RESULTS

This chapter presents the results of the study. First, the survey response rates are presented. Second, results for the dependent variables are presented. Third, results for each of the research questions are presented in order, including a brief summary for each question. Finally, a summary of the study results is presented.

Survey Response Rates

Table 2 shows survey response rates by course and instructor. Some participants were enrolled in multiple courses, so the overall participation rate of 58% has been adjusted to account for these multiple enrollments. Responses were received for each of the courses included in the study with response rates ranging from 23% to 70%. Because the overall response rate was favorable, and all courses were represented, no additional procedures were performed to sample non-respondents.

It should be noted that one instructor taught two of the larger courses, resulting in a disproportionate number of study participants for this instructor (n= 39 or 42%).

Table 2

Survey Response Rates

Course (Instructor)	Survey Respondents	Course Enrollment	Response Rate
1 (a)	8	17	47%
1 (b)	5	9	56%
2	5	22	23%
3	16	23	70%
4	4	14	29%
5	3	8	38%
6 (a)	13	24	54%
6 (b)	14	23	61%
7	25	46	54%
Totals	93	186	
Duplicate enrollments		-25	
Overall	93	161	58%

Dependent Variables

The dependent variables for this study are teaching (TP), social (SP), and cognitive (CP) presence. Scale score means for each of these variables were calculated from survey item responses associated with each type of presence. Responses were based on a 5-point Likert scale (1= strongly disagree; 5= strongly agree). The scale score means, standard deviations, and Cronbach's alpha for these variables are presented in

Table 3. The individual items associated with each variable are indicated in the survey instrument presented in Appendix A.

Table 3

Dependent Variable Descriptive Statistics and Reliability (n= 91)

	TP	SP	CP
Scale Score Mean	4.12	3.93	4.15
Std. Dev.	0.76	0.54	0.54
Number of items	13	9	12
Cronbach's alpha	0.95	0.87	0.91

The mean scores suggest that the participants generally agreed with statements regarding teaching, social, and cognitive presence. Perceptions on teaching and cognitive presence were comparable while perceptions on social presence were slightly lower. Standard deviations were similar for social and cognitive presence, 0.54 and 0.54, respectively. The standard deviation for teaching presence was greater at 0.76, suggesting more variability for this variable. The Cronbach's alpha scores are good to excellent as they are 0.80 and higher (George & Mallery, 2003), and they are consistent with those reported in prior research for these variables (Arbaugh, Bangert, & Cleveland-Innes, 2010).

The dependent variables were evaluated for possible correlations. Table 4 presents the Pearson coefficients for teaching, social, and cognitive presence. As indicated by Pearson correlation coefficients that range from .59 to .72, the three

dependent variables are highly correlated in a positive direction. These results are consistent with those of prior research on the CoI survey instrument (Archibald, 2010).

Table 4

Pearson Correlations for Teaching, Social and Cognitive Presence (n= 91)

	TP	SP	CP
Teaching presence (TP)	1		
Social presence (SP)	.59(**)	1	
Cognitive presence (CP)	.72(**)	.65(**)	1

** Correlation is statistically significant at the .01 level (2-tailed).

Helpfulness of CMC Tools

RQ1: How do students perceive the helpfulness of different CMC tools?

The computer mediated communication (CMC) tools included in this study were e-mail, news forums, discussion forums, Wimba™ web-conferencing, text chat, phone, and Skype™ (voice over Internet). It should be noted that Wimba™ and its text chat feature were not available to all participants as not all courses included web-conferencing as an instructional feature. News forums and discussion forums were available to all students via the Moodle ™ learning management system. E-mail was available to all students through the university e-mail system. Phone and Skype™ availability depended on students' own personal access. The usage of these CMC tools was mainly directed by course designs and instructor directives. Not all participants utilized all CMC tools in this study.

Participants responded to three types of questions about CMC tools in this portion of the survey instrument:

1. CMC tool helpfulness for teaching presence communications
2. CMC tool helpfulness for social presence communications
3. Comfort in using CMC tools

CMC tool helpfulness scale scores.

Scale scores were formulated to evaluate helpfulness for each tool. The helpfulness for teaching presence communications was calculated as the mean of four items in the survey, and the helpfulness for social presence was calculated as the mean of two items. The specific items associated with each variable are indicated in the survey instrument presented in Appendix A. Participant responses were based on a 5-point Likert scale, where 1= strongly disagree and 5= strongly agree. Not all participants utilized all the tools, so the number of responses varied across the tools.

For teaching presence communications.

The scale score means, standard deviations, and Cronbach's alpha for CMC tool helpfulness for teaching presence (TP) communications are presented in Table 5.

Eighty-nine of the 91 participants reported using e-mail for teaching presence (TP) communications. News and discussion forums had 64 and 63 users, respectively. Of the 50 Wimba™ users, only 40 reported using the text chat feature. Very few participants used phone (n= 16) or Skype™ (n= 8).

E-mail had the highest mean scale score for TP helpfulness (4.23) followed by Wimba™ (4.03). Discussion forums and news forums had mean scale scores of 3.94 and

3.92, respectively. Text chat, phone, and Skype™ had means scale scores of 3.78, 3.63 and 2.33, respectively. The standard deviations for these scores ranged from 0.65 to 1.24.

Table 5

CMC Tool Helpfulness for TP Communications (n=91)

CMC Tool	*n** (users)	Mean Scale Score	Std. Dev.	Valid cases**	Cronbach's Alpha
E-mail	89	4.23	0.92	86	0.93
News forums	64	3.92	0.76	53	0.88
Discussion forums	63	3.94	0.84	58	0.90
Wimba™	50	4.03	0.78	45	0.90
Text chat	40	3.78	0.99	34	0.97
Phone	16	3.63	1.24	13	0.99
Skype™	8	2.88	0.65	7	0.92

**n* varies by tool because not all participants used all tools.
***The number of valid cases is less than *n* due to missing values for some items.

Cronbach's alpha for the scale scores of CMC tool helpfulness for teaching presence ranged from 0.88 to 0.99 for these tools, which is well within suggested ranges for good reliability (George & Mallery, 2003). However, due to the small number of cases for text chat, phone, and Skype ™, these tools are not included in further statistical analyses of the study. Based on Cronbach's alpha, it appears that the scale scores for CMC tool helpfulness for teaching presence are reliable for e-mail, news forums, discussion forums, and Wimba™. These variables are used for further statistical analysis in the study.

For social presence communications.

The scale score means, standard deviations, and Cronbach's alpha for CMC tool helpfulness for social presence (SP) communications are presented in Table 6.

Table 6

CMC Tool Helpfulness for SP Communications (n= 91)

CMC Tool	*n** (users)	Mean Scale Score	Std. Dev.	Valid cases	Cronbach's Alpha
E-mail	60	4.23	0.69	60	0.70
News forums	53	4.07	0.76	53	0.83
Discussion forums	68	4.34	0.56	68	0.78
Wimba™	47	4.09	0.64	47	0.69
Text chat	39	4.01	0.75	39	0.83
Phone	14	3.90	0.95	14	0.85
Skype™	7	3.42	0.88	7	0.96

**n* varies by tool because not all participants used all tools.

Among the 91 participants in the study, the largest reported usage of CMC tools for social presence (SP) communications was 68 users for discussion forums. Sixty reported using e-mail; 53 reported using news forums; and 47 reported using Wimba™. Of the Wimba™ users, 39 reported using the text chat feature. Very few participants used phone (n= 14) or Skype™ (n= 7) for social presence communications.

Discussion forums had the highest mean scale score for SP helpfulness (4.34) followed by e-mail (4.23). Wimba™ and news forums had mean scale scores of 4.09 and

4.07, respectively, followed by text chat at 4.01. Phone and Skype™ mean scale scores were 3.90 and 3.42, respectively. The standard deviations for these scores ranged from 0.64 to 0.95.

Cronbach's alpha for the scale scores of CMC tool helpfulness for social presence ranged from 0.69 to 0.96 for these tools, which suggest acceptable reliability (George & Mallery, 2003). However, due to the small number of cases for text chat, phone, and Skype ™, these tools are not included in further statistical analyses of the study. Based on Cronbach's alpha, it appears that the scale scores for CMC tool helpfulness for social presence are acceptably reliable for e-mail, news forums, discussion forums, and Wimba™. These variables are used for further statistical analysis in the study.

Comfort with using CMC tools.

One item on the survey addressed participant comfort with using different CMC tools. The responses were based on the same 5-point Likert scale. The results for comfort with CMC tool usage are presented in Table 7.

In general, participants "agreed" or "strongly agreed" that they are comfortable using the tools included in the study. E-mail had the highest rating, and Skype™ the lowest. The frequency distributions for all of the CMC tools were negatively skewed as only a few participants indicated they were not comfortable in using certain tools. The medians are higher than the means for all of the CMC tools listed. Standard deviations ranged from 0.75 to 0.98. Based on these results, it appears that the participants were comfortable using the tools they employed in the courses included in the study.

Table 7

Comfort with CMC Tool Usage

CMC tool	*n** (users)	Median	Mean	Std. Dev.
E-mail	91	5.00	4.64	0.80
News forums	72	5.00	4.40	0.82
Discussion forums	78	5.00	4.51	0.75
Wimba™	58	5.00	4.41	0.84
Text chat	47	5.00	4.38	0.90
Phone	28	5.00	4.32	0.98
Skype™	12	4.00	3.92	0.90

**n* varies by tool because not all participants used all tools.

Summary on CMC tool helpfulness.

On average, the results suggest that participants found the CMC tools they used in their courses helpful for teaching presence (TP) and social presence (SP) communications. One exception was Skype™, which few participants (n=8) used and most reported as not helpful for TP communications. E-mail and Wimba™ were reported as the most helpful for TP communications. Discussion forums and e-mail were reported as the most helpful tools for SP communications. In reporting comfort levels with CMC tools they used in their courses, most participants "strongly agreed" they were comfortable in using the tools, with the exception of Skype™, for which most only "agreed."

Effects of Web Conferencing vs. Discussion Forums vs. Both

RQ2: Is there a difference in student perceptions for the following factors between courses that do/do not include synchronous online meetings (web- conferencing):

a. social presence?

b. teaching presence?

c. cognitive presence?

Research question two evaluates three groups of CMC tool usage. Group one utilized Wimba™ synchronous web-conferencing but did not utilize asynchronous discussion forums. Group two utilized asynchronous discussion forums but did not utilize Wimba™. Group three utilized both Wimba™ and discussion forums. One-way ANOVA was used to determine possible mean differences among the groups.

Assumptions for ANOVA.

Use of ANOVA is appropriate when the following assumptions are met (Huck, 2008).

1. Observations are independent.
2. The dependent variable population distributions display normality.
3. Random sampling is employed.
4. Groups display homogeneity of variance.

For each of the dependent variables (social, teaching, and cognitive presence), the groups analyzed within each are independent. No one response is influenced by the response of others in the study. The population distributions, as represented by the sample distributions, display normality for the dependent variables under study. Though random sampling was not used in this study, responses were obtained from all of the

courses included in this study, and the overall response rate was favorable at 58%. The population variances are unknown.

Homogeneity of variance was tested by Levene's statistic with the significance level set at 0.05. The *p* values of Levene's statistic for teaching presence, social presence, and cognitive presence were 0.16, 0.23, and 0.24, respectively. Based on Levene's test, it appears that the assumption for homogeneity of variance is satisfied.

In summary, it appears that the dependent variables of social, teaching, and cognitive presence meet the assumptions required for using one-way ANOVA for statistical analysis.

ANOVA results.

Table 8 presents the means, standard deviations, and ANOVA results for the three groups of CMC tool users. The ANOVA results indicate a statistically significant difference among the means for teaching presence and cognitive presence. Tukey HSD was applied as a post hoc test to determine which pairs of mean differences were statistically significant. The post hoc Tukey HSD test identified a statistically significant difference of means for teaching presence between the Wimba™ group and the discussion forum group. Results indicate a higher mean score for the discussion forum group. While guidelines for effect size vary, generally 0.2 is considered small; 0.5 is considered moderate; and 0.8 is considered large (Huck, 2008). The effect size for this mean difference is 1.23, indicating that difference is also a practical one.

The post hoc Tukey HSD test identified a statistically significant mean difference for cognitive presence between the Wimba™ group and the discussion forum group, and between the Wimba™ group and the group using both CMC tools. In each comparison,

the Wimba™ group had the lower mean score for cognitive presence. The effect size for the mean difference between the Wimba™ group and the discussion forums group is 1.31. The effect size for the mean difference between the Wimba™ group and the group using both CMC tools is 0.79. These results suggest that the mean differences are also practically significant.

Table 8

Descriptives and ANOVA for TP, SP, CP for Wimba™, DF, and Both

	Wimba™ n= 11 (a)	DF n= 28 (b)	Both n= 50 (c)	F	Comparisons	Effect Size
Teaching Presence						
Mean	3.66	4.34	4.13	3.60*	(a)<(b)*	1.23
Std. Dev.	0.68	0.48	0.83		(a)<(c)	0.58
					(c)<(b)	0.29
Social Presence						
Mean	3.60	3.94	4.02	2.99	(a)<(b)	0.71
Std. Dev.	0.59	0.42	0.56		(a)<(c)	0.73
					(b)<(c)	0.15
Cognitive Presence						
Mean	3.74	4.31	4.18	5.09**	(a)<(b)*	1.31
Std. Dev.	0.54	0.378	0.56		(a)<(c)*	0.79
					(c)<(b)	0.26

* Statistically significant at the .05 level
**Statistically significant at the .01 level

While no statistically significant mean differences were identified for social presence among the three groups, the effect sizes are worth noting. For social presence, the Wimba™ only group had lower mean scores than the other two groups. The effect size for the mean difference between the Wimba™ group and the discussion forum group was 0.71, and the effect size for the mean difference between the Wimba™ group and the group using both tools was 0.73. While not statistically significant, there appear to be practical differences in the mean scores among these groups.

Plots of means.

Figures 4, 5, and 6 illustrate the plot of means for teaching, cognitive, and social presence, respectively, for the Wimba™ group, the discussion forum (DF) group, and the group using both CMC tools.

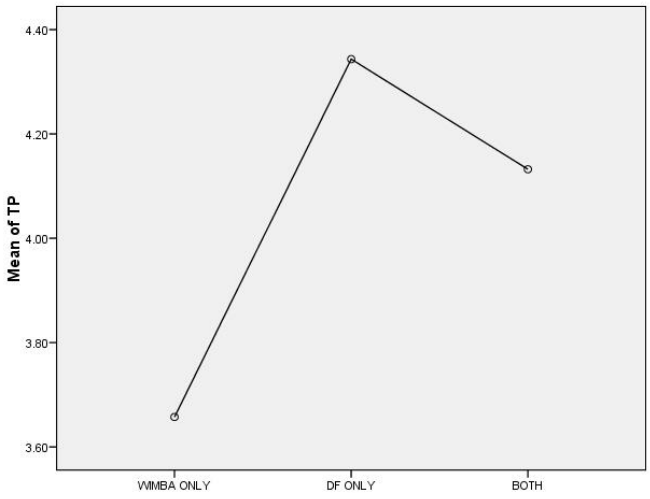

Figure 4. Plot of Means for Teaching Presence

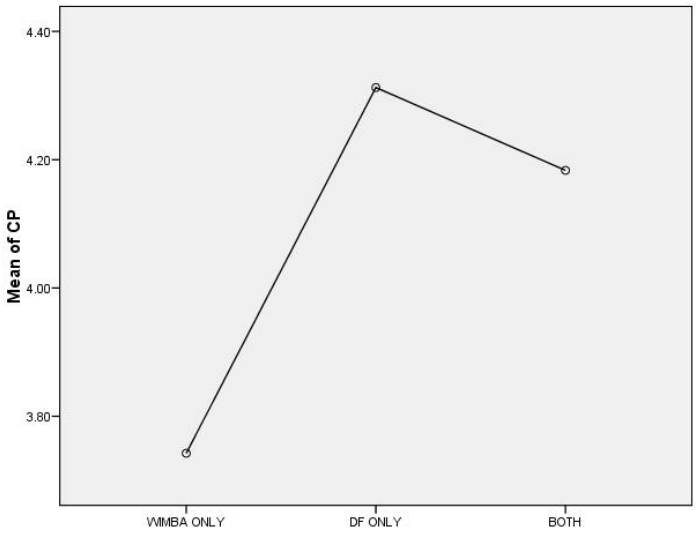

Figure 5. Plot of Means for Cognitive Presence

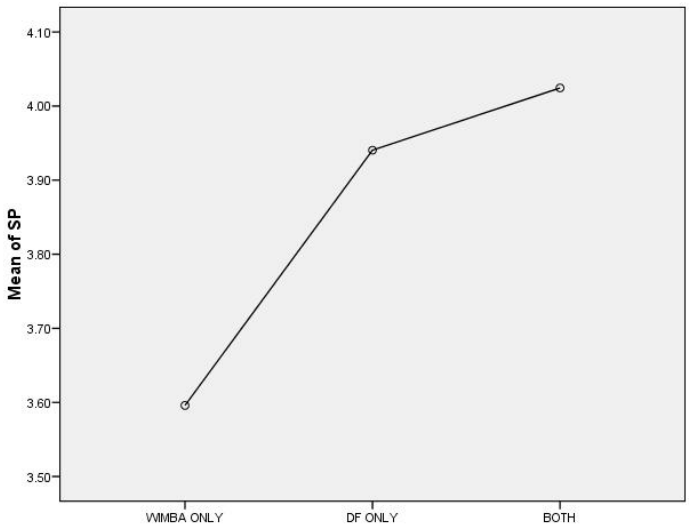

Figure 6. Plot of Means for Social Presence

These figures illustrate the lower mean scores for the Wimba™ group for teaching, cognitive, and social presence when compared to the discussion forum group and the group that utilized both CMC tools. The mean scores for the discussion forum

group were higher than those for the group using both tools for teaching and cognitive presence. But, for social presence, the groups using both tools had the higher mean score.

Summary of effects.

To evaluate the effects of using Wimba™ web-conferencing, discussion forums or both CMC tools on student perceptions of online learning, three groups were evaluated for teaching presence, social presence, and cognitive presence. These variables met the assumptions required for ANOVA which was used to determine any statistically significant mean differences among the groups tested. Results indicated statistically significant mean differences for teaching and cognitive presence. No statistically significant mean difference was found for social presence.

For teaching presence, the mean for the discussion forum group was significantly higher than the mean for the Wimba™ group with an effect size of 1.24. For cognitive presence, the means for the discussion group and for the group utilizing both tools were significantly higher than the mean for the Wimba™ group. The mean differences had effect sizes of 1.31 and 0.79, respectively. Based on these results, it appears that the Wimba™ group perceived lower teaching and cognitive presence than the discussion group and lower cognitive presence than the group using both CMC tools.

CMC Tool Helpfulness in Relation to Social and Teaching Presence

RQ3: Are student perceptions of CMC tool helpfulness associated with student perceptions of social or teaching presence?

As described in chapter three, CMC tools are used to facilitate communications and interactions among students and teachers that promote social and teaching presence. Different tools may be perceived as more or less helpful in promoting teaching or social

presence. To address this question, the scale scores for CMC tool helpfulness were evaluated with overall social and teaching presence for possible correlations. Variables which demonstrated statistically significant correlations were further analyzed with standard multiple regressions. Because not all participants utilized all CMC tools, only three could be included in this portion of the study: e-mail, news forums, and discussion forums. These are the most utilized tools by the participants in the study and provide an adequate number of cases for multiple regression analysis.

First, the relationships between CMC tool helpfulness for teaching presence and overall teaching presence are presented. Then, the relationships between CMC tool helpfulness for social presence and overall social presence are presented.

CMC tool helpfulness and teaching presence.

Correlations.

Table 9 provides the correlations among the variables of CMC tool helpfulness for e-mail, news forums, discussion forums, and overall teaching presence. The number of cases decreased from the original 91 participants because only 55 participants utilized all three CMC tools for teaching presence communications.

Correlations with teaching presence are statistically significant (at the .01 level) for all three CMC tools at low to moderate levels and in a positive direction, ranging from .36 to .49. The correlation between DFTP and NFTP is statistically significant at a high level and in a positive direction. Additionally, the correlation between EMTP and NFTP is statistically significant at a low level and in a positive direction.

Table 9

Pearson Correlations for CMC Tool Helpfulness and Teaching Presence (n=55)

	TP	DFTP	EMTP	NFTP
TP	1			
DFTP	.49(**)	1		
EMTP	.40(**)	.19	1	
NFTP	.36(**)	.73(**)	.32(**)	1

**Correlation statistically significant at the 0.01 level (2-tailed).
Key: EMTP= E-mail helpfulness for TP; NFTP= news forum helpfulness for TP; DFTP= discussion forum helpfulness for TP

Standard multiple regression on teaching presence.

A standard multiple regression was conducted to further examine the extent to which perceptions of CMC tool helpfulness are related in meaningful ways to perceptions of teaching presence. Table 10 presents the multiple regression results for the helpfulness of discussion forums, e-mail, and news forums on teaching presence.

Table 10

Standard Multiple Regression of DFTP, EMTP, and NFTP on Teaching Presence

Variable			Unstandardized Coeff.			
	Mean	Std. Dev.	B	Std. Error	β	sr^2
Constant			2.41			
DFTP	3.86	0.85	.33**	0.10	.53	.24
EMTP	4.30	0.80	.23**	0.08	.34	.16
NFTP	3.91	0.80	-.09	0.12	-.13	

n=55; R^2= .35; Adjusted R^2= .31; R= .59 (p<.01); **p< .01

Statistically, R for regression was significantly different from zero, $F(3, 51) = 9.12$, $p < .01$, with R^2 at .35. The adjusted R^2 value of .31 indicates that approximately 31% of the variability in teaching presence is accounted for the helpfulness of discussion forums, e-mail, and news forums. Only two regression coefficients had statistically significant values different from zero: discussion forum helpfulness (DFTP) and e-mail helpfulness (EMTP). The three variables in combination contributed another 2.41 in shared variability.

Examination of the residuals scatter plot indicates that the residuals are approximately normal in distribution about the predicted teaching presence scores, that the residuals have a straight-line relationship with the predicted teaching presence scores, and that the variance of the residuals about the predicted teaching presence scores is the same for all predicted scores.

Altogether, 31% of the variance in teaching presence was accounted for by knowing scores on these three variables. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting teaching presence. But, of the two, the helpfulness of discussion forums is more important, as indicated by the squared semi-partial (sr^2) correlations. The helpfulness of news forums did not contribute significantly to the prediction of teaching presence.

For exploratory analysis, a second standard multiple regression was performed with the addition of Wimba™ (WMBTP) helpfulness for teaching presence as a fourth independent variable. When WMBTP was added, the number of cases fell to 34, which is insufficient for a reliable regression. R increased to .70, $F(4, 30) = 7.26$, $p < .01$. Adjusted

R^2 increased to .42, suggesting that 42% of the variability in teaching presence is accounted for by the helpfulness of discussion forums, e-mail, news forums, and Wimba™. As in the first model, only two regression coefficients had statistically significant values different from zero: discussion forum helpfulness ($\beta = .58$) and e-mail helpfulness ($\beta = .39$). The four variables in combination contributed another 2.09 in shared variability.

Examination of the residuals scatter plot indicates that the residuals are approximately normal in distribution about the predicted teaching presence scores, that the residuals have a straight-line relationship with the predicted teaching presence scores, and that the variance of the residuals about the predicted teaching presence scores is the same for all predicted scores.

Altogether, 42% of the variance in teaching presence was accounted for by knowing scores on these four variables. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting teaching presence. But, of the two, the helpfulness of discussion forums was, once again, more important, as indicated by a squared semi-partial (sr^2)correlation of .47 compared to .27 for e-mail. Neither the helpfulness of Wimba™ nor the helpfulness of news forums contributed significantly to the prediction of teaching presence.

Based on the results of these two models, it appears that discussion forum helpfulness and e-mail forum helpfulness are most closely related to overall teaching presence, and that discussion forum helpfulness is the most important factor associated with teaching presence.

CMC tool helpfulness and social presence.

Correlations.

Table 11 provides the correlations among the variables of CMC tool helpfulness for e-mail, news forums, discussion forums, and overall social presence. The number of cases decreased from the original 91 participants because only 48 participants utilized all three CMC tools for social presence communications.

Table 11

Pearson Correlations for CMC Tool Helpfulness and Social Presence

	SP	DFSP	EMSP	NFSP
SP	1			
DFSP	.38(**)	1		
EMSP	.44(**)	.47(**)	1	
NFSP	.12	.67(**)	.43(**)	1

n= 48; **Correlation statistically significant at the .01 level (2-tailed); Key: EMSP= E-mail helpfulness for SP; NFSP= news forum helpfulness for SP; DFSP= discussion forum helpfulness for SP

Correlations with social presence are statistically significant (at the .01 level) for discussion forum helpfulness (DFSP) and e-mail helpfulness (EMSP) in a positive direction and at low to moderate levels, ranging from .38 to .44. The correlations of DFSP with EMSP and with NFSP are statistically significant in positive directions and at moderate and high levels, respectively. Additionally the correlation between EMSP and NFSP is statistically significant in a positive direction and at a moderate level.

Standard multiple regression on social presence.

A standard multiple regression was conducted to further examine the extent to which perceptions of CMC tool helpfulness are related in meaningful ways to perceptions of social presence. Table 12 presents the multiple regression results for the helpfulness of discussion forums, e-mail, and news forums on social presence.

Table 12

Standard Multiple Regression of DFSP, EMSP, and NFSP on Social Presence

Variable			Unstandardized Coeff.			
	Mean	Std. Dev.	B	Std. Error	β	sr^2
Constant			2.56			
DFSP	4.37	0.61	.29*	.12	.42	.15
EMSP	4.28	0.64	.25*	.10	.38	.20
NFSP	4.13	0.73	-.19	.10	-.33	

n= 48; R^2= .29; Adjusted R^2= .24; R= .54 (p<.01); *p< .05

Statistically, R for regression was significantly different from zero, $F(3, 44) = 6.06$, $p < .01$, with R^2 at .29. The adjusted R^2 value of .24 indicates that approximately 24% of the variability in social presence is accounted for by the helpfulness of discussion forums, e-mail, and news forums. Only two regression coefficients had statistically significant values different from zero: discussion forum helpfulness (DFSP) and e-mail helpfulness (EMSP). The three variables in combination contributed another 2.56 in shared variability.

Examination of the residuals scatter plot indicates that the residuals are approximately normal in distribution about the predicted social presence scores, that the

residuals have a straight-line relationship with the predicted social presence scores, and that the variance of the residuals about the predicted social presence scores is the same for all predicted scores.

Altogether, 24% of the variance in social presence was accounted for by knowing scores on these three variables. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting social presence. But, of the two, the helpfulness of e-mail is more important, as indicated by the squared semi-partial correlations (sr^2). The helpfulness of news forums did not contribute significantly to the prediction of social presence.

For exploratory analysis, a second standard multiple regression was performed with the addition of Wimba™ (WMBSP) helpfulness for social presence as a fourth independent variable. When WMBSP was added, the number of cases fell to 27, which is insufficient for a reliable regression. R increased to .79, $F(4, 23) = 9.79$, $p < .01$. Adjusted R^2 increased to .57, suggesting that 57% of the variability in social presence is accounted for by the helpfulness of discussion forums, e-mail, news forums, and Wimba™. As in the first model, only two regression coefficients had statistically significant values different from zero. Once again, discussion forum helpfulness ($\beta = .52$) was statistically significant. But, Wimba™ helpfulness ($\beta = .37$) replaced e-mail helpfulness ($\beta = .23$) as a more statistically significant variable. The four variables in combination contributed another 1.68 in shared variability.

Examination of the residuals scatter plot indicates that the residuals are approximately normal in distribution about the predicted social presence scores, that the residuals have a fairly straight-line relationship with the predicted social presence scores,

and that the variance of the residuals about the predicted social presence scores is the same for all predicted scores.

Altogether, 57% of the variance in social presence was accounted for by knowing scores on these four variables. The size and direction of the relationships suggest that the helpfulness of discussion forums and Wimba™ contribute the most to predicting social presence. But, of the two, the helpfulness of discussion forums was, once again, more important, as indicated by a squared semi-partial correlation (sr^2) of .47 compared to .42 for Wimba™. Neither the helpfulness of e-mail nor the helpfulness of news forums contributed significantly to the prediction of social presence.

The results of these two models consistently indicate a statistically significant relationship between helpfulness of discussion forums and social presence. The three-variable model (excluding Wimba™) indicated a statistically significant relationship between helpfulness of e-mail and social presence, while the four variable model (including Wimba™) indicated a statistically significant relationship between Wimba™ helpfulness and social presence. The limited number of cases for the four variable model severely limits its reliability, but the finding is still interesting to note and should be examined in further research.

Summary of tool helpfulness in relation to social and teaching presence.

Because not all students utilized all CMC tools, the helpfulness of only three of the CMC tools were evaluated for possible relationships with social and teaching presence: e-mail, news forums, and discussion forums.

To evaluate possible relationships between CMC tool helpfulness and social or teaching presence, correlations were examined using Pearson's coefficient. Results

indicated statistically significant correlations in a positive direction for e-mail, discussion forum, and news forum helpfulness with teaching presence at a moderate level. Results also indicated statistically significant correlations in a positive direction for e-mail and discussion forum helpfulness with social presence at a moderate level. No statistically significant correlation was found between news forum helpfulness and social presence.

Correlated variables were further analyzed with standard multiple regressions. For teaching presence, the three factor model indicated that 31% of the variance in teaching presence was accounted for by knowing scores on e-mail, discussion forum, and news forum helpfulness. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting teaching presence. But, of the two, the helpfulness of discussion forums is more important, as indicated by the squared semi-partial correlations. The helpfulness of news forums did not contribute significantly to the prediction of teaching presence.

For social presence, the three factor model indicated that 24% of the variance in social presence was accounted for by knowing scores on e-mail, discussion forum, and news forum helpfulness. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting social presence. But, of the two, the helpfulness of e-mail is more important, as indicated by the squared semi-partial correlations. The helpfulness of news forums did not contribute significantly to the prediction of social presence.

Alternate four factor models that included Wimba™ helpfulness for social and teaching presence did not have sufficient cases for reliability. The addition of Wimba™ helpfulness as a fourth variable had little effect on results for the teaching presence

regression. However, adding Wimba™ helpfulness as a fourth variable in predicting social presence did affect the results, suggesting that Wimba™ may be significantly related to student perceptions of social presence. Further research with larger sample sizes is needed to further explore that relationship.

Demographics and Perceptions of Social, Teaching, and Cognitive Presence

RQ4: Are student demographics associated with student perceptions of social, teaching, and cognitive presence?

The main purpose for this research question was to determine whether background demographic variables have any associations with the dependent variables of social, teaching, and cognitive presence. As part of the survey, participants were asked to indicate their gender, level of study (certificate or masters), registration status (part-time or full-time), concentration of study, number of prior online courses taken, and years of teaching experience. Table 13 presents the frequencies and percentages for each of these nominal variables.

Most of the participants were female (85%), most were enrolled in certification level courses (81%), and most were registered as part time students (89%). A little more than half of the participants were enrolled in the gifted education training program (54%), and those enrolled in special education training were split between general (24%) and adaptive (17%) programs. Most participants (83%) had taken at least one prior online course, and over one third (35%) had taken four or more prior online courses. Teaching experience among the participants ranged from none (20%) to more than three years (54%).

Table 13

Participant Demographics

	Number of participants	Percentage
Gender		
Female	79	85%
Male	14	15%
Level of study		
Certification	75	81%
Masters	18	19%
Registration status		
Part time	82	89%
Full time	11	11%
Concentration of study		
General special education	22	24%
Adaptive special education	16	17%
Gifted education	52	56%
Other	3	3%
Prior online courses taken		
None	12	13%
One	14	15%
Two	12	13%
Three	22	24%
Four or more	33	35%

Table13 (continued)

	Number of participants	Percentage
Years of teaching experience		
None	19	20%
1 year or less	6	6%
1 to 2 years	9	10%
2 to 3 years	9	10%
More than 3 years	50	54%

To determine the effects of these demographic variables, t-tests and one-way ANOVA were applied based on the number of groups present for each. These tests are appropriate when the following assumptions are met (Huck, 2008).

1. Observations are independent.
2. The dependent variable population distributions display normality.
3. Random sampling is employed.
4. Groups display homogeneity of variance.

For each of the dependent variables (social, teaching, and cognitive presence), the groups analyzed within each are independent. No one response is influenced by the response of others in the study. The population distributions, as represented by the sample distributions, display normality for the dependent variables under study. Though random sampling was not used in this study, the response rates across the courses suggest that the sample is representative of the total population. The overall response rate of 58% provides additional assurance that the sample is representative and that no significant

sub-groups have been omitted. Homogeneity of variance was tested by Levene's statistic with the significance level set at .05.

Gender.

Participants were enrolled in this study included men and women. An independent t-test was used to determine the presence of any statistically significant mean differences for social, teaching, or cognitive presence by gender. The means and standard deviations by gender are presented for teaching (TP), social (SP), and cognitive (CP) presence in Table 14.

Table 14

Descriptive Statistics for Gender

	Gender	Mean	Std. Dev.
TP	Female	4.15	0.74
	Male	3.95	0.87
SP	Female	3.94	0.52
	Male	3.87	0.70
CP	Female	4.19	0.52
	Male	3.96	0.59

n= 77 female; 14 male

Independent t-tests were used to analyze mean differences between gender groups for teaching, social, and cognitive presence. Alpha was set at .05 for hypothesis testing. The results are presented in Table 15.

Table 15

Independent t-test Results for Gender

	Levene's Test for Equality of Variance		t-test		Mean difference
	F	*p*	t	*p*	
TP	0.17	.68	.93	.35	0.20
SP	2.79	.10	.48	.63	0.08
CP	0.06	.80	1.42	.16	0.22

n = 77 female; 14 male; df= 89

The Levene's test for equality of variances failed to reject the null hypothesis, indicating that the assumption for homogeneity of variances is supported. The t-test results indicate that there are no statistically significant mean differences between female and male participants at the .05 level for teaching, social, or cognitive presence. For this population, it appears that gender has no effect on the means for social, teaching, or cognitive presence.

Level of study.

Participants were enrolled in either certification or master's degree programs as their level of study. An independent t-test was used to determine the presence of any statistically significant mean differences for social, teaching, or cognitive presence between these groups. The means and standard deviations by level of study are presented for teaching (TP), social (SP), and cognitive (CP) presence in Table 16.

Table 16

Descriptive Statistics for Level of Study

	Level	Mean	Std. Dev.
TP	Certification	4.11	0.70
	Masters	4.16	0.97
SP	Certification	3.94	0.54
	Masters	3.90	0.59
CP	Certification	4.14	0.57
	Masters	4.20	0.41

n= 73 certificate, 18 masters

Independent t-tests were used to analyze mean differences between levels of study for teaching, social, and cognitive presence. Alpha was set at .05 for hypothesis testing. The results are presented in Table 17.

Table 17

Independent t-test Results for Level of Study

	Levene's Test for Equality of Variance		t-test		Mean difference
	F	p	t	*p*	
TP	1.41	.24	-.25	.80	-.05
SP	0.04	.85	.30	.77	.04
CP	1.04	.31	-.46	.65	-.07

n= 73 certificate, 18 masters; df= 89

The Levene's test for equality of variances failed to reject the null hypothesis, indicating that the assumption for homogeneity of variances is supported. The t-test results indicate that there are no statistically significant mean differences between participant levels of study at the .05 level for teaching, social, or cognitive presence. For this population, it appears that level of study has no effect on the means for social, teaching, or cognitive presence.

Registration status.

Participants were enrolled as either part-time or full-time students as their registration status. An independent t-test was used to determine the presence of any statistically significant mean differences for social, teaching or cognitive presence between these groups. The means and standard deviations by registration status are presented for teaching (TP), social (SP), and cognitive (CP) presence in Table 18.

Table 18

Descriptive Statistics for Registration Status

	Level	Mean	Std. Dev.
TP	Part time	4.13	0.70
	Full time	4.01	1.14
SP	Part time	3.92	0.56
	Full time	3.98	0.47
CP	Part time	4.16	0.55
	Full time	4.11	0.48

n= 80 part-time, 11 full-time

Independent t-tests were used to analyze mean differences between registration status for teaching, social, and cognitive presence. Alpha was set at .05 for hypothesis testing. The results are presented in Table 19.

Table 19

Independent t-test Results for Registration Status

	Levene's Test for Equality of Variance		t-test		Mean difference
	F	*p*	t	*p*	
TP	0.93	.34	.52	.61	0.13
SP	0.27	.60	-.33	.74	-0.06
CP	0.07	.79	.30	.77	0.05

n= 80 part time, 11 full time; df= 89

The Levene's test for equality of variances failed to reject the null hypothesis, indicating that the assumption for homogeneity of variances is supported. The t-test results indicate that there are no statistically significant mean differences between participant registration statuses at the .05 level for teaching, social or cognitive presence. For this population, it appears that registration status has no effect on the means for social, teaching, or cognitive presence.

Concentration of study.

Participants were enrolled in different concentrations of teacher training study: general special education (Gen SpEd), adaptive special education (Ad SpEd), gifted education (GF Ed), and other. One-way ANOVA was used to determine the presence of any statistically significant mean differences for social, teaching or cognitive presence

among these groups. The means, standard deviations, and ANOVA results for concentration of study are presented in Table 20.

Homogeneity of variance was tested by Levene's statistic with the significance level set at .05. The *p* values for Levene's statistic for teaching presence, social presence, and cognitive presence were 0.12, 0.79, and 0.33, respectively. Based on Levene's test, it appears that the assumption for homogeneity of variance is satisfied.

Table 20

Descriptives and ANOVA for TP, SP, CP for Concentration of Study

	GenSpEd *n*= 21	AdSpEd *n*= 16	GFEd *n*= 49	Other *n*= 55	F
Teaching Presence					
Mean	4.18	4.36	4.02	4.09	0.88
Std. Dev.	0.99	0.58	0.72	0.31	
Social Presence					
Mean	4.00	3.89	3.91	3.93	0.16
Std. Dev.	0.53	0.63	0.55	0.31	
Cognitive Presence					
Mean	4.14	4.16	4.16	4.08	0.03
Std. Dev.	0.48	0.49	0.60	0.26	

The F statistic was not statistically significant for social, teaching, or cognitive presence for the four concentrations of study. Based on these results, it appears that there

are no statistically significant differences among the means for social, teaching, or cognitive presence for concentration of study. For this population, it appears that concentration of study has no effect on the means for social, teaching, or cognitive presence.

Prior online experience.

Participants were asked to indicate the number of prior online courses they had taken. Their responses were categorized into four groups: none, one prior course, two prior courses, three prior courses, and four or more prior courses. One-way ANOVA was used to determine the presence of any statistically significant mean differences for social, teaching or cognitive presence among these groups. The means, standard deviations, and ANOVA results for prior online experience are presented in Table 21.

Homogeneity of variance was tested by Levene's statistic with the significance level set at .05. The *p* values Levene's statistic for teaching presence, social presence, and cognitive presence were 0.75, 0.88, and 0.09, respectively. Based on Levene's test, it appears that the assumption for homogeneity of variance is satisfied.

The ANOVA results indicate a statistically significant difference among the means for cognitive presence only. The F statistic was not statistically significant for social or teaching presence for the different levels of prior online course experience. Tukey HSD was applied to determine which pairs of cognitive presence mean differences were statistically significant.

The post hoc Tukey test identified a statistically significant difference of means for cognitive presence between the group with one prior course and the group with four or more prior courses. Results indicate a higher mean score for cognitive presence for

participants with one prior course. While guidelines for effect size vary, generally 0.2 is considered small; 0.5 is considered moderate; and 0.8 is considered large (Huck, 2008).The effect size for this mean difference is 0.81, which suggests that the difference is also practical.

Table 21

Descriptives and ANOVA for TP, SP, CP for Prior Online Experience

	None	1 Prior	2 Prior	3 Prior	> 4 Prior	F
	n= 11	*n*= 13	*n*= 12	*n*= 22	*n*= 33	
Teaching Presence						
Mean	4.43	4.41	4.17	4.07	3.91	1.67
Std. Dev.	0.55	0.54	0.54	0.91	0.80	
Social Presence						
Mean	3.74	4.15	3.95	4.04	3.83	1.38
Std. Dev.	0.48	0.47	0.46	0.56	0.59	
Cognitive Presence						
Mean	4.14	4.42	4.32	4.23	3.93	2.90*
Std. Dev.	0.35	0.40	0.43	0.45	0.65	

* Statistically significant at the .05 level

Based on these results, it appears that there are no statistically significant differences among the means for social or teaching presence for levels of prior online course experience. But, there is a statistically significant difference between the means of those with one prior online course experience and those with four or more prior online

course experiences for cognitive presence. The mean for one prior online course experience is higher than the mean for four or more prior online course experiences.

Years of teaching experience.

Participants were asked to indicate years of prior teaching experience. Three groups were formed based on responses: no prior experience, up to three years experience, and three or more years of experience. One-way ANOVA was used to determine the presence of any statistically significant mean differences for social, teaching, or cognitive presence among these groups. The means, standard deviations, and ANOVA results for years of teaching experience are presented in Table 22.

Table 22

Descriptives and ANOVA for TP, SP, CP for Years of Teaching Experience

	None	Up to 3 yrs	3 or more yrs	F
	n= 18	*n*= 24	*n*= 49	
Teaching Presence				
Mean	4.26	4.15	4.05	0.49
Std. Dev.	0.98	0.71	0.69	
Social Presence				
Mean	3.87	3.98	3.93	0.21
Std. Dev.	0.31	0.65	0.49	
Cognitive Presence				
Mean	4.24	4.10	4.14	0.35
Std. Dev.	0.51	0.59	0.53	

Homogeneity of variance was tested by Levene's statistic with the significance level set at .05. The *p* values for Levene's statistic for teaching presence, social presence, and cognitive presence were 0.57, 0.51, and 1.00, respectively. Based on Levene's test, it appears that the assumption for homogeneity of variance is satisfied.

The F statistic was not statistically significant for social, teaching or cognitive presence for the three levels of teaching experience. Based on these results, it appears that there are no statistically significant differences among the means for social, teaching or cognitive presence for years of teaching experience. For this population, it appears that years of teaching experience have no effect on the means for social, teaching, or cognitive presence.

Summary of results for background demographic variables.

Several background demographic variables were evaluated for possible confounding effects on social, teaching, and cognitive presence. Distributions of all the variables were evaluated for normalcy. The groups for each variable were independent. Though random sampling was not used, response rates suggest that the sample participants represent the population of the study. Homogeneity of variance was evaluated and affirmed for each of the variables. These conditions allowed for the use of t-tests and one-way ANOVA analyses for the variables.

Gender, level of study (certificate and masters), and registration status (part-time and full-time) were evaluated for mean differences between groups through independent t-tests. For each variable, the results indicated no statistically significant mean differences between groups.

Concentration of teacher training study (general SpEd, adaptive SpEd, gifted education, and other), prior experience with online courses, and years of teaching experience were evaluated for mean differences among groups through one-way ANOVA. For concentration of study and years of teaching experience, the results indicated no statistically significant mean differences among the groups. For prior experience with online learning, one statistically significant mean difference was detected for cognitive presence. The group with one prior online course experience had a significantly higher mean (4.42) than the group with four or more online course experiences (3.93). The effect size of 0.81 suggests that this is a practical difference, too.

Overall, it appears that gender, level of study, registration status, concentration of study, and years of teaching experience have no effect on the means for social, teaching, or cognitive presence for the population under study. It also appears that social and teaching presence means are not affected by prior online course experience. However, there appears to be a statistically significant mean difference for perceptions of cognitive presence between those with one prior course experience and those with four or more prior course experiences, with the first group having the higher mean.

Summary of Results

The dependent variables for this study are teaching (TP), social (SP), and cognitive (CP) presence. Scale score means for each of these variables were calculated from survey item responses associated with each type of presence. The mean scores suggest that the participants generally agreed with statements regarding teaching, social, and cognitive presence. Perceptions on teaching and cognitive presence were comparable while perceptions on social presence were slightly lower. Cronbach's alpha scores are

good to excellent and are consistent with those reported in prior research for these variables (Arbaugh et al., 2010). Results indicate that the dependent variables are highly correlated, which is also consistent with prior research (Archibald, 2010).

On average, the results suggest that participants found the CMC tools they used in their courses helpful for teaching presence (TP) and social presence (SP) communications. One exception was Skype™, which few participants used and most reported as not helpful for TP communications. E-mail and Wimba™ were reported as the most helpful for TP communications. Discussion forums and e-mail were reported as the most helpful tools for SP communications. In reporting comfort levels with CMC tools they used in their courses, most participants "strongly agreed" they were comfortable in using the tools, with the exception of Skype™, for which most only "agreed."

To evaluate the effects of using Wimba™ web-conferencing, discussion forums, or both CMC tools on student perceptions of online learning, three groups were evaluated for teaching presence, social presence, and cognitive presence. These variables met the assumptions required for ANOVA which was used to determine any statistically significant mean differences among the groups tested. Results indicated statistically significant mean differences for teaching and cognitive presence. No statistically significant mean difference was found for social presence.

For teaching presence, the mean for the discussion forum group was significantly higher than the mean for the Wimba™ group. For cognitive presence, the means for the discussion group and for the group utilizing both tools were significantly higher than the mean for the Wimba™ group. The effect sizes of for these mean differences suggest

practical significance. Based on these results, it appears that the Wimba™ group perceived lower teaching and cognitive presence than the discussion group and lower cognitive presence than the group using both CMC tools.

CMC tool helpfulness in relation to social and teaching presence was evaluated for e-mail, discussion forums, and news forums. Results indicated statistically significant correlations in a positive direction for e-mail, discussion forum, and news forum helpfulness with teaching presence at a moderate level. Results also indicated statistically significant correlations in a positive direction for e-mail and discussion forum helpfulness with social presence at a moderate level. No statistically significant correlation was found between news forum helpfulness and social presence.

Correlated variables were further analyzed with standard multiple regressions. For teaching presence, a three factor model indicated that 31% of the variance in teaching presence was accounted for by knowing scores on e-mail, discussion forum, and news forum helpfulness. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting teaching presence. But, of the two, the helpfulness of discussion forums is more important. The helpfulness of news forums did not contribute significantly to the prediction of teaching presence.

For social presence, the three factor model indicated that 24% of the variance in social presence was accounted for by knowing scores on e-mail, discussion forum, and news forum helpfulness. The size and direction of the relationships suggest that the helpfulness of discussion forums and e-mail contribute the most to predicting social presence. But, of the two, the helpfulness of e-mail is more important. The helpfulness of news forums did not contribute significantly to the prediction of social presence.

Alternate four factor models that included Wimba™ helpfulness for social and teaching presence did not have sufficient cases for reliability. The addition of Wimba™ helpfulness as a fourth variable had little effect on results for the teaching presence regression. However, adding Wimba™ helpfulness as a fourth variable in predicting social presence did affect the results, suggesting that Wimba™ may be significantly related to student perceptions of social presence. Further research with larger sample sizes is needed to further explore that relationship.

Several background demographic variables were evaluated for possible effects on social, teaching, and cognitive presence. Gender, level of study, and registration status were evaluated for mean differences between groups through independent t-tests. For each of those variables, the results indicated no statistically significant mean differences between groups.

Concentration of teacher training study, prior experience with online courses, and years of teaching experience were evaluated for mean differences among groups through one-way ANOVA. For concentration of study and years of teaching experience, the results indicated no statistically significant mean differences among the groups. For prior experience with online learning, one statistically significant mean difference was detected for cognitive presence. The group with one prior online course experience had a significantly higher mean than the group with four or more online course experiences. The effect size suggests that this is a practical difference, too.

The next chapter presents conclusions and implications of the study and recommendations for future research.

CHAPTER FIVE: CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

As an aid to the reader, this chapter briefly restates the research problem and methodology for the study. Then, this chapter discusses key findings for each of the research questions, including relationships to prior research and implications. Finally, this chapter presents recommendations for further research.

Problem Statement

Through advancements in educational technology, online learning has become a popular delivery system for teacher training in special education. Over the past decade several computer-mediated communication (CMC) tools have been added to online course delivery. Such tools include e-mail, discussion forums, news forums, web-conferencing, text chat, and Skype™. There is limited research on the helpfulness of these tools for learning.

Using the Community of Inquiry (CoI) theoretical framework, this study evaluates the online experiences of teachers in training for special education. The purpose of this study is to evaluate how students perceive the helpfulness of CMC tools for online learning and to determine whether CMC tool helpfulness is related to student perceptions of teaching, social, or cognitive presence. Specifically, this study evaluates student perceptions of CMC tool helpfulness for social and teaching presence; explores the effects of different CMC tool usage on social, teaching, and cognitive presence; and explores possible relationships between CMC tool helpfulness and social and teaching presence. This study also evaluates the effects of background demographic variables.

Summary of Methodology

This quantitative study was conducted at a large, public university in the southeastern U.S. The participants of the study were graduate level students enrolled in special or gifted education teacher training courses that were delivered entirely online.

Four research questions were developed to study how students perceive the helpfulness of CMC tools, the differences in perceptions among groups that utilize synchronous and/or asynchronous CMC tools, the possible relationships among perceptions of CMC tool helpfulness and social, teaching, and cognitive presence, and which background demographic variables may have any association with social, teaching, or cognitive presence.

An instrument was developed to survey participants about their perceptions of online learning and about the helpfulness of CMC tools utilized in their courses. Data from the survey were downloaded and statistically analyzed via SPSS. Scale scores were calculated for the dependent variables: social, teaching, and cognitive presence. Scale scores were also calculated for the independent variables for CMC tool helpfulness. Reliability for all scale scores was tested using Cronbach's alpha.

Descriptive statistical analyses, correlations, and inferential statistical analyses were performed to evaluate the hypotheses. Standard multiple regressions were applied to determine associations and relative contributions to the variance accounted for by each model.

The following section summarizes and discusses the results for the dependent variables and for each of the research questions.

Discussion of Results

Dependent variables.

The dependent variables for this study are social presence (SP), teaching presence (TP), and cognitive presence (CP). Social presence refers to the extent to which participants are able to express themselves personally and to experience a sense of belonging to the learning community. Teaching presence refers to the extent to which the instructor effectively designs and facilitates the learning process. Cognitive presence refers to the extent to which participants can create meaning through the learning process of inquiry and discussion. These three elements overlap to create an effective educational experience in a learning community environment.

The results for these variables indicate that the participants experienced all three elements in their online courses. Teaching and cognitive presence were rated slightly higher than social presence. Cronbach's alpha scores were 0.95, 0.87, and 0.91 for teaching, social, and cognitive presence, respectively. As shown in Table 23, these results are consistent with prior research on the CoI instrument and add to the body of research on instrument reliability.

The results from this present study also indicate that teaching, social and cognitive presence are highly correlated. Table 24 provides comparisons with correlation results from other studies. The results of the present study are consistent with prior research and add to the body of research on relationships among the three elements.

Table 23

Cronbach's Alpha Comparisons

	TP	SP	CP
Present study	0.95	0.87	0.91
Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, and Swan (2008)	0.94	0.91	0.95
Arbaugh, Bangert, and Cleveland-Innes (2010)			
School A	0.96	0.91	0.95
School B	0.96	0.87	0.94
Shea and Bidjerano (2009)	0.96	0.92	0.95
Swan, Shea, Richardson, Ice, Garrison, Cleveland-Innes, and Arbaugh (2008)	0.94	0.91	0.95

Table 24

Correlation Comparisons

	CP and TP	CP and SP	TP and SP
Present study	.72	.65	.59
Shea and Bidjerano (2009)	.69	.70	.49
Archibald (2010)	.75	.76	.65

In summary, the results for teaching, social, and cognitive presence support the reliability of the CoI instrument and affirm the inter-relationships among the elements. The instrument can be used as a reliable tool for evaluating student perceptions of

teaching, social, and cognitive presence. When using the instrument, it is important to understand that the three elements are inter-related.

Research question one: CMC tool helpfulness.

The first research question was: How do students perceive the helpfulness of different computer-mediated communication (CMC) tools? Specifically, this study evaluated CMC tool helpfulness for teaching presence (TP) communications, CMC tool helpfulness for social presence (SP) communications and student comfort in using CMC tools. The CMC tools included in the study were e-mail, discussion forums, news forums, Wimba™ web-conferencing, text chat, phone, and Skype™. The participants in the study did not utilize all the CMC tools equally.

CMC tool helpfulness for teaching presence.

For TP communications, e-mail was the most used and was rated as the most helpful of the CMC tools. News forums and discussion forums were used by more than two-thirds of the participants and were similarly rated in helpfulness. Wimba™ was used by a little more than half of the participants and was rated between e-mail and news/discussion forums in helpfulness. Text chat was used by less than half the participants and was rated as less helpful than e-mail, news forums, discussion forums, and Wimba™. Very few participants used phone or Skype™, and these were rated as the least helpful among the tools for teaching presence communications.

Availability of and familiarity with the different CMC tools may have influenced these results. E-mail is a CMC tool that is used extensively in higher education settings and has been available longer than most of the other tools (phone being one exception). Using e-mail, students can easily send messages to one or to many recipients, to their

instructor, or to other students. Discussion and news forums require students to log into the Moodle ™ learning management system to gain access, unless students select a setting that automatically sends forum posts to their e-mail accounts. All of the participants in the study had access to these forums, but additional "clicks" may have been perceived as less convenient. Havard (2008) found that factors influencing student preferences included convenience, flexibility, efficiency, and privacy. It is possible that e-mail is considered more convenient, flexible, efficient, and private than discussion and news forums.

Wimba™ web-conferencing was only available to participants enrolled in online courses that included synchronous meetings in the course design. Those who used Wimba™ ranked it second only to e-mail for its helpfulness in TP communications. Giesbers, Rienties, Gijselaers, Segers, and Tempelaar (2009) found that students perceived better instruction when web-conferencing was included in course design. The use of video, even asynchronously, has enhanced student perceptions of instructor immediacy (Griffiths & Graham, 2010). But, Rockinson-Szapkiw, Baker, Neukrug, and Hanes (2010) determined that the difference in learning perceptions was insignificant with the addition of web-conferencing.

Some possible explanations for these different findings may be the way in which web-conferencing is used by the instructor and the degree to which students are allowed or encouraged to interact with the instructor during web-conferencing. Teaching presence measures course design, course facilitation, and direct instruction. If an instructor delivers direct instruction but provides little course structure or facilitation through web-conferences, then participants may perceive less teaching presence.

Text chat is a CMC tool that often accompanies web-conferencing tools. If students are able and encouraged to send text messages to their instructors during web-conferences, they may perceive greater teaching presence. In this present study, less than half of the participants used text chat and ranked its helpfulness lower than e-mail, discussion/news forums, and Wimba™ web-conferencing for TP communications.

Phone and Skype™ were used by very few participants and were ranked the lowest for TP communications helpfulness. These results are interesting due to their low usage. Students enrolled in online courses may not have physical access to their instructors, but most likely, they have access to office phone numbers for their instructors. It may be that the high usage of e-mail has replaced the use of telephone in instructor-student communications.

Most of those who used Skype™ did not find it helpful for TP communications. Of the CMC tools included in this study, Skype™ may be the least familiar for both students and instructors. Like the telephone, it may be viewed as not needed due to the high usage of e-mail for instructor-student communications.

CMC tool helpfulness for social presence.

For SP communications, discussion forums exceeded e-mail as the most used tool and as the most helpful tool. Rourke and Anderson (2002) determined that asynchronous discussion forums can provide sociable environments for learning. Behaviors associated with a positive social environment include addressing others by name, complimenting, expressing appreciation, posting replies, expressing emotions, and using humor (Rourke & Anderson, 2002). Student perceptions of social presence in discussion forums are reflected in statements of personal value, self-disclosure, and group reference.

Participants adopt more personal and casual styles of writing, have an appreciation for the contributions of others, and value interactions with and perceptions of others (Swan & Shih, 2003). The findings of this current study suggest that participants viewed discussion forums as helpful for promoting social presence in their courses.

E-mail was used by almost two-thirds of the participants and was ranked second to discussion forums in helpfulness for SP communications. The ability to send personal messages via e-mail to individuals or to groups of fellow students appears to be viewed as helpful in promoting social presence. However, unlike discussion forums, participants can only view content if they are included as message recipients.

Like discussion forums, news forums allow the instructor or any student to post information for all course participants to view. About half of the participants used news forums for SP communications. Like discussion forums, others can reply with comments. Usually the difference between news forums and discussion forums are the topics. Discussion forums are commonly used for specific course-related topics, while news forums are used to share general news or information. In this present study, news forums were less helpful than e-mail and discussion forums for SP communications.

As noted above, not all participants had access to Wimba™ web-conferencing. A little more than half of the study participants used Wimba™ for SP communications. Wimba™ was rated as less helpful than discussion forums and e-mail and about equally helpful as news forums for SP communications. Synchronous CMC tools, such as Wimba™, are generally believed to promote social presence (Clark & Mayer, 2008).

Again, it may depend on how the instructor uses web-conferencing and the degree to which participants are able to interact with each other during a web-conference. If

students are provided opportunities to see and hear one another or to text chat during a web-conference, they may perceive web-conferencing as more helpful for SP communications. In this present study, text chat was used by about one-third of the participants. Text chat was perceived as less helpful than e-mail, discussion/news forums, and Wimba™. But, text chat was perceived as more helpful for SP communications than for TP communications.

Phone and Skype™ were used by very few participants and were ranked the lowest for SP communications helpfulness. These results are interesting due to their low usage. The prevalence of individual cell phones suggests that most students have access but may not know the phone numbers of other students. But, all students have e-mail accounts in the university system.

Most of those who used Skype™ did find it helpful for SP communications. Of the CMC tools included in this study, Skype™ may be the least familiar for to students. Like the telephone, it may be viewed as not needed due to the high usage of discussion forums and e-mail for student-student communications.

Comfort with using CMC tools.

With the exception of Skype™, almost all of the participants "agreed" or "strongly agreed" that they were comfortable using the various CMC tools in this study. Chou (2001) has suggested that student comfort levels increase with practice. Most (87%) of the participants had taken at least one prior online course and may have had prior experience with the tools included in this study. The consistent, high comfort levels reported suggest that comfort level is not a contributing factor to variations in the dependent variables of this study.

Implications for CMC tool helpfulness.

The results of this study suggest that e-mail is considered helpful for promoting both teaching and social presence. The results of this study suggest that e-mail is the most used and is perceived as the most helpful CMC tool for teaching presence. Students may appreciate the privacy and immediacy that e-mail provides for communications with their instructors. E-mail may be their CMC tool of choice when communicating with their instructors. Second only to discussion forums, e-mail is perceived as useful for promoting social presence. Because discussion forums are usually topic driven, students may view e-mail as more flexible and immediate for social interactions.

Web-conferencing is perceived as another helpful CMC tool for teaching presence. This tool can be used for direct instruction, for student-instructor interactions, and for course facilitation, all of which promote perceptions of teaching presence. Depending on the amount of student-student interaction included, web-conferencing may also be a helpful CMC tool for promoting social presence.

Discussion forums were perceived as the most helpful tool for social presence. In discussion forums, everyone has a voice because everyone has access and everyone can view what is posted. As participants engage in discussion forums, they learn about each other and can respond to one another. Discussion forums may also be helpful CMC tools for promoting teaching presence. Instructors can facilitate discussions to keep them on topic and provide additional information when questions arise.

Though less used than e-mail and discussion forums, news forums can be helpful CMC tools for both teaching and social presence communications. Usually, the topics in news forums are determined by the author. Instructors can use them to provide course

updates, to remind students of upcoming deadlines, or even to share some personal information. Students can use news forums to share personal information, to share resources or to provide helpful comments based on course experiences.

Text chat can be a helpful CMC tool for promoting teaching and social presence. Whether during web-conferences or during a separate online session, instructors and students can communicate synchronously via text chat. The immediacy of text chat can be useful for asking questions, for planning projects, or for exchanging personal comments.

In this present study, phone and Skype™ were the least used and the least useful CMC tools. The low usage suggests that students prefer not to call their instructors or fellow students. It may be that using other CMC tools make it unnecessary to call, or that phone and Skype™ calls are difficult to arrange. It is a curious outcome and is worthy of further study.

In summary, most of the CMC tools used in this study were considered helpful for teaching presence and social presence communications. Instructors and course designers should consider carefully the number and combination of CMC tools that are used. More research is needed to understand which CMC tools are more helpful for different kinds of communications. An analysis of specific communication categories might provide greater insights into how to best utilize different CMC tools.

Research question two: Synchronous vs. asynchronous.

Research question two was: Is there a difference in student perceptions for the following factors between courses that do/do not include synchronous online meetings (web- conferencing):

a. social presence?

b. teaching presence?

c. cognitive presence?

Participants were divided into different groups based on their usage of Wimba™ web-conferencing. Group one utilized Wimba™ synchronous web-conferencing but did not utilize asynchronous discussion forums. Group two utilized asynchronous discussion forums but did not utilize Wimba™. Group three utilized both Wimba™ and discussion forums. One-way ANOVA was used to determine possible mean differences among the groups. Means for social, teaching, and cognitive presence were compared across groups.

Results indicate a statistically significant difference among the means of these groups for teaching and for cognitive presence. The mean differences among the groups for social presence were not statistically significant.

Social presence.

Social presence refers to the extent to which participants are able to express themselves personally and to experience a sense of belonging to the learning community. Social presence provides support to the learning process by making group interactions enjoyable and inclusive. In order for a community of learners to communicate effectively, participants need to bond with the group and feel accepted and heard.

In this present study, there were no statistically significant mean differences among the groups for social presence. This result differs from those of Rockinson-Szapkiw, Baker, Neukrug, and Hanes (2010) who found higher perceptions of social presence for groups that use both web-conferencing and asynchronous discussion forums. Though statistically significant, Rockinson-Saapkiw et al. (2010) reported a small effect

size for the mean difference in social presence. The differences between these studies may depend on how different CMC tools are used to promote social presence. If participants are given ample opportunities to communicate and interact with each other through discussion forums, they may not perceive increased social presence by the addition of web-conferencing. In their study, Giesbers et al. (2009) suggested that some students may have perceived the addition of web-conferencing as a redundant course element.

Teaching presence.

Teaching presence refers to the extent to which the instructor effectively designs and facilitates the learning process. Web-conferencing can provide live, face-to-face interactions among students and their instructors. Because of its "real time" nature, web-conferencing most closely mirrors traditional face-to-face classroom experiences (Repman, Zinskie, & Carlson, 2005).

In this present study, the mean score for teaching presence was significantly higher for the discussion forum group than for the Wimba™ web-conferencing group. Students who used Wimba™ perceived less teaching presence than those who used discussion forums. Though not statistically significant, the group that utilized both Wimba™ and discussion forums also perceived greater teaching presence than the Wimba™ only group.

These results seem to contradict prior research. In a study comparing web-conferencing to asynchronous lecture notes, students indicated that web-conferences aided their understanding and enabled them to perform better on quizzes (Skylar, 2009). Likewise, Griffiths and Graham (2010) found that the use of video can establish positive

and motivational relationships between instructors and students. But, Chou (2001) found that participants ranked weekly text-based discussions higher than web-conferencing for communication effectiveness.

Because teaching presence evaluates course design and course facilitation as well as direct instruction, it may be that students perceive that some of these components are better delivered through discussion forums than through web-conferencing. Considerations for course design should include the different strengths and weaknesses of different CMC tools. Web-conferencing provides synchronous communication but may limit interactions between the instructor and students, especially for large class sizes. Discussion forums provide more flexibility and give every student an opportunity to interact with the instructor and with other students. Through discussion forums, instructors can facilitate learning through relevant topics and by guiding discussions to remain on topic. Also, through discussion forums, instructors can provide helpful feedback and correct misconceptions.

Perceptions of teaching presence may also depend on how instructors use different CMC tools and for what purposes. Web-conferencing can be one-way or two-way communication. If an instructor utilizes web-conferencing solely for one-way communication, such as direct lecture, students may perceive less teaching presence. Because discussion forums require careful design, invite participation, and require instructor facilitation, students may perceive greater teaching presence through these forums.

Regardless of which CMC tool is used, perceptions of teaching presence may depend on the frequency of communications and interactions with an instructor. If web-

conferences are offered only a few times in a semester, then students may perceive they are less helpful for teaching presence. If discussion forums are offered weekly, then students may perceive them as more helpful for teaching presence.

Cognitive presence.

Cognitive presence refers to the extent to which participants can create meaning through the learning process of inquiry and discussion. It refers to the conditions and processes that enable participants in a community of inquiry to build and apply knowledge through a collaborative and constructivist approach to learning.

In this present study, the mean score for cognitive presence was significantly higher for the discussion forum group and for the group that utilized both tools than for the Wimba™-only group. Participants perceived higher cognitive presence when discussion forums were included as CMC tools. There was no statistically significant difference between the means of the discussion forum group and the group using both discussion groups and web-conferencing.

Because cognitive presence measures exploration, integration, and resolution, it is not surprising that the inclusion of discussion forums generated higher mean scores in the present study. Research on discussion forums suggests their importance for promoting cognitive presence (Garrison, Anderson, & Archer, 2001; Persico, Pozzi, & Sarti, 2010; Schrire, 2006). It is believed that discussion forums can encourage higher order thinking and reflection (Repman et al., 2005). It has been suggested that asynchronous discussion forums provide time for reflection, tend to be complex and explicit, and are associated with careful, critical thinking (Garrison, Anderson, & Archer, 2000). The results of this

present study confirm the importance of including discussion forums as a CMC tool to promote cognitive presence.

Implications for synchronous and asynchronous.

Based on the results of this study, it appears that the inclusion of discussion forums creates greater perceptions of teaching and cognitive presence for online learners. Using web-conferencing without the addition of discussion forums resulted in statistically significant, lower perceptions of teaching and cognitive presence, and the effect sizes were large. Online course designers and instructors should consider carefully the inclusion of discussion forums to encourage higher order thinking and reflection. Discussion forums encourage student interaction with the topics and seem to be an important CMC tool in aiding them to integrate concepts, to solve problems and to apply knowledge to different situations.

The limited sample size of the current study limits the generalizability of the results. More research with larger sample sizes is needed to further understand the use of web-conferencing and discussion forums, individually and in combination.

Research question three: Relationships.

Research question three was: Are student perceptions of CMC tool helpfulness associated with student perceptions of social or teaching presence? Social presence and teaching presence are facilitated through the CMC tools used. Different tools may be more or less helpful in promoting teaching or social presence. It is important to understand possible relationships between student perceptions of CMC tool helpfulness for promoting social and teaching presence and their overall perceptions of social and teaching presence.

Relationships with teaching presence.

In this present study, teaching presence was moderately correlated with helpfulness scores for e-mail, discussion forums, and news forums. Results from a standard multiple regression suggest that 31% of the variance in teaching presence was accounted for by knowing scores on these three variables. While discussion forums and e-mail contributed the most to predicting teaching presence, discussion forums were the most helpful. News forums did not contribute significantly to the prediction of teaching presence.

These results are supported by other research. In a large study of asynchronous learning environments, Shea, Sauli and Pickett (2006) concluded that "a strong and active presence on the part of the instructor—one in which she or he actively guides and orchestrates the discourse—is related both to students' sense of connectedness and learning" (2006, p. 185). They describe activities such as encouraging participation, creating a comfortable learning environment, correcting misconceptions, identifying areas of agreement or disagreement, and injecting their own knowledge as important elements of directed facilitation.

The results of this present study suggest that e-mail and discussion forums are important CMC tools for promoting teaching presence. These results are consistent with other findings of this study. Participants perceived e-mail and discussion forums as most helpful for promoting TP communications. Scale scores for teaching presence were higher when discussion forums were included as CMC tools in their online courses.

Relationships with social presence.

In this present study, social presence was moderately correlated with helpfulness scores for e-mail, discussion forums, and news forums. Results of a standard multiple regression suggest that 24% of the variance in social presence was accounted for by knowing scores on these three variables. While discussion forums and e-mail contributed the most to predicting social presence, e-mail was the most helpful, but only slightly so. News forums did not contribute significantly to the prediction of social presence.

These results are consistent with other research. As discussed earlier, Rourke and Anderson (2002) determined that asynchronous discussion forums can provide sociable environments for learning. Behaviors associated with a positive social environment include addressing others by name, complimenting, expressing appreciation, posting replies, expressing emotions, and using humor (Rourke & Anderson, 2002). Student perceptions of social presence in discussion forums are reflected in statements of personal value, self-disclosure, and group reference. Participants adopt more personal and casual styles of writing, have an appreciation for the contributions of others, and value interactions with and perceptions of others (Swan & Shih, 2003). The findings of this current study suggest that participants viewed discussion forums as helpful for promoting social presence in their courses.

These results are also consistent with other findings of this current study. Participants perceived e-mail and discussion forums as the most helpful CMC tools for promoting SP communications. E-mail was used by almost two-thirds of the participants and was ranked second to discussion forums in helpfulness for SP communications. In

this present study, scale scores for social presence were higher when discussion forums were included as CMC tools in their online courses.

The ability to send personal messages via e-mail to individuals or to groups of fellow students appears to be viewed as helpful in promoting social presence. E-mail offers convenience, privacy and flexibility for communications and interactions with other students. However, unlike discussion forums, participants can only view content if they are included as message recipients.

Implications of relationships.

CMC tool helpfulness for discussion forums and e-mail appears to explain some of the variance for teaching and social presence. Because both of these tools, and to a lesser extent, news forums, are associated with social and teaching presence, it would seem that both should be included in online courses.

Course designers and instructors should consider the inclusion of these tools, especially discussion forums, for promoting teaching presence. Through discussion forums and e-mail, students can communicate and interact with their instructors frequently and at times that are convenient for them. E-mail offers privacy as well as convenience. Discussion forums offer opportunities for instructor guidance and affirmation in the context of student interactions on course topics.

Course designers and instructors should consider how to integrate discussion forums and e-mail to promote social presence in online courses. Students should be encouraged to share e-mail contact information and to engage regularly in discussion forums. Through these tools, affective language and group cohesion should be encouraged to promote social presence.

Because of the small sample size of the current study, additional tools, such as web-conferencing, could not be adequately evaluated for relationships with social and teaching presence. More research with larger sample sizes is needed to further study what combinations of CMC tools are most helpful in promoting social and teaching presence communications.

Research question four: Demographics.

Research question four was: Are background demographic variables associated with social, teaching, or cognitive presence? Variables of gender, level of study, registration status, concentration of study, prior online courses taken, and years of teaching experience were included in the study to evaluate possible associations with social, teaching, and cognitive presence.

Gender.

In this present study, 15% of the participants were male and 85% were female. An independent t-test was used to determine the presence of any statistically significant mean differences for social, teaching or cognitive presence by gender. Females generally scored higher than males for social, teaching, and cognitive presence, but the mean differences were not statistically significant. The insignificant mean differences for gender in the present study suggest that gender did not contribute to variances in social, teaching, or cognitive presence.

These results differ slightly from those reported by Shea and Bidjerano (2009) in a much larger study (n= 2159) on predictors of social, teaching, and cognitive presence. In their study, the distribution was 25% male and 75% female. Shea and Bidjerano (2009) found a direct effect of gender on perceptions of teaching presence, but no effect on

perceptions of social or cognitive presence. However, gender accounted for a very small amount of the variance in teaching presence.

Together, these studies suggest that gender does not contribute significantly to variances in social and cognitive presence, but may have a slight effect on teaching presence.

Level of study.

Participants were enrolled in either certification (81%) or master's degree (19%) programs as their level of study. An independent t-test was used to determine the presence of any statistically significant mean differences for social, teaching, or cognitive presence between these groups. The mean differences for social, teaching, and cognitive presence between certification and master's degree students were not statistically significant.

These results are consistent with those of Shea and Bidjerano (2009). Their research of predictors on social, teaching, and cognitive presence included six levels of study: freshman (16%), sophomore (27%), junior (14%), senior (12%), graduate (15%), non-matriculated (9%), and undesignated (7%). Shea and Bidjerano (2009) found no direct effects for level of study on social, teaching, or cognitive presence.

Together, these studies suggest that level of study does not contribute significantly to variances in social, teaching, and cognitive presence.

Registration status.

In this present study, participants were enrolled as either part-time (89%) or full-time (11%) students as their registration status. Results of an independent t-test found no statistically significant mean differences for social, teaching, or cognitive presence

between these groups. These results are interesting as one might expect that full-time students might perceive more teaching and social presence as a result of taking a full course load and having more classes for interactions with faculty and peers.

No other research studies were found that evaluated the effects of registration status on social, teaching, and cognitive presence. The limited sample size of this present study limits the generalizability of the results for registration status. Further research is needed to better understand how registration status might affect social, teaching, and cognitive presence.

Concentration of study.

In this present study, participants were enrolled in different concentrations of teacher training study: general special education (24%), adaptive special education (17%), gifted education (56%), and other (3%). One-way ANOVA results indicated no statistically significant mean differences for social, teaching, or cognitive presence among these groups.

Arbaugh, Bangert, and Cleveland-Innes (2010) researched the effects of academic disciplines on perceptions of social, teaching, and cognitive presence. Data were collected from two different schools (total n= 1582) across academic disciplines including education, nursing, business, health, engineering, and science fields. Arbaugh et al. (2010) found main effects for academic disciplines. They concluded that these effects may be due to the different paradigms of different academic disciplines. Certain "hard" disciplines, such as science, have dominant paradigms and focus more on knowledge acquisition while other "soft" disciplines, such as education, have competing paradigms and focus on knowledge application and integration.

In this present study, the different concentrations of study are all in the discipline of education training. It seems reasonable that there would be no statistically significant mean differences among these groups for social, teaching, and cognitive presence.

Prior online courses taken.

Participants were asked to indicate the number of prior online courses they had taken. Their responses were categorized into four groups: none (13%), one prior course (15%), two prior courses (13%), three prior courses (24%), and four or more prior courses (35%). Results of a one-way ANOVA found a statistically significant mean difference for cognitive presence among these groups. Post hoc analysis revealed a higher mean score for the group with one prior online course compared to the group with four or more prior online courses, and the effect size was large.

A closer examination of the mean scores reveals a trend in which perceptions of cognitive presence seem to decline as additional online courses are taken. A similar trend is noted for perceptions of teaching presence, but not for perceptions of social presence. The cause(s) for such a decline are not readily apparent, but one could surmise that prior experience may influence perceptions. As students gain more experience with online courses, their expectations for teaching and cognitive presence may increase, and lower perceptions of teaching and cognitive presence may be due to unmet expectations. Or, their expectations may decrease and be reflected in lower perceptions of teaching and cognitive presence.

Another possible explanation may be increases in independent learning. As students increase their experiences with online learning they may become more independent and self-directed, needing and perceiving less teaching presence in their

online learning experiences. They may choose to communicate and interact less frequently with their instructors because they feel less need to do so. Because teaching presence is a strong predictor of cognitive presence (Shea & Bidjerano, 2009), student perceptions of cognitive presence might decrease as well.

Arbaugh (2004) found little significant change in student perceptions of online learning as they experienced multiple online MBA courses over a period of four years. Student perceptions of course flexibility, interactions, usefulness of course software, ease of use, delivery medium satisfaction, content learning, and instructor immediacy were evaluated. Results indicated no statistically significant mean differences for perceptions of instructor immediacy and no statistically significant mean differences for perceptions of content learning between one or more prior online courses.

No other studies were found that evaluated social, teaching, or cognitive presence based on the number of prior online courses taken.

Years of teaching experience.

Participants were asked to indicate years of prior teaching experience. Three groups were formed based on responses: no prior experience (20%), up to three years experience (26%), and three or more years of experience (54%). Results of one-way ANOVA indicated no statistically significant mean differences for social, teaching, or cognitive presence among these groups. For this population, it appears that years of teaching experience have no effect on the means for social, teaching, or cognitive presence.

Based on the literature review, this researcher found no studies to suggest that prior teaching experience would be related to perceptions of teaching, social. or cognitive

presence. The analysis was done to detect any possible effects of prior teaching experience on the dependent variables in the study.

Implications of demographic variables.

The results of this present study suggest that variables of gender, level of study, registration status, concentration of study, and years of teaching experience have no effect on social, teaching, or cognitive presence. But, results for prior online courses taken suggest that teaching and cognitive presence may decline as online course experiences increase. It is an interesting outcome that warrants further study. As the prevalence of online learning continues to grow, researchers, course designers, and instructors should consider how multiple online course experiences affect student perceptions.

Recommendations for Further Research

Due to the small sample size and specific population evaluated in this present study, the generalizability of the results is limited. Additional studies are needed to further validate the instrument and the results. Larger sample sizes are needed to further test the reliability of the CMC elements of the survey. Other populations of online students should be studied to determine possible differences in student perceptions about CMC tool helpfulness and relationships with social and teaching presence.

As more CMC tools are introduced to online learning, more studies should be done to evaluate their helpfulness for learning. Future studies could help identify which tools are most helpful for different communications and purposes. Also, more research is needed to evaluate how different combinations of CMC tools contribute to student perceptions of social, teaching, and cognitive presence.

The observed decreases in teaching and cognitive presence with more online courses suggest that more research is needed to understand how social, teaching, and cognitive presence change over time. Studies should be done to measure these elements during a single course and over the duration of multiple courses to measure the effects of time and experience with online learning.

Finally, research is also needed to better understand how instructors use different CMC tools and combination of tools in their online courses. It would be interesting to compare how instructors perceive the helpfulness of different CMC tools with student perceptions of those same tools. It would also be interesting to compare instructor objectives for using different CMC tools with student outcomes.

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APPENDIX A: SURVEY INSTRUMENT

The survey instrument consists of three parts: Community of Inquiry items, communication mode items, and demographics. The instrument employs a five point Likert scale as follows:

1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree

Community of Inquiry Items

Teaching presence.

Design and organization.

1. The instructor clearly communicated important course topics.

2. The instructor clearly communicated important course goals.

3. The instructor provided clear instructions on how to participate in course learning activities.

4. The instructor clearly communicated important due dates/time frames for learning activities.

Facilitation.

5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.

6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.

7. The instructor helped to keep course participants engaged and participating in productive dialogue.

8. The instructor helped keep the course participants on task in a way that helped me to learn.

9. The instructor encouraged course participants to explore new concepts in this course.

10. Instructor actions reinforced the development of a sense of community among course participants.

Direct instruction.

11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.

12. The instructor provided feedback that helped me understand my strengths and weaknesses.

13. The instructor provided feedback in a timely fashion.

Social presence.

Affective expression.

14. Getting to know other course participants gave me a sense of belonging in the course.

15. I was able to form distinct impressions of some course participants.

16. Online or web-based communication is an excellent medium for social interaction.

Open communication.

17. I felt comfortable conversing through the online medium.

18. I felt comfortable participating in the course discussions.

19. I felt comfortable interacting with other course participants.

Group cohesion.

20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.

21. I felt that my point of view was acknowledged by other course participants.

22. Online discussions help me to develop a sense of collaboration.

Cognitive presence.

Triggering event.

23. Problems posed increased my interest in course issues.

24. Course activities piqued my curiosity.

25. I felt motivated to explore content related questions.

Exploration.

26. I utilized a variety of information sources to explore problems posed in this course.

27. Brainstorming and finding relevant information helped me resolve content related questions.

28. Online discussions were valuable in helping me appreciate different perspectives.

Integration.

29. Combining new information helped me answer questions raised in course activities.

30. Learning activities helped me construct explanations/solutions.

31. Reflection on course content and discussions helped me understand fundamental concepts in this class.

Resolution.

32. I can describe ways to test and apply the knowledge created in this course.

33. I have developed solutions to course problems that can be applied in practice.

34. I can apply the knowledge created in this course to my work or other non-class related activities.

CMC Tool Helpfulness Items

Participants are asked to rate their level of agreement with the following statements about the CMC tools they used in their online courses. The same five –point

Likert scale is used with an additional option of "did not use" because not all tools are utilized by all participants.

Helpfulness for teaching presence items.

35. Using (insert CMC tool name) was helpful for receiving information from my instructor about course topics, goals and learning activities.

36. Using (insert CMC tool name) was helpful for receiving directions or clarification from my instructor.

37. Using (insert CMC tool name) was helpful for receiving personal feedback from my instructor.

38. Using (insert CMC tool name) was helpful for communicating questions or concerns to my instructor.

Helpfulness for social presence items.

39. Using (insert CMC tool name) was helpful for getting to know other course participants.

40. Using (insert CMC tool name) was helpful for interacting and collaborating with other course participants.

Comfort level.

41. I was comfortable using (insert CMC tool name).

Demographic Items

42. What is your gender?

- male
- female

43. What is your current level of study?

- certification
- masters

44. What is your registration status?

- part-time student
- full-time student

45. What is your concentration?

- general special education
- adaptive special education
- gifted education
- other (please name)

46. How many years of teaching experience do you have?

- None
- less than one year
- 1-2 years
- 2-3 years
- 3+ years

47. Prior to the current semester, how many online courses have you taken?

- none
- one
- two
- three
- four or more

48. Prior to the current semester, please indicate which of the following online communication tools you have used in online courses. (Check all that apply)

- e-mail
- Moodle ™ news forums
- Moodle ™ discussion forums
- Skype™
- Web-conferencing (Wimba™)
- other

49. I am comfortable taking courses online.

50. I can learn effectively through online courses.

51. You are invited to offer any additional comments about your experience taking this online course.

APPENDIX B: REPRINT PERMISSION

University of North Carolina at Charlotte
College of Education Building Suite 261
9201 University City Blvd.
Charlotte, NC 28223

August 19, 2011

Dr. D. Randy Garrison
University of Calgary
2500 University Dr. NW
Calgary, Alberta, Canada
T2N 1N4

Dear Dr. Garrison,

I am completing a doctoral dissertation at the University of North Carolina at Charlotte entitled "Student Perceptions of Computer-Mediated Communication Tools in Online Learning: Helpfulness and Effects on Teaching, Social, and Cognitive Presence." I would like your permission to reprint in my dissertation excerpts from the following:

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*(2-3), 87-105. Retrieved from http://communitiesofinquiry.com

The excerpts to be reproduced are the following figures and table:

Table 1. Community of Inquiry Coding Template

Elements	*Categories*	*Indicators (examples only)*
Cognitive Presence	Triggering Event	Sense of puzzlement
	Exploration	Information exchange
	Integration	Connecting ideas
	Resolution	Apply new ideas
Social Presence	Emotional Expression	Emotions
	Open Communication	Risk-free expression
	Group Cohesion	Encouraging collaboration
Teaching Presence	Instructional Management	Defining and initiating discussion topics
	Building Understanding	Sharing personal meaning
	Direct Instruction	Focusing discussion

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Thank you very much.

Sincerely,

Sara R. Salloum
Doctoral Candidate, UNCC

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USE REQUESTED ABOVE:

Dr. D. Randy Garrison

Date: Aug 19, 2011

APPENDIX C: IRB APPROVAL

UNC CHARLOTTE

Office of Research Compliance

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Institutional Review Board (IRB) for Research with Human Subjects

Approval of Exemption

Protocol #	**11-04-09**			
Title:	**Student Perceptions of Computer-Mediated Communication Tools in Online Learning: Usefulness and Effects on Social, Teaching, and Cognitive Presence**			
Date:	**4/7/2011**			
Responsible Faculty	**Dr.**	**John**	**Gretes**	**Educational Leadership**
Investigator	**Ms.**	**Sara**	**Salloum**	**Educational Leadership**
Co-investigator	**Dr.**	**Richard**	**Lambert**	**Educational Leadership**

The Institutional Review Board (IRB) certifies that the protocol listed above is exempt under category 2 (45 CFR 46.101 2.b.4).

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and

b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

This approval will expire one year from the date of this letter. In order to continue conducting research under this protocol after one year, the "Annual Protocol Renewal Form" must be submitted to the IRB. Please note that it is the investigator's responsibility to promptly inform the committee of any changes in the proposed research, as well as any unanticipated problems that may arise involving risks to subjects. Amendment and Event Reporting forms are available on our web site: http://research.uncc.edu/compliance-ethics/human-subjects/amending-your-protocol or http://research.uncc.edu/compliance-ethics/human-subjects/reporting-adverse-events

M. Lyn Exum — 4/8/11

Dr. M. Lyn Exum, IRB Chair — Date