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A Mixed Method Study Examining Synchronous-Enhanced Learning in Distance Education

by

Kimberly M. Wheeler

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Educational and Psychological Studies
College of Education
University of South Florida

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ABSTRACT

This mixed method study examined how integration of synchronous Web-based desktop conferencing affects undergraduate distance learning students' educational experience. Specifically, it compared students in one distance learning section of an introductory technology course delivered through a synchronous-enhanced mode (employing both synchronous and asynchronous tools) with students in a second section of the same distance learning course provided in the asynchronous only mode to examine variations in cognitive presence, social presence, and teaching presence through the lens of the Community of Inquiry model (Garrison, Anderson, and Archer, 2000). Additionally, this study measured perceived learning, learner-instructor interaction, and learner-learner interaction to determine whether observable differences between the two groups occurred. Benefits of the synchronous-enhanced distance learning environment predicted in this study included a statistically significantly stronger sense of cognitive presence, social presence, and teaching presence. It was also hypothesized that the synchronous-enhanced distance learning environment would yield statistically significantly higher reported perceived learning and interaction in contrast to the asynchronous condition. This study qualitatively explored how students perceived their experiences in synchronous-enhanced and asynchronous distance learning environments through focus group interviews and deductive analysis. Results of the analysis revealed no statistically significant differences between the synchronous-enhanced and asynchronous groups in measuring cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-

learner interaction. Qualitative results evidenced higher frequencies in the synchronous-enhanced group with regard to clarification, collaboration, direct instruction, and interaction.

CHAPTER ONE – INTRODUCTION AND BACKGROUND

Distance education is an emergent initiative transforming the higher education curriculum in the United States. From 2002 to 2012, the number of students enrolled in at least one distance learning course rose 1.6 million to 7.1 million (Allen & Seamen, 2014). According to the U.S. Department of Education's National Center for Education Statistics (2011), between 2007 and 2008, approximately 4.3 million undergraduate students (20% of undergraduates) enrolled in at least one distance education course. Approximately 800,000 (4% of undergraduates) completed the entirety of their undergraduate program through distance education. The percentage of students who enrolled in any distance education courses increased from 16% between 2003 and 2004 to 20% between 2007 and 2008 (U.S. Department of Education, 2011). Distance learning emerged through the adoption of correspondence courses in the 1800s when students received instruction in a largely passive role. Today, a myriad of technologies, once restricted to the imagination, are available to enhance the learning experience in distance education. From a variety of technologies available for use in distance education, most instructors in higher education today use asynchronous learning tools (Rovai, Ponton, & Baker, 2008).

Asynchronous learning is time independent. Through asynchronous tools, instructors deliver content or communications to students and respond at a different time. Using the same tools, students access content and send communications regardless of other users' schedules. Examples of asynchronous tools include email, discussion boards, wikis, and audio/video

recordings. In contrast to asynchronous learning, synchronous learning occurs simultaneously. Synchronous learning tools connect individuals in the same place at the same time. Examples of synchronous tools include synchronous desktop conferencing, instant messaging/chat, and Voice over Internet Protocol (VoIP) in which students and instructors interact with one another in real time. In recent years, researchers have examined both asynchronous and synchronous communication to inform best practices for the design of distance education courses; however, CMC (computer-mediated communication) literature indicates asynchronous tools have received far more research interest than synchronous media (Hrastinski & Keller, 2007). According to the 2012 Horizon Report by the American Council on Education (EDUCAUSE), as trends in education and technology continue to evolve, learning will become more active, collaborative, and mobile, and students' needs will drive delivery (Johnson, Adams, & Cummins, 2012). In tandem with the transition toward a student-centered environment, some expect the learner's role to shift from passive listener to engaged and active collaborator (Johnson et al., 2012). Collaboration (student-teacher or student-student) has transitioned to a practice essential to the learning process (Johnson et al., 2012). Research suggests that students' combined learning experiences constructed through differentiated expertise facilitates the creation of knowledge structures that exceed those found from working independently (De Miranda, 2004). Given the advent of Internet-based learning and recent technological developments, synchronous communication tools may offer a solution to enrich communication (de Freitas & Neumann, 2009; Mabrito, 2006; Schullo, Kromrey, Barron, & Hogarty, 2005) among students and teachers in the online learning environment. Further, these tools may enhance students' educational experience (Chou, 2002; de Freitas & Neumann, 2009; Hrastinski & Keller, 2007; Tolu, 2010) in

contrast to asynchronous instruction alone.

The Potential of Synchronous Learning

Synchronous Web-based course systems offer unique opportunities for enhancing the online educational experience. Synchronous technologies have the potential to support communities of learners who can interact and learn together in real-time. Over time, this communal support may diminish learner isolation as participants identify themselves as belonging to the community rather than as isolated beings (de Freitas & Neumann, 2009; Hrastinski, 2008; Hrastinski & Keller, 2007; Koszalka & Ganesan, 2004; Mabrito, 2006). Specifically, synchronous desktop conferencing has the unique potential to apply to a myriad of circumstances achieved through multiple modes (de Freitas & Neumann, 2009). Synchronous desktop conferencing allows small teams to conduct meetings, instructors to provide detailed and interactive feedback through application sharing, and groups to collaborate visually on projects from a distance and in real time (de Freitas & Neumann, 2009). Both asynchronous and synchronous (same time) technologies lend themselves to integration into the distance learning course design; however, some researchers report higher education institutions integrate synchronous learning tools into their distance learning courses less frequently than they integrate asynchronous technologies (Parsad & Lewis, 2008).

Instructors often use a variety of asynchronous communication tools such as discussion boards, wikis, blogs, and email in distance learning; however, research suggests that synchronous learning (e.g., Elluminate Live!®, Blackboard Collaborate®) may offer a means to enhance students' educational experience through improving cognitive presence, social presence, and teaching presence (Chou, 2002; de Freitas & Neumann, 2009; Hrastinski & Keller, 2007; Tolu,

2010). Additionally, synchronous learning may improve learning and interaction (de Freitas & Neumann, 2009; Disbrow, 2008; Gillies, 2008; Koszalka & Ganesan, 2004; Mabrito, 2006; Skylar, 2009; Zsiray, Smith, & West, 2001) in comparison with asynchronous instruction.

Theoretical Framework

In designing an effective distance learning environment, educators must consider the potential applications of the learning tool, benefits to the learning process, and the positive effects students might realize. Garrison, Anderson, and Archer (2000) suggest a theoretical framework for examining students' educational experience. Their Community of Inquiry model proposes the need to ensure the consideration of three constructs—cognitive presence, social presence, and teaching presence—in the integration of any technology in the classroom (Garrison et al., 2000).

Table 1. Characteristics of cognitive presence, social presence, and teaching presence

Cognitive Presence	**Social Presence**	**Teaching Presence**
• triggering event	• effective communication	• design and organization
• exploration	• open communication	• facilitating discourse
• integration	• group cohesion	• direct instruction
• resolution		

Garrison and colleagues (2000) define social presence as "the ability of participants in a community of inquiry to project themselves socially and emotionally, as 'real' people (e.g., their full personality), through the medium of communication being used" (p. 94). Social presence, a term originally coined by Short, Williams, and Christie (1976), involves the element of media richness, the ability to establish relationships, and students' ability to project themselves as real

and present individuals. The three primary elements of social presence include "effective communication, open communication and group cohesion" (Garrison, 2007, p. 63). Social presence can occur when individuals have the opportunity to reflect their identity in the distance learning community (Gunawardena, 1995; Gunawardena & Zittle, 1997). Some researchers (Gunawardena, 1995; Richardson & Swan, 2003) have associated students' perceived satisfaction and actual learning in the online learning environment with social presence. Anderson and colleagues (2001) define teaching presence as "the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes" (p. 5). In the Community of Inquiry model, teaching presence incorporates three components—design and organization, facilitating discourse, and direct instruction—and encompasses activities such as structuring course materials such as lecture notes, mini-lectures, and personal commentaries (Anderson, Rourke, Garrison, & Archer, 2001). These authors define cognitive presence as the "exploration, construction, resolution, and confirmation of understanding through collaboration and reflection in a community of inquiry" (Garrison, 2007, p. 65). Cognitive presence, grounded in the theory of reflective thinking (Dewey, 1933), relates to "higher-order thinking processes as opposed to specific learning outcomes" (Garrison et al., 2001). Cognitive presence is composed of elements of the Practical Inquiry Model including a triggering event, exploration, integration, and resolution (Garrison, Anderson, & Archer, 2000).

This mixed method study (IRB#: Pro00015756) expanded the level of research that has explored the benefits of synchronous (same time) learning in the distance education environment and the Community of Inquiry model's (Garrison, Anderson, & Archer, 2000) theoretical

framework. This study sought to examine whether integration of synchronous interaction within the distance learning environment results in statistically significant differences in students' educational experience (e.g., cognitive presence, social presence, and teaching presence), perceived learning, and interaction. This study also explored how students in the synchronous-enhanced learning condition felt this method of delivery supported their learning.

Statement of Problem

Research supports the theory that synchronous learning offers unique benefits to students in the distance learning environment and may enhance their educational experiences. Although somewhat limited, studies comparing synchronous and asynchronous learning suggest a myriad of advantages in favor of synchronous communication tools. A review of current literature illustrates advantages within cognitive presence, social presence, teaching presence, perceived learning, and interaction; however, most of the studies reviewed lack rigor and require additional research. Finally, much of the limited research comparing synchronous and asynchronous learning focuses on text-based (visual verbal) as opposed to oral-verbal communication and fails to integrate current audio, graphic, and video capabilities (Chou, 2002; Hrastinski & Keller, 2007; Koszalka & Ganesan, 2004). Recent advances in synchronous Web-based course system capabilities and gaps in previous research justify further examination into the potential of synchronous learning. This study expanded the current body of knowledge and examined the effect of integrating synchronous learning on students' educational experience, operationally measured as students' perceptions of cognitive presence, social presence, and teaching presence through the lens of the Community of Inquiry model (Garrison et al., 2000). This research also evaluated perceived learning and interaction in synchronous-enhanced and asynchronous

distance learning courses. Finally, this study explored how students perceived their experience in an undergraduate, introductory technology, synchronous-enhanced distance learning course. It extended the pilot study conducted over two semesters prior to this proposed research.

Research Questions and Hypotheses

Research Questions

1. How do undergraduate students perceive their educational experience in a synchronous-enhanced Web-based introductory technology course?
2. How do undergraduate students perceive their educational experience in an asynchronous Web-based introductory technology course?

Research Hypotheses

1. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will report a statistically significantly higher sense of social presence, teaching presence, and cognitive presence in contrast to students who use only asynchronous tools.
2. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will evidence statistically significantly higher levels of perceived learning and interaction in contrast to those who use only asynchronous tools.

Purpose of Research Study

This mixed method study examined how integration of synchronous learning affects undergraduate distance learning students' educational experience in an introductory technology course. It compared students' perceptions of cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction in an

undergraduate introductory technology distance learning course that integrated a synchronous component with the same online course that did not incorporate synchronous learning. This research examined synchronous and asynchronous instruction to examine the impact on learners' educational experience, perceived learning, and interaction and investigate how students in each learning environment perceive their experience. It was predicted that the synchronous-enhanced distance learning environment would yield statistically significantly higher reported cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction in contrast to the asynchronous condition. This study also qualitatively explored how undergraduate students perceived their experiences in synchronous-enhanced and asynchronous distance learning environments through focus group interviews and deductive analysis.

Definition of Terms and Abbreviations Used in Study:

The following definitions are provided to help facilitate discussion of this study.

Definition of Terms

Asynchronous learning is time independent. Through asynchronous tools, instructors may deliver content or communications to students and respond at another time. Using asynchronous tools, individuals can access content and send communications regardless of other users' schedules. Examples of asynchronous tools include email, discussion boards, wikis, and audio/video recordings.

Blog or "Web log" is an electronic communication tool, accessible through the World Wide Web, which combines a journal with reflections and comments provided by the

author and readers.

Cognitive presence is the "exploration, construction, resolution, and confirmation of understanding through collaboration and reflection in a community of inquiry" (Garrison, 2007, p. 65).

Community of Inquiry (CoI) model proposes the need to ensure that when integrating any technology in the classroom, three constructs—cognitive presence, social presence, and teaching presence—are essential for a successful learning experience (Garrison, Anderson, & Archer, 2000).

Computer mediated communication (CMC) is any human communication that occurs through computer technology (Thurlow, Lengel, & Tomic, 2004).

Discussion board is an asynchronous, electronic communication tool—including text-based and voice-based discussion board posts—that facilitates threaded discussions among participants.

Distance education is "teaching and planned learning in which teaching normally occurs in a different place from learning, requiring communication through technologies as well as special institutional organization" (Moore & Kearsley, 2011, p. 2).

Instant messaging (IM) is a synchronous, text-based, electronic communication tool that facilitates real-time interaction.

Instructional design is "the systematic and reflective process of translating principles of

learning and instruction into plans for instructional materials, activities, information resources, and evaluation" (Smith & Ragan, 2005. p. 4).

Learning management system (LMS) is a computer-based platform (e.g., Canvas®, Blackboard®) designed to organize all aspects of course delivery including content delivery, discussion, assessment, etc., which may support or replace the classroom learning environment.

Media is defined by Moore (2012) as text, images, sounds, and artifacts.

Presence is "a sense of being or identity created through interpersonal communication" (Garrison, 2011, p. 22-23).

Social presence incorporates the ability to form relationships and project one-self as a real individual (Short, Williams & Christie, 1976). The three primary elements of social presence include "effective communication, open communication and group cohesion" (Garrison, 2007, p. 63). Individuals shape their social presence by projecting their identity in the community (Gunawardena, 1995; Gunawardena & Zittle, 1997).

Synchronous learning occurs simultaneously. Synchronous learning tools connect individuals in the same place at the same time. Examples of synchronous communication tools include synchronous desktop conferencing, instant messaging (e.g., chat), and Voice over Internet Protocol (VoIP) in which students and instructors interact with one another in real time.

Synchronous-enhanced learning is a learning environment that encompasses both

synchronous and asynchronous communication tools.

Synchronous desktop videoconferencing is an electronic computer conferencing tool (e.g., Blackboard Collaborate®) designed to support real-time communication among participants. Communication may occur via audio (oral-verbal) or text-based (visual-verbal) and permits video interaction.

Teaching presence is "the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p. 5).

Wiki, is "a freely expandable collection of interlinked webpages, a hypertext system for storing and modifying information—a database, where each page is easily edited by any user with a forms-capable Web browser client" (Leuf & Cunningham, 2001, p. 14).

World Wide Web or "the Web" is an information sharing system which accesses information from users linked to the Internet through HyperText Transfer Protocol (HTTP).

Abbreviations

Commonly used abbreviations in this study include the following:

CoI Community of Inquiry

CMC Computer mediated communication

DE Distance education

F2F Face-to-face

HTML HyperText Markup Language

HTTP HyperText Transfer Protocol

LMS Learning management system

SAC Synchronous audiographic conferencing

SWBCS Synchronous Web-based course systems

VoIP Voice over Internet Protocol

CHAPTER TWO – LITERATURE REVIEW

This review of literature will examine theory including the Community of Inquiry model by Garrison and colleagues (2000) and Moore's Theory of Interaction (1989) to inform the development of this study. Next, it will explore current research comparing synchronous and asynchronous learning in higher education, including outcomes identified by Garrison and colleagues (2000) as they pertain to the student's educational experience. Outcomes include cognitive presence, social presence, and teaching presence. Additionally, it will investigate benefits to learning and interaction in the synchronous learning environment. The review of literature will conclude by establishing the need for this research designed to compare students' educational experience, perceived learning, and interaction in synchronous-enhanced (integration of both synchronous and asynchronous learning tools) versus asynchronous (use of only asynchronous learning tools) distance learning environments.

Theoretical Frameworks

Community of Inquiry (CoI) Model

The Community of Inquiry model (Garrison, Anderson, & Archer, 2000) proposes the need to ensure that those implementing any technology consider three interdependent constructs—cognitive presence, social presence, and teaching presence—to facilitate deep and meaningful learning (collaborative constructivist). A number of researchers (Arbaugh, 2008;

Garrison & Arbaugh, 2007; Tolu, 2010) have examined the Community of Inquiry model and found it valid and effective. Garrison (2011) defined presence as "a sense of being or identity created through interpersonal communication" (p. 22–23).

Figure 1. The Community of Inquiry Framework

(Reproduced with permission from Pergamon. From 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.)

Teaching Presence

Anderson et al. (2001) defined teaching presence as "the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes" (p .5). Teaching presence encompasses three

components including design and organization, facilitating discourse, and direct instruction (Garrison et al., 2000). Activities comprised in this category of teaching presence include the structuring of course materials such as lecture notes, mini-lectures, and personal commentaries (Anderson et al., 2001). The organization component of teaching presence, particularly important in the distance education environment, provides a consistent and straightforward course structure, two strong predictors of success in online courses (Swan, 2003, 2002). The facilitating discourse component of teaching presence, described as "critical to maintaining the interest, motivation and engagement of students in active learning," requires the teacher to read frequently, to participate in the online discussion, and continuously explore new methods to support the learning community (p. 7). The third component of teaching presence, classified as direct instruction, proposes that teachers provide academic leadership and share subject matter expertise.

Social Presence

Social presence incorporates the element of media richness, and students' ability to establish relationships and project themselves as real and present individuals (Short, Williams & Christie, 1976). The three primary elements of social presence include effective communication, open communication, and group cohesion (Garrison, 2007). Social presence occurs through individuals' projection of their identity in the online community (Gunawardena, 1995; Gunawardena & Zittle, 1997). According to computer mediated communication (via networked telecommunications) research, individuals can perceive social presence in the CMC (computer mediated communication) learning environment (Gunawardena, 1995; Richardson & Swan, 2003; Tu & McIsaac, 2002; Walther, 1994).

The communication medium can affect social presence, an important element in the learning process. A review of media research conducted by Williams and Christie (1976) concluded that in a text-based environment, the "absence of visual channel reduces the possibilities for expression of socio-emotional material and decreases the information available about the other's self-image, attitudes, moods, and reactions" (p. 59). Research by Rogers and Lea (2005) illustrates that group cohesion and productivity improves when a group shares a social identity. Additionally, the level of commonality within the group rather than among individual members enhances social presence (Rogers & Lea, 2005).

Research also shows a link between social presence and teaching presence. A study conducted by Shea et al. (2010) identified a correlation between the increase or decrease in teaching presence and an increase or decrease in student social presence. In this study, the correlation for course A rose from .02 to .97, indicating an increase in social presence relating to an increase in teaching presence. The correlation fell from .78 to .38 for course B, illustrating a decline in social presence corresponding to a decrease in teaching presence. Other researchers have associated student satisfaction (perceived) and actual learning in the online learning environment with social presence (Gunawardena, 1995; Richardson & Swan, 2003).

Cognitive Presence

Garrison (2007) defines cognitive presence as the "exploration, construction, resolution, and confirmation of understanding through collaboration and reflection in a community of inquiry" (p. 65). Cognitive presence, grounded in Dewey's (1933) theory on reflective thinking, relates to higher-order thinking processes rather than explicit outcomes (Garrison, Anderson, & Archer, 2001). Cognitive presence becomes operational through the practical inquiry model in

which individuals shift from a triggering event to exploration, integration, and resolution (Garrison, 2007). Arbaugh (2007) regards cognitive presence as the most difficult component to ascertain among the three presences within the Community of Inquiry model.

Garrison et al. (2001) explored cognitive presence in the asynchronous text-based computer conferencing environment based upon the practical inquiry model through content analysis. Three one-week text based discussions in two graduate-level courses were used to examine cognitive presence. Fourteen people, including the instructor, two moderators, and students participated in the discussion during week one. Discussion was led by two student moderators who stimulated dialogue. During week one, the instructor played a passive role but monitored interactions and provided expertise when needed. A total of 51 messages were examined during week one. Six students participated in week two and twenty messages were exchanged among the students and instructor. Twenty-four messages were exchanged among the instructor and students during week three. Two graduate students coded the transcripts from the three discussions and evaluated and refined the coding scheme based upon the practical inquiry model. During weeks two and three, the instructor played an active role in the discussion. The researchers noted that although they found a high number of comments related to the exploration phase (42%), they found very few comments reached the integration (13%) and resolution (4%) stages. Some (Arnold & Ducate, 2006; Garrison et al., 2001) have suggested that the teacher's role may have a significant effect on the ability of students' to move beyond exploration to reach the higher levels of integration and resolution. Garrison et al. (2001) assert that the lack of resolution responses in the asynchronous text-based computer conferencing environment used in their study was difficult to explain; however, they postulate

that either "there may have been deficiencies in the facilitation in terms of guiding and shaping the discourse toward higher order cognitive activities" or that the asynchronous text-based medium used in their study "does not support this kind of activity" (Garrison et al., 2001, p. 20). Arnold and Ducate (2006) examined communication through asynchronous discussion boards over one semester and concluded that even the highest levels of cognitive presence are achievable through asynchronous discussion boards. He also discovered that the structure of the questions and tasks posed by the instructor directly affects whether the students' discussion reaches the resolution stage.

Moore's (1989) Theory of Interaction

Given the importance of interaction to the learning process, designers of distance learning courses may need to integrate both synchronous and asynchronous tools into the course design to support optimal interaction. According to Moore (1989), the primary weakness of distance learning courses is the inclusion of only one type of medium. Moore (2012) defines media as text, images, sounds, and artifacts. One medium limits integration to one type (e.g., learner-learner, learner-instructor, or learner-content) at the exclusion of other types (Moore, 1989). Interaction consists of three primary elements including learner-learner, learner-instructor, and learner-content interaction (Moore, 1989). Regarding learner-learner interaction, students interact with one another to enhance understanding and perspective. Learner-instructor interaction involves student interaction with the instructor. Learner-content interaction implies student interaction with instructional materials resulting in changes in comprehension.

Multimedia Learning Theory

Multimedia learning theory plays an important role in the successful integration of

various elements in a multimedia-facilitated course design. Research on multimedia learning supports the concept termed the modality principle, which asserts that replacing text with narration "eliminates the competing verbal and visual inputs" (Moreno & Mayer, 1999, p. 366). Research conducted by Mayer and colleagues (Moreno & Mayer, 1999; Moreno, Mayer, Spires, & Lester, 2001) has important implications for distance learning course design.

Research on multimedia learning also provides evidence of the modality principle (Moreno & Mayer, 1999; Moreno, Mayer, Spires, & Lester, 2001). A study conducted by Moreno & Mayer (1999) (N = 132) investigated the relationship between temporal-contiguity and modality to multimedia learning with animation. They compared two groups to test their theory relating to the modality principle. Computer programs that offered the same content but differed in their use of text or narration were used in this study. On-screen text or narration was presented for the same amount of time, and several measures including a questionnaire, retention test, matching test, and four-page transfer test were used to examine outcomes. Study results illustrated that, for verbal recall, the treatment group scored statistically significantly higher where $F(2, 119) = 16.137$, MSE = 8.861, $p < .001$, with the effect size calculated at 1.0 for narration. For problem solving and transfer, ANOVA revealed a statistically significant effect for the treatment group where $F(2,119) = 24.073$, MSE = 1.746, $p < .001$, with a 1.06 effect size for modality. The test for visual-verbal matching revealed a significant effect for the treatment group. ANOVA revealed a statistically significant main effect for the treatment group where $F(2, 119) = 18.632$, MSE = 8.203, $p < .001$. As a result of this study, the researchers concluded that "not only…[is] more information…likely to be held in both auditory and visual working memory rather than just one but also that the combination of auditory verbal materials with

visual nonverbal materials may create deeper understanding than the combination of visual verbal and nonverbal materials (Moreno & Mayer, 1999, p. 366)." The results of the study also point to the effect of integrating narration over on-screen text in computer-based, multimedia instruction.

A study conducted by Moreno, Mayer, Spires, and Lester (2001) investigated how the introduction of interactive oral communicative tools in a computer-based learning environment affect retention, transfer (deep learning), and interest. Their research also supports the modality effect. Consistent with conclusions made by Moreno and Mayer (1999), this study reported significant increases in learning in the animation and narration group in comparison to the animation and on-screen text condition. Two different experiments were conducted to examine whether students who were presented with instruction that included a human voice learned more deeply than students who learned using on-screen text.

During the first experiment, 64 college students served as part of a 2 × 2 between-subject factorial design. The results revealed that groups presented with the oral verbal information recalled significantly more elements and answered more accurately than those presented with the verbal visual (text) information. A two-factor ANOVA revealed a main effect for modality, $F(1, 60) = 9.30$, $MSE = 17.30$, $p < .005$, with a mean number of ideas recalled of 8.12 ($SD = 0.96$) and 7.10 ($SD = 1.70$), respectively, for the narration and text groups. The two-factor ANOVA revealed a main effect for modality, $F(1, 60) = 16.16$, $MSE = 1000.78$, $p < .0005$, with a mean number of correct answers of 39.09 ($SD = 6.82$) and 31.20 ($SD = 8.85$). Measurements indicating interest among the groups revealed that the narration groups rated their interest in the material significantly greater than the text groups, $F(1, 60) = 9.51$, $MSE = 43.97$, $p < .005$, with a

mean rating of 6.39 (*SD* = 2.24) and 4.71 (*SD* = 2.09), respectively.

Another experiment in this study (N = 79) investigated the effect on learning as a result of integrating oral verbal instruction versus visual verbal instruction. In this experiment, using a two-factor ANOVA design, research participants consisted of 79 college students. This experiment also revealed that groups presented with oral verbal instruction recalled significantly more information and answered questions more accurately than the visual verbal (text) group. Using retention as a dependent measure, the two-factor ANOVA revealed a statistically significant main effect for modality, $F(1, 75) = 8.58$, $MSE = 12.76$, $p < .005$, with a mean number of ideas recalled of 8.10 (*SD* = 0.82) and 7.30 (*SD* = 1.49). Given transfer as a dependent measure, the two-factor ANOVA revealed a main effect for modality, $F(1, 75) = 46.70$, $MSE = 2604.44$, $p = .0001$, with a mean number of correct answers of 39.95 (*SD* = 6.35) and 28.40 (*SD* = 8.41), respectively. Interestingly, students in the oral verbal group also rated perceived difficulty significantly lower in comparison with the visual verbal group. The two-factor ANOVA yielded $F(1, 75) = 4.24$, $MSE = 12.24$, $p < .05$, with mean ratings of 4.47 (*SD* = 1.41) and 5.28 (*SD* = 1.94), respectively.

Overall, Moreno and colleagues (Moreno & Mayer, 1999; Moreno, Mayer, Spires, & Lester, 2001) evidenced modality effects in their experiments. Their study results offer further support for the presentation of computer-based verbal materials in an oral (narration) rather than a visual (text) modality and have important implications for design and development of multimedia instruction.

Synchronous and Asynchronous Distance Education Research

Research supports the notion that both synchronous and asynchronous communication

tools offer advantages to learners in a distance education environment (Cao, Griffin, & Bai, 2009; Chou, 2002; de Freitas & Neumann, 2009; Disbrow, 2008; Gillies, 2008; Hiltz & Goldman, 2005; Hrastinski & Keller, 2007; Jaffee, Moir, Swanson, & Wheeler, 2006; Koszalka & Ganesan, 2004; Levin et al., 2006; Mabrito, 2006; Skylar, 2009; Tolu, 2010; Zsiray et al., 2001). While educators have increased the integration of asynchronous tools into post-secondary, distance learning course design in the recent past (Parsad & Lewis, 2008), synchronous learning remains an essential consideration in the design of any distance learning environment and may significantly affect the quality of students' educational experience and outcomes.

Benefits associated with asynchronous learning include an environment conducive to contemplation and reflection (Hiltz & Goldman, 2005; Jaffee et al., 2006), and a medium that permits additional time to complete tasks at the user's convenience. Research that points to the potential of asynchronous learning to promote deep and meaningful thought has received scrutiny (Levin et al., 2006). Levin et al. (2006) suggest that synchronous learning actually encourages higher levels of critical refection than the asynchronous mode of online course delivery. Research has also identified several potential weaknesses within the context of the asynchronous distance learning environment. Limitations cited in the research include lack of immediacy and prolonged feedback (Levin et al., 2006, Schullo et al., 2005), feelings of isolation (Ludwig-Hardman & Dunlap, 2003), lack of social context (Vonderwell, 2003), and lack of community support (Garrison & Archer, 2007). Research points to benefits to integrating synchronous and asynchronous learning. A meta-analysis conducted by Zhao and colleagues (2005) comparing the effects of distance education with F2F (face-to-face) instruction revealed

that the combination of asynchronous and synchronous learning tools in distance learning evidenced that distance education was significantly more beneficial than F2F instruction (d=-22, p<.001).

Cognitive Presence, Social Presence, Teaching Presence

Studies examining synchronous learning suggest strong potential for synchronous Web-based course systems and benefits to cognitive presence, social presence, and teaching presence (Chou, 2002; de Freitas & Neumann, 2009; Hrastinski & Keller, 2007; Tolu, 2010). Tolu (2010) explored these constructs within the context of an online post-secondary pre-service ESOL course delivered using synchronous technologies including Elluminate Live!® and the Gmail Chat® instant message tool. Data sources included Elluminate Live!® meeting recordings, student written reflections, surveys, interviews, and journals. The qualitative case study revealed that synchronous learning enhances the development of an online Community of Inquiry by enabling interactions contributing to cognitive presence, social presence, and teaching presence (Tolu, 2010). The study defined the presences operationally through the categories and indicators that guided the researcher's coding of transcripts to determine the extent the online course embodied cognitive presence, social presence, and teaching presence. Tolu (2010) concluded that students perceived an enhancement to their learning and a stronger sense of connection to their instructor and peers as a result of the online class meetings conducted through the synchronous Web-based course system, Elluminate Live!®. Immediate oral-verbal communication enhanced social presence by creating an environment of trust and belonging. Further, groups worked more efficiently through use of the synchronous platform and enhanced cognitive presence through the teacher and student-led presentations, teacher demonstrations via

the webcam, interaction using the Whiteboard, text-based chat (real-time text-based communication), real-time oral communication (talk) via the microphone, emoticons, and breakout rooms (Tolu, 2010).

In an examination of patterns of interactions among distance learners through various asynchronous and synchronous technologies, Chou (2002) identified a socioemotional component prevalent in the synchronous learning condition. With data collected from undergraduate students' course transcripts held over one week through both asynchronous and synchronous modes, this study compared text-based asynchronous interaction through discussion boards and text-based chat within synchronous Web conferencing sessions. This study used a modified form of Bales' IPA to analyze the transcripts in both synchronous and asynchronous conditions including a total of 4,977 sentences (Chou, 2002). Study results indicated inter-rater reliability for the two coders at .90 (week 3), .89 (week 5), and .88 (week 8). The results of this study reported a higher percentage of observed socioemotional interactions in the synchronous condition (33%) in contrast to the asynchronous environment (8%), but a higher percentage of task-oriented content in the asynchronous (92%) rather than synchronous mode (67%). The researchers observed "more spontaneous" and "more equally distributed" communication in the synchronous mode (p. 6). They also reported the synchronous mode "made it easier to provide immediate feedback to information seekers" and students "revealed more about their frustration or need for help with less hesitation" (p. 6). Notably, this study examined only text-based communication, and patterns of communication may have differed among synchronous and asynchronous groups given inclusion of oral-verbal interaction.

While research conducted on asynchronous tools is far more common than that conducted

on synchronous media, synchronous communication studies suggest that synchronous Web-based course systems "cultivate the social network and thus strengthen students' sense of belonging in online communities" (Hrastinski & Keller, 2007, p. 74). According to Hrastinski (2008) asynchronous distance education courses fail to address social interaction, an essential component of the learning process (Bandura, 1971; Garrison, 2004; Vygotsky, 1978). Hrastinski and Keller (2007) assert that through their examination of 117 articles published in *Computers & Education*, *Educational Media International*, *Journal of Educational Computing Research*, and *Journal of Educational Media* between 2000 and 2004, "many distance learning classes are supported by video-conferencing technology, but research that investigates this medium is absent in the journals reviewed" (p. 74).

Examining the literature conducted on synchronous audiographic conferencing (SAC), de Freitas and Neumann (2009) also highlighted the theme of perceived social presence as a benefit of the synchronous learning environment. The researchers defined SAC as "a combination of technologies for real-time communication and interaction using multiple media and modes" (de Freitas & Neumann, 2009, p. 980). Synchronous audiographic conferencing applications integrate the audio capabilities of the telephone and data capabilities of the computer to facilitate two-way voice and simultaneous graphical interaction to support collaborative work (Chute et al., 1999). The researchers examined studies involving the use and application of synchronous audiographic conferencing as well as pedagogic strategies supporting its integration into education. To aggregate the studies published between 2000 and January 2007 containing the keywords *synchronous audiographic conferencing*, de Freitas and Neumann (2009) conducted a search of electronic databases in accord with the methodology employed in the Evidence for

Policy and Practice Information and Coordinating Center. Their search identified 59 studies that met the search criteria.

Their review of the studies indicated that synchronous audiographic conferencing has the potential to apply to an array of circumstances achieved through multiple modes. For example, users of SAC technology can conduct small group meetings through video conferencing; tutors can provide comments and revisions in students' shared electronic documents through application sharing; and groups can collectively produce diagrams, draft questionnaires, and analyze their results in real-time both on and off campus (de Freitas & Neumann, 2009). Notably, the SAC market offers a wide variety of products applicable to meet a broad range of needs and a wide range of options currently exists in the SAC market for a variety of platforms (de Freitas & Neumann, 2009).

De Freitas and Neumann (2009) examined the current use of synchronous audiographic conferencing software to identify the practical challenges cited in the literature regarding the use of synchronous audiographic conferencing. Based on their review, the authors determined that "the notion of social presence has particular resonances with SAC as a synchronous source of information delivery on one level but importantly, as a space for social interactions between learners and between learners and the tutor" (de Freitas & Neumann, 2009, p. 993). The authors cited social presence as advantageous "for engaging and retaining the interest in particular of distance and remote learners, but may also have scope for supporting SAC used with F2F (face-to-face) cohorts of learners, in particular larger groups of learners" (de Freitas & Neumann, 2009, p. 993). Based on their review of the literature, the authors noted that "with SAC, the additional aspect of live social interactions with peers needs special consideration, and can add

valuable support for learners in terms of feedback to assignments and retention on the course" (de Freitas & Neumann, 2009, p. 993). The researchers conclude that their comprehensive review "suggests that SAC represents a largely undiscovered opportunity for implementing and supporting effective pedagogic strategies for the benefit of learners, especially in non-standard [*sic*] contexts such as distance education" (de Freitas & Neumann, 2009, p. 994).

Many researchers (Anderson et al., 2001; Arbaugh, 2008; Arnold & Ducate, 2006; Garrison et al., 2001; Gunawardena, 1995; Gunawardena & Zittle, 1997; Richardson & Swan, 2003; Rogers & Lea, 2005; Shea et al., 2005, 2006; Swan, 2002, 2003; Tu & McIsaac, 2002) have documented the three presences evident within the Community of Inquiry model (Garrison, Anderson, & Archer, 2000); however, evidence of cognitive presence, social presence, and teaching presence occurring simultaneously across learning communities requires further research. Although research examining social presence suggests that students may realize significant benefits through integration of synchronous learning tools, whether the same benefits accrue with regard to cognitive and teaching presence remain unclear. Although one qualitative case study (Tolu, 2010) supports the theory that synchronous learning supports cognitive presence, social presence, and teaching presence, determining how these presences compare between the synchronous-enhanced and asynchronous learning environments requires further study. The proposed study will address this need by examining the three constructed embedded within the Community of Inquiry framework (Garrison, Anderson, & Archer, 2000) in both the synchronous-enhanced and asynchronous learning environments. It will employ a mixed method design to delve into the important and timely question of whether post-secondary students perceive a stronger cognitive presence, social presence, and teaching presence in the

synchronous rather than the asynchronous learning environment.

Learning and Interaction

Recent research also suggests increases in learning and interaction as a result of the integration of synchronous Web-based course systems in the distance education environment. In a study by Koszalka and Ganesan (2004), synchronous chats, assimilated into the course redesign, encouraged student interaction that resulted in meaningful learning experiences. Using a design-based research model in their study to examine the relevance of CMS features in a blended learning environment, the researchers integrated these approaches to collect and analyze student interactions within the course as well as outcomes during the course revision process. From a northeastern private U.S. university, research participants were first-year graduate-level education students categorized as having minimal background in learning theory. The primary sources for data collection in this study were discussion board posts, course evaluations, and individual student works demonstrating learning outcomes. The course incorporated frequent use of discussion forums throughout the design of the course; however, the researchers found that discussion boards did not provide a viable solution to the problem of promoting collaboration and enhancing learning in an online environment (Koszalka & Ganesan, 2004, p. 251). According to the researchers, "the incorporation of discussions…was *distracting* to the learners as they questioned the social nature of learning rather than focusing" on the topic of instruction (Koszalka & Ganesan, 2004, p. 251).

In contrast to asynchronous discussion boards, synchronous chats resulted in meaningful learning experiences. This redesigned, distance learning course focused on intended outcomes and "took advantage of the CMS features to enhance the interactions that the learners had during

the class" (Koszalka & Ganesan, 2004, p. 253). According to the researchers, students evaluated the virtually delivered version of the course that included synchronous chats as "highly engaging, thought provoking, intellectually challenging, and supportive of developing understanding of the course content" (Koszalka & Ganesan, 2004, p. 253). Additionally, "these ratings were descriptively higher than the first online version and in many cases the same as, or slightly higher than, the classroom version ratings" (Koszalka & Ganesan, 2004, p. 253). In summary, this study offers support for the use of synchronous chat in education and also points to the need for future research to guide integration of synchronous tools into the distance learning course design.

In a comparison of students' perceived learning among students (N=44) who participated in synchronous Web conferencing lectures and asynchronous text-based discussion, 87.8% of students agreed that the use of synchronous Web conferencing increased their understanding of the material (Skylar, 2009). Additionally, 80.5% of participants exposed to Web conferencing lectures, delivered with the Elluminate Live!® platform, felt they performed better on course quizzes. The course, classified as a hybrid, also included several F2F class meetings. While the comparative effects of synchronous and asynchronous environments on learning require further research, this study offers compelling insight into how learners who experience both types of distance learning environments perceive their experiences. Further, the study suggests that synchronous learning may be more effective than asynchronous online learning.

A study by Mabrito (2006) cites increases in communication and satisfaction among students using synchronous technology. Mabrito compared the effectiveness of student collaboration in both synchronous, text-based chat rooms versus asynchronous, text-based

discussion boards. Study participants—eight men and eight women randomly assigned into four project groups—all reported prior experience with both synchronous and asynchronous technologies (N = 16). Student groups received the same collaborative writing task in either the synchronous (chat) mode or the asynchronous discussion board mode. At the end of the first session, the groups switched to the other treatment mode to complete a second collaborative writing task very similar to the first. Both groups completed the same writing task in the second session. The study included eight sessions, four collaborative writing sessions in each mode (synchronous and asynchronous). Mabrito observed that students communicated more in the synchronous environment (M = 720, SD = 57) than asynchronous mode (M = 523, SD = 62). Additionally, 75% of learners reported that the synchronous sessions were successful (44% agree, 31% strongly agree). In contrast, only 50% of the asynchronous group rated the session as productive (42% agree, 8% strongly agree). This study points to the potential of synchronous tools to enhance dialogue in the online learning environment. However, the study also points to the need of additional research given the sample size and format (synchronous tools restricted to text-based chat).

A case study by Gillies (2008) explored the experiences of students in a one-year distance education course designed to provide training to prospective primary school teachers. Participants comprised 27 students separated into three groups at three remote sites integrating videoconferencing sessions. Student interviews revealed strengths of the videoconferencing sessions, which centered on communication including "live interaction with a tutor, immediacy, and having the opportunity to have questions answered in 'real time'" (Gillies, 2008, p. 112). Overall, students reported feeling most engaged during videoconference sessions that included

an element of interaction, allowed active student participation, focused on a topic deemed significant and assigned tasks in the introduction (Gillies, 2008). Students reported feeling least engaged in situations that involved a high degree of instructor monologue, specifically if content discussed (e.g., PowerPoint™ slides) had been previously distributed to students. Students described videoconferencing sessions "dominated by the tutor" and extending to 90 minutes as particularly challenging (Gillies, 2008). While the results of this study cannot be generalized due to the qualitative nature of the research, they do offer insight into students' perceptions of integration of synchronous videoconferencing into the distance learning classroom and provide direction for future research.

In a qualitative study examining students' perceptions of online computer conferencing sessions, Disbrow (2008) noted that students (37 participants) most frequently cited interactivity and convenience as benefits of the Elluminate Live!® synchronous desktop videoconferencing sessions. In the researcher's survey, students reported a number of positive aspects of the Elluminate Live!® sessions including interactivity = 13, not having to leave home or office/participate from anywhere = 13, using interface tools (whiteboard, chat, emoticons) = 5, ease of use = 5, group meetings were easier to schedule than face-to-face = 4, helped create understanding of information = 3, learning how to use technology = 3, immediate response from professor = 3, saving travel time to campus, change of pace from ordinary classroom = 2, felt like you were in a classroom = 2 (Disbrow, 2008). Negative perceptions of the synchronous computer conferencing software included technical difficulties = 5, audio problems = 4, waiting to talk = 3, missed personal interaction = 3, sessions were "a little long" = 2, no complete open forum for participation = 2, accessing PowerPoint and applications for presentations = 2.

Although results from this study defy generalization to the population, they point to the importance of interaction from a student perspective and its presence in the synchronous desktop videoconferencing environment.

In their review of synchronous audiographic literature, de Freitas and Neumann (2009) suggested significant potential in terms of enhancing dialogue with synchronous technologies, specifically synchronous audiographic conferencing. The authors concluded that "the graphic displays and opportunities for interaction provide a means for learners to practice tasks… and to discuss their reflection on those tasks, and therefore, can cover the whole Conversational Framework (Laurillard, 2002) if well designed" (p. 993). In their reference to Laurillard's (2002) Conversational Framework, de Freitas and Neumann (2009) relay their view that synchronous audiographic conferencing (SAC) is "potentially the most powerful medium so far in terms of coverage of the Conversational Framework" (p. 993). The authors also point to research conducted by Finkelstein (2006) who noted the opportunity for increased access to expertise as well as real-time application of concepts made possible through the SAC platform (de Freitas & Neumann, 2009, p. 994). Additional benefits cited in the literature include the "potential to inform and support not just direct and formal learning but also serendipitous, vicarious learning and professional interactions" (de Freitas & Neumann, 2009, p. 994).

Fulford and Zhang (1993) examined learners' perceptions of learner-learner and learner-instructor interaction in the distance learning environment. They identified students' perceived overall interaction as the primary predictor of student satisfaction. The findings suggest that when students perceive a high level of interaction, student satisfaction increases. Perceived overall interaction accounted for considerable variance in satisfaction where correlations for the

three data collection points at the beginning, middle, and end of the course yielded r = .67, r = .64, and r = .73, N = 123, $p < .01$, and the mean correlation was calculated at r = .68, $R^2 = .46$. In their study, Fulford and Zhang also examined personal interaction as a potential predictor of student satisfaction but determined perceived interaction ($R^2 = .15$) a better predictor than personal interaction. Both predictors were examined in combination where perception of overall interaction was entered before personal interaction, and all three cases were found to be statistically significant, F (2, 120) = 48.21, 41.89, and 76.11, $p < .01$. However, Fulford and Zhang found no statistically significant difference between the two-predictor model (perceived overall interaction and personal interaction) and the one-predictor model (overall interaction only).

Research supports the notion that interaction is fundamental to learning (Fulford & Zhang, 1993; Moore, 1989). Interaction is embedded within the Community of Inquiry model (Garrison et al., 2000). Specifically, research shows synchronous (same time) interaction improves student satisfaction (Cao, Griffin, & Bai, 2009; Mabrito, 2006), strengthens students' sense of belonging (Hrastinski & Keller, 2007), and may result in improvements in students' overall learning experience (Koszalka & Ganesan, 2004). In contrast, a lack of interaction in online learning environments may help explain the increase in recently reported dropout rates (Lee & Choi, 2011). While additional research employing more rigorous methods is needed to compare synchronous and asynchronous learning and their effects on learning and interaction, several studies previously outlined offer compelling insight into how students who participate in both synchronous and asynchronous environments perceive their experiences. Study results suggest that synchronous learning may offer more positive effects on learning and interaction in

comparison to asynchronous learning (Gillies, 2008; de Freitas & Neumann, 2009; Disbrow, 2008; Koszalka & Ganesan, 2004; Mabrito, 2006; Skylar, 2009; Zsiray et al., 2001).

Gaps in Previous Research

Research comparing synchronous and asynchronous learning has begun to scratch the surface. Several studies offer insight into the potential of integrating synchronous tools to improve students' educational experience in the distance learning environment. While research points to advantages to students' educational experience (cognitive presence, social presence, teaching presence), learning, and interaction among post-secondary students in synchronous learning communities, quantifying the comparative benefits of synchronous and asynchronous interaction requires additional research using more rigorous research methods and employing the current capabilities of synchronous Web-based course systems.

Although research examining cognitive presence, social presence, and teaching presence abounds (Anderson et al., 2001; Arbaugh, 2008; Arnold & Ducate, 2006; Garrison et al., 2001; Gunawardena, 1995; Gunawardena & Zittle, 1997; Richardson & Swan, 2003; Rogers & Lea, 2005; Shea et al., 2005, 2006; Swan, 2003, 2002; Tu & McIsaac, 2002), a review of current literature reveals that research simultaneously examining the three presences among both asynchronous and synchronous learning across learning environments is minimal. Additionally, while the literature includes studies addressing the benefits of learning interaction, many of these studies lack rigor and thus require additional exploration before educators can draw conclusions. Notably, much of the research—typically limited to text-based (visual verbal) communication—does not include the use of current audio, graphic, and video capabilities (Chou, 2002; Hrastinski & Keller, 2007; Koszalka & Ganesan, 2004). Hrastinski and Keller's (2007) review examining

current computer mediated communication research notes that the majority of research on synchronous learning limits the focus of study to text-based communication, but does not include the use of recent capabilities now available through synchronous Web-based course systems such as Elluminate Live!®. Current synchronous Web-based conferencing technologies not only allow learner participation through text-based chat, but also offer the capability for student interaction among peers through audio and graphic tools integrated into the platform. Research on computer-based multimedia learning provides strong support for the inclusion of oral verbal communication in instruction over text-based verbal communication (Moreno & Mayer, 1999; Moreno et al., 2001). Oral verbal communication, now possible through synchronous desktop conferencing software, is an important feature any examination of the distance learning environment must consider. Students may perceive an improved educational experience given the inclusion of these capabilities; however, making such a determination requires future research to further explore the potential of synchronous technology given the recent advances in synchronous web-based course system capabilities.

This study sought to build on previous research to examine important constructs through a mixed method design incorporating current audio and graphic capabilities now available through current synchronous learning tools. This study expanded on the current body of knowledge by examining the effect of integrating synchronous desktop conferencing systems on students' educational experience, operationally measured as students' perceptions of cognitive presence, social presence, and teaching presence through the lens of the Community of Inquiry model (Garrison et al., 2000). Additionally, this study measured perceived learning and interaction in both the synchronous-enhanced and asynchronous conditions to examine

differences between the two groups. Finally, this study qualitatively explored students' perceptions of synchronous-enhanced and asynchronous distance learning environments and examined students' rationales for their perspectives.

CHAPTER THREE – METHOD

This mixed method study (IRB#: Pro00015756) examined synchronous-enhanced (integration of both synchronous and asynchronous learning tools) and asynchronous distance learning environments over the course of one semester in two sections of the *EME 2040: Introduction to Technology for Educators* undergraduate course delivered in the online format at a RU/VH: Research University (very high research activity) in the southeastern United States. This study extended the work of a pilot study conducted by the researcher over two semesters examining the same introductory technology course at the same university. This research compared synchronous-enhanced and asynchronous instruction to evaluate the effects on the learners' educational experience, perceived learning, and interaction. In contrast to the asynchronous group, the synchronous-enhanced group participated in bi-weekly online class discussions. The instructor conducted the online class meetings using a synchronous communication tool called Blackboard Collaborate®. This synchronous software application was integrated within the Canvas® learning management system used at the university. Class lectures included a collaborative component held with the students and instructor. Students received instruction related to the course activities and content. Additionally, the instructor asked students to participate in groups through breakout rooms to problem solve and analyze content related questions. The online class sessions occurred every other week and lasted approximately one hour. A total of six online class sessions were held with the treatment group

throughout the semester. Material presented during the online class meetings was provided to students in both sections of the course. The two sections of the *EME 2040* course were identical with the exception that one included bi-weekly synchronous class discussion. Following each online class session, students were provided with an opportunity to discuss individual course-related questions with the instructor.

This research examined both synchronous-enhanced and asynchronous distance learning environments through the lens of the Community of Inquiry (CoI) framework (Garrison et al., 2000). The Community of Inquiry model is operationally defined through students' perceptions of cognitive presence, social presence, and teaching presence. These model characteristics encompass elements of a successful educational experience (Garrison et al., 2000). This study compared the synchronous-enhanced versus the asynchronous learning environment to determine whether the two groups evidenced statistically significant differences in cognitive presence, social presence, teaching presence, perceived learning, and interaction. It also qualitatively explored how students in synchronous-enhanced and asynchronous environments in an introductory technology course perceived their learning experience.

Research Questions

1. How do undergraduate students perceive their educational experience in a synchronous-enhanced Web-based introductory technology course?
2. How do undergraduate students perceive their educational experience in an asynchronous Web-based introductory technology course?

Research Hypotheses

1. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will report a

statistically significantly higher sense of cognitive presence, social presence, and teaching presence in contrast to students who use only asynchronous tools.

2. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will evidence statistically significantly higher levels of perceived learning and interaction in contrast to those who use only asynchronous tools.

Research Design

This study employed a mixed method design to examine how the inclusion of online, synchronous class meetings affects undergraduate students' educational experience. As operationally defined in this study, educational experience means students' perceptions of three constructs—cognitive presence, social presence, and teaching presence—the three essential elements of a successful learning environment (Garrison et al., 2000). This study also compared perceived learning and interaction in the synchronous-enhanced and asynchronous distance learning conditions. The researcher used survey instruments including the Community of Inquiry Survey (Garrison et al., 2000) and a student learning scale (Bryan et al., 2005) to quantitatively evaluate cognitive presence, social presence, teaching presence, and perceived learning. The researcher included items in the end-of-course survey to examine student-instructor and student-student interaction in both synchronous-enhanced and asynchronous sections of the course (Johnson, Aragon, Shaik, & Palma-Rivas, 2000). This study utilized focus groups to explore how students in the synchronous-enhanced and asynchronous learning conditions perceived their course experiences.

Asynchronous communication involves two or more individuals communicating irrespective of time or location with delayed feedback. Synchronous communication occurs

when two or more individuals communicate at the same time, regardless of location, and provides immediate feedback. The two online sections of the course were taught in different modes. The treatment group (synchronous-enhanced course section) comprised all elements (e.g., discussion boards, wikis, blogs, and email) of the asynchronously delivered distance learning course, as well as included synchronous (same time) online meetings delivered through the Blackboard Collaborate® Web-based desktop conferencing system. The asynchronous control group completed the course only through asynchronous learning modes and did not include use of bi-weekly synchronous class discussions. The same instructor taught both the synchronous-enhanced treatment group and the asynchronous control group. The instructor delivered the course content consistently over the course of the semester to both groups. Each group received the same content and assignments within the course modules in both sections. The assignments and directions in both groups were also identical. The synchronous-enhanced and asynchronous sections were indistinguishable from the students' perspective with the exception that the treatment group also participated in bi-weekly synchronous class discussions.

Participants

The sample for this study included undergraduate students enrolled in two sections of the *EME2040: Introduction to Technology for Educators* course delivered in the online format during the fall 2014 semester. Students were organized into two pre-existing groups. A convenience sample used in this study provided a means to examine undergraduate distance learning students' perceptions of an online introductory technology course delivered in both the asynchronous and synchronous-enhanced formats. The instructor of both sections of the *EME 2040* course taught and participated in the course redesign process for four years prior to the

beginning of this study and had access to the course to complete this study. The *EME 2040* course, required for all education majors, aims to provide hands-on experience with integrating technologies into the teaching and learning processes that will be essential in their future careers. Students enrolled in *EME 2040*, a pre-requisite course, are currently seeking entrance into the university's College of Education program for pre-service teachers. Notably, students enrolled in the course have not yet declared a major and may come from various disciplines. Students enrolled in this course typically include those interested in teaching at the K-12 level in concentrations such as science, mathematics, or English.

Setting

The *EME 2040* course has undergone iterative redesigns since fall 2009. During the course redesign, instructors examined how best to integrate various technologies into the course to support meaningful learning for use in the students' future classrooms. The instructors met throughout the review process to collaborate and reflect upon past experiences to improve the course design. This process led to the selection and implementation of new technologies into the course. The course redesign process involved both online and face-to-face sections, and instructors of the *EME 2040* course delivered content and requirements uniformly to the students in each section per semester.

Several theoretical frameworks guided the redesign of this course including constructivism (Piaget, 1955), constructionism (Papert, 1991), social development theory (Vygotsky, 1978), and problem-based learning (Allen, Duch, & Groh, 1996; Ausubel, Novak, & Hanesian, 1978; Bruner, 1959; Dochy, Segers, Van den Bossche, & Gijbels, 2003). Because the *EME 2040* course curriculum was designed to facilitate higher level thinking, analysis, and

problem solving, instructors must facilitate critical thinking. Instructors therefore structured activities and assignment to build upon students' knowledge to encourage higher level thinking such as analysis, synthesis, and evaluation (Bloom, 1956). In the course, students frequently collaborated on assignments, applied problem-based learning scenarios, and critiqued one another's work on a shared platform to help students apply their experiences to investigate, create, collaborate, and critically examine at a high cognitive level (Bloom, 1956; Gagné, Yekovich, & Yekovich, 1993; Segers, 1997).

Procedures

This mixed method study examined whether students exposed to a synchronous-enhanced and asynchronous distance learning course evidenced statistically significant differences in cognitive presence, social presence, teaching presence, perceived learning, and interaction. The study also explored students' perceptions of their experiences in the synchronous-enhanced and asynchronous learning conditions.

Students had the option to decline involvement in this study during the semester. Declining to participate in this study had no effect on the course requirements and did not affect a student's grades in any way. This study included two separate online *EME 2040: Introduction to Technology for Educators* course sections. Over one semester, the instructor conducted bi-weekly, synchronous Web-based desktop conferencing meetings through Blackboard Collaborate® in the synchronous-enhanced distance learning course. In contrast, the instructor did not hold bi-weekly synchronous class discussions with the students in the asynchronous distance learning course. During the fall 2014 semester, the same instructor taught one distance learning section in the asynchronous mode while the same instructor taught a different section of

the distance learning course in the synchronous-enhanced mode. A total of six, one-hour synchronous class meetings were held over the course of the semester in the synchronous-enhanced group while no synchronous class meetings were held in the asynchronous group. The online class meetings were required as part of students' participation grade, and each synchronous class meeting offered either two or three sessions during the week in which students had the option to attend. Various features were used in the Blackboard Collaborate® online class meetings. A matrix of the features used in each session is included in the matrix in Table 2.

Table 2. Blackboard Collaborate® Features Used

Synchronous Class Meetings	Audio/Microphone	Whiteboard	Web Tour	Application Sharing	Chat	Polling	Breakout Rooms	Video	# Attendees
Session 1	Yes	Yes	No	Yes	Yes	Yes	Yes	No	27/29
Session 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	28/29
Session 3	Yes	Yes	No	Yes	Yes	Yes	No	No	24/29
Session 4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	26/29
Session 5	Yes	Yes	Yes	Yes	Yes	No	Yes	No	24/29
Session 6	Yes	Yes	Yes	Yes	Yes	No	Yes	No	25/29

Both sections of the *EME 2040* distance learning course were taught by the same instructor. The learning modules for each section of the course were identical. The instructor delivered identical course content uniformly to students regardless of their particular course section. All assignments were graded by the instructor using detailed rubrics, as illustrated in Table 3.

Rubrics were presented to the students prior to and following their assignment submissions. Constructive feedback and scores based upon the rubrics were provided to the students consistently in both groups. Since the researcher was also the instructor in this study, an outside reviewer was used to monitor feedback provided to students in both groups. Two weeks of the course were randomly selected to be monitored by an outside source. The results of the

analysis are presented in Table 3.

Table 3. Instructor Feedback

Instructor Feedback (2 week period over Fall 2014 semester)		
Assignment	*Group*	*Feedback*
Digital Story	A	Score, Rubric, Descriptive comment
Digital Story	B	Score, Rubric, Descriptive comment
ePortfolio Update - Digital Story	A	Score, Rubric
ePortfolio Update - Digital Story	B	Score, Rubric
Quiz Ch. 6-8	A	Score, Feedback on items correct/incorrect
Quiz Ch. 6-8	B	Score, Feedback on items correct/incorrect

A = synchronous-enhanced group
B = asynchronous group

Table 4. Example Assignment Rubric

Digital Storytelling				
Criteria	Ratings (Full, Partial, No Marks)			Points
Create a digital story using a video editor of your choice and upload it to YouTube or to another video sharing website, as specified in the directions, that includes:				
Detailed, concise and engaging story	Full (10 pts)	Partial (5 pts)	No marks (0 pts)	n/10
Effective images that correspond to digital story	Full (10 pts)	Partial (6 pts)	No marks (0 pts)	n/10
Effective Audio (narration and sound track)	Full (10 pts)	Partial (6 pts)	No marks (0 pts)	n/10
Closed captions containing an accurate transcription of the video embedded within the published video	Full (10 pts)	Partial (6 pts)	No marks (0 pts)	n/10
Credits page with references for images, content, etc.	Full (5 pts)	Partial (4 pts)	No marks (0 pts)	n/5
Assignment is submitted for peer review by the due date	Full (2 pts)	No partial credit	No marks (0 pts)	n/2
Title page with title of story and creator's name	Full (3 pts)	No partial credit	No marks (0 pts)	n/3

At the end of the course, students in both the synchronous-enhanced and asynchronous groups were asked to complete an end-of-course survey to assist with the effective design and delivery of the distance learning *EME 2040: Introduction to Technology for Educators* course. The end-of-course survey measured cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction. Students in both the synchronous-enhanced and asynchronous course sections were asked to participate in focus group interviews with their classmates to evaluate their course experience. Data from the synchronous-enhanced group were compared with that from the asynchronous group in order to address the research questions and hypotheses.

Outcome Measure Sources

The Community of Inquiry (CoI) survey instrument measuring cognitive presence, social presence, teaching presence (Arbaugh et al., 2008) was included in an end-of-course student survey to determine whether students in the synchronous-enhanced distance learning group evidenced statistically significant differences in cognitive presence, social presence, and teaching presence compared with students in the asynchronous distance learning group. Students participated voluntarily. The instructor used an instrument developed by Bryan et al. (2005) to measure perceived learning. Student-instructor and student-student interaction was measured using an instrument developed by Johnson, Aragon, Shaik, and Palma-Rivas (2000). The end-of-course survey also included a demographic survey used in this study to describe the sample and examine similarity between the two groups. The instructor delivered the end-of-course survey through Survey Monkey® and distributed it to students through the Canvas® learning management system.

The researcher conducted two focus group interviews to explore students' perceptions of the synchronous-enhanced and asynchronous distance learning environments in the same introductory technology course. Students in the synchronous-enhanced and asynchronous groups were asked to participate in focus groups with their course section and received compensation for their time. Five students from each course participated in each of the focus groups. The focus groups were conducted after the conclusion of the course, once the instructor had recorded students' final grades, to minimize coercion. The focus groups were conducted online through the Blackboard Collaborate® platform. The researcher recorded, hand transcribed, coded, and analyzed focus group interview data using deductive analysis. Four codes developed through thematic analysis during two phases of a pilot study conducted prior to this research were used to code the focus group interview transcripts. The four codes developed during the pilot study included interaction, direct instruction, clarification, and collaboration. Two coders were used in this study to code the focus group data.

Community of Inquiry (CoI) survey

Students received the Community of Inquiry (CoI) survey instrument (Arbaugh et al., 2008) at the end of the semester in both the synchronous-enhanced and asynchronous conditions to examine whether statistically significant differences in cognitive presence, social presence, and teaching presence occurred between the two groups. The Community of Inquiry survey includes Likert scale items rated from one to five (strongly disagree to strongly agree) which the researcher used to assess students' perceptions of cognitive presence, social presence, and teaching presence at the end of the course. The Community of Inquiry survey demonstrates evidence of validity and reliability for measuring cognitive presence, social presence, and

teaching presence (Swan et al., 2008). Researchers frequently use the Community of Inquiry survey to examine students' perception of presence in online learning environments (Swan et al., 2008; Arbaugh et al., 2008).

Factor analysis conducted by Swan and colleagues (2008) (N = 287) evidenced the clustering of elements in the theoretical model proposed by Garrison, Anderson, and Archer's (2000) Community of Inquiry model. Consistent with the blueprint of the instrument, the three-factor model including cognitive presence, social presence, and teaching presence was supported. As intended, items 1-13 loaded most heavily on factor one (teaching presence); items 14-22 loaded most heavily on factor two (social presence); and items 23-34 loaded most heavily on factor three (cognitive presence). Cronbach's Alpha, used as a measure of internal consistency of correlations to examine the reliability of the instrument, yielded high inter-correlations for the items in the three presences' scales: cognitive presence ($\alpha = .95$), social presence ($\alpha = .91$), and teaching presence ($\alpha = .94$) (Swan et al., 2008).

Student Learning

This study incorporated a perceived learning scale developed by Bryan et al. (2005) to examine students' perceptions of their learning. This instrument has been examined by Kiefer, Anderson, and Bryan (2007) using a large sample of 16,064 college students. Findings from this study indicate that this instrument has strong psychometric properties. The ECEF is comprised of 26 items using a 5-point Likert scale for four domains: student learning, communication and clarity of materials, organization and preparation, and stimulating interest. This instrument illustrated strong evidence of reliability: student learning ($\alpha = .95$), communication and clarity of materials ($\alpha = .94$), organization and preparation ($\alpha = .96$), and stimulating interest ($\alpha = .94$)

(Kiefer, Anderson, and Bryan, 2007). An item analysis was also conducted which revealed that high scores on the items corresponded with high scores on the instrument. For the total scale and the four subscales, item-to-total correlations were positive and above .40.

Exploratory and confirmatory factor analysis was conducted by the researchers to examine the End of Course Evaluation Form (ECEF; Bryan et al., 2005). Exploratory factor analysis through principal axis extraction and rotation to the verimax criterion was used. Scree plot analysis and the K1 Rule evidenced retention of two factors accounting for 69.41% of score variance. Communalities averaged .69 (*SD* = .06) ranging from .57 to .82. Confirmatory factor analysis was based upon four different models, and the four factor structure in which the ECEF instrument is aligned with was supported. Of the four models examined, the theoretically developed four factor model evidenced the best fit (χ^2 = 9,149.87, CFI = .97, NFI = .97, RMSEA = .05).

Learner-Instructor and Learner-Learner Interaction

The end-of-course survey included items to examine students' level of interaction between students and their instructor (learner-instructor interaction) as well as among students in the class (learner-learner interaction) in both the synchronous-enhanced and asynchronous distance learning groups (Johnson, Aragon, Shaik, & Palma-Rivas, 2000). Items measuring learner-instructor and learner-learner interaction were included from the *Course Interaction, Structure, and Support Instrument* (CISS). Factor analysis was used to confirm the construct validity of this measure (Johnson, Aragon, Shaik, & Palma-Rivas, 2000). Scree plot analysis and an eigenvalue greater than or equal to one was used to establish the number of factors to be included using a 0.50 criterion for inclusion. Verimax rotation was conducted for items with

multiple factors. Based upon factor and reliability analysis, a total of 24 items were retained from the original 50 items including 11 items for the dialogue construct, eight items for support, eight items for course structure, and four for transactional distance.

Demographic Survey

The end-of-course survey also included demographic items to capture information about the students' age, gender, ethnic background, and prior distance education experience. The researcher used results from the demographic survey to describe and compare the synchronous-enhanced and asynchronous groups.

The end-of-course survey comprised the Community of Inquiry survey (Arbaugh et al., 2008), student learning instrument (Bryan et al., 2005), interaction survey (Johnson, Aragon, Shaik, & Palma-Rivas, 2000), and demographic survey was delivered at the end of the semester. Students received extra credit for completing the end-of-course survey. A second optional assignment of equal value also was provided if students chose not to complete the end-of-course survey. The optional assignment required students to post an evaluative comment on a discussion board relating to the textbook content and respond to any feedback from their peers relating to the post.

Focus Group Interviews

The researcher conducted focus group interviews designed to explore students' perceptions of the synchronous-enhanced and asynchronous learning environment. Students participated in the focus group interviews voluntarily and compensation for their time was provided. Those who volunteered to participate in the interview received a $15 gift card as compensation for their time. Student participants were recruited by the researcher at the end of

the semester. The researcher emailed the students with information about how they could participate. In the synchronous-enhanced group, only students who attended all online class meetings during the semester were offered the opportunity to participate in the focus group. All students in the asynchronous group were asked to partake in the focus group. Five participants in each group participated in the focus group interviews. The first five students to volunteer were given the opportunity to participate in the interview. The focus groups were conducted separately depending upon whether the students were part of the synchronous-enhanced or asynchronous course section. The researcher conducted the focus group interviews after the conclusion of the course, once students' final grades had been submitted, to minimize coercion.

Data Analysis Procedures

This study employed descriptive and inferential statistical procedures to examine the researcher's hypotheses and questions. Several hypotheses developed through a review of the literature include the following: 1) Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will evidence a statistically significantly higher sense of cognitive presence, social presence, and teaching presence in contrast to students who use only asynchronous tools, and 2) Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will evidence statistically significantly higher levels of perceived learning and interaction in contrast to those who use only asynchronous tools. The researcher employed independent t-tests to assess the researcher's hypotheses and examine statistical significance.

For this study, the primary research questions—open to exploration through qualitative

analysis— sought to answer how undergraduate students perceive their experiences in a synchronous-enhanced and an asynchronous Web-based introductory technology course. The study extended the results of semi-structured interviews conducted during phases one and two of the pilot study in which a thematic analysis and an inductive approach was used to develop themes that emerged from the data. The researcher employed a constant-comparative method whereby open coding, axial coding, and selective coding helped the researcher determine general codes present in the data (Lichtman, 2013; Strauss & Corbin, 1990). Four key themes were identified through the thematic analysis including interaction, direct instruction, collaboration, and clarification. Focus group interviews with both the asynchronous and synchronous-enhanced groups were conducted after the pilot study to examine the presence of these themes in each group. Focus group interviews prompted students to discuss their experience in their *EME 2040* online class with respect to the four themes identified during the thematic analysis in phases one and two of the pilot study.

Focus Group Interview Guide:

Interview Guide (Synchronous):

1. Throughout the course of the semester, you participated in several class meetings delivered through Blackboard Collaborate. Can you tell me about your experience participating in the online class meetings during the course?
2. Can you describe the level of interaction that you had with your Instructor and classmates in this course?
3. Do you feel that the online class meetings enhanced collaboration in this course? If so, how?
4. Do you feel that the online class meetings helped to clarify issues throughout the course? If so, how?
5. Can you describe how the online class meetings directed your learning and contributed to your understanding of the course content?

Interview Guide (Asynchronous):

1. Throughout the semester, you participated in an Introduction to Technology for Educators distance learning course. Can you describe your experience in this course?
2. Can you describe the level of interaction that you had with your Instructor and classmates in this course?
3. Can you describe the level of collaboration that you had in this course?
4. Can you describe how you were able to clarify issues throughout the course?
5. Can you describe how your instructor directed your learning and contributed to your understanding of the course content?

Pilot Study

Purpose

The objectives of the original pilot study included the following: 1) to examine cognitive presence, social presence, teaching presence, perceived learning, and student satisfaction in a synchronous-enhanced online course versus an asynchronous online course, 2) to explore how students perceive their experience in a synchronous-enhanced distance learning environment, 3) to examine the perceived benefits and drawbacks of synchronous online class meetings, 4) to examine how students feel their experience in a synchronous-enhanced online course compares to other delivery modes, 5) to test the instruments, treatments, and analyses for use in a larger-scale study that will test for significance among synchronous and asynchronous groups, and 6) to enhance the delivery of the *EME 2040: Introduction to Technology for Educators* distance learning course. Findings from this preliminary study served to inform follow-up studies to enhance the delivery of the *EME 2040: Introduction to Technology for Educators* distance learning course.

Participants

Participants for the original pilot study included 53 students from two sections of the spring 2013 *EME 2040: Introduction to Technology for Educators* course delivered in the online

format at a research one university in the southeastern United States. The sample (N = 53) primarily comprised Caucasian (58%), female (81%) students between the ages of 18 and 24 (79%) at the junior baccalaureate status (61%). Twenty-five percent of students reported that they had previously enrolled in zero distance education courses prior to enrolling in the distance learning *EME 2040* course. Eighteen percent reported six or more prior distance education classes, 17% reported two, 14% reported three, 14% reported one, 8% reported four, and 4% reported five.

Method

The researcher redesigned the online *EME 2040* class described in this study to integrate synchronous meetings, facilitated by Web-based desktop conferencing technology, with students and the instructor throughout the course of one semester.

During phase one of the pilot study (spring 2013), students were randomly assigned to two separate course sections (synchronous-enhanced and asynchronous) through the creation of development sites within the learning management system. In the synchronous-enhanced section of the course, the instructor and students used the Elluminate Live!® desktop conferencing platform to participate in live online class discussions throughout the semester. Students and the instructor used the Elluminate Live!® desktop conferencing platform to communicate verbally, share their computer screen, and chat via instant message with one another, while the second section did not participate in live online class discussions. Students were also able to see their instructor through the video feature available through the platform. The video feature was not used with students. Students were not able to see one another. In the synchronous-enhanced group, the instructor held four online class discussions with two session times per week to

accommodate students in the distance learning course. At the end of the semester, the researcher recruited students to complete an end-of-course survey to examine their course experience. Students who agreed to participate in the study did so voluntarily. Students who had attended the majority of the Elluminate Live!® sessions throughout the course of the semester were also asked to participate in an interview. The researcher conducted semi-structured interviews after the conclusion of the course to gather data and address the research questions. An interview guide was used by the researcher to conduct the semi-structured interviews.

Interview Guide:

1. Throughout the course of the semester, you participated in several class meetings delivered through Elluminate Live®. Can you tell me about your experience participating in the online class meetings during the course?
2. What did you enjoy about the live online class meetings with your instructor and classmates? Why do you think that this was enjoyable to you?
3. What did you dislike about the online class meetings? What would you recommend to address (this issue or these issues)?
4. What recommendations in general would you suggest to improve the online class meetings?
5. Do you feel that the online class meetings enhanced your learning experience?
    a. How so or how not?
    b. Why do you feel that the online class meetings affected your learning experience in this way?
6. Do you feel that the online class meetings hindered your learning experience in any way? Why do you feel this way?
    a. How so or how not?
    b. Why did the online class meetings affect your learning experience in this way?
7. How does your experience in this online course that included live class discussion with your instructor and classmates compare to your experience in other course delivery modes such as online courses that included no live discussion, blended courses, or traditional classroom courses? How did you feel about having meetings where you met with your teacher and classmates live over the Internet as opposed to not having these meetings at all in your online course?
8. Would you prefer to enroll in an online course that includes live, online class discussion with your instructor and classmates? Why or why not?

Phase two of the pilot study also employed a mixed method design. This phase of the pilot study was conducted over the course of one semester (spring 2014) at the same university using the same course as phase one. In contrast to phase one, in which both sections of the course were taught by the same instructor; during phase two, two different instructors taught two separate sections of the *EME 2040* course. The structure of the two sections of the course was identical; however, use of two different instructors may raise an internal validity issue given that even slight differences in teacher styles could affect students' experience. The instructor may be a potentially confounding variable. In the synchronous-enhanced section of the course, six live online class discussions were held with the students and instructor throughout the semester, while online class discussions were not held in the asynchronous section of the course. At the end of the semester, students in both the synchronous-enhanced and asynchronous course sections were asked to complete an end-of-course survey in order to examine their course experience. Following the conclusion of the course, students in the synchronous-enhanced group were also asked to participate in a semi-structured interview to examine their experience participating in synchronous class discussions in the course throughout the semester.

Data Analysis

Following the completion of phase one of the pilot study, results of the end-of-course survey were analyzed, and descriptive statistics (means and standard deviations) for cognitive presence, social presence, teaching presence, perceived learning, and student satisfaction are presented in Table 5. Cronbach's Alpha, used as a measure of internal consistency, yielded high inter-correlations for the items in the three presences' scales: cognitive presence ($\alpha = .97$), social presence ($\alpha = .95$), and teaching presence ($\alpha = .96$). An instrument developed by Hiltz (1994)

was used to measure perceived learning. Internal consistency of the subscale was estimated at .97. A single survey item to assess students' overall satisfaction with the quality of the course was used to measure student satisfaction. During phases one and two of the pilot study, semi-structured interviews provided a means to examine students' perceptions of the synchronous-enhanced distance learning environment. The interviewer recorded and hand transcribed the interviews, entered them into ATLAS.ti 7®, and open coded them while analyzing the transcripts. A thematic analysis was conducted, and inductive coding was used to identify themes apparent in the data. A constant-comparative method employed open coding, axial coding, and selective coding to determine general codes present in the data (Lichtman, 2013; Strauss & Corbin, 1990). The study employed member checking to verify the accuracy of the transcript with interview participants. Following the interviews and before the analysis, participants received a copy of the transcript to ensure the transcript reflected their experience and to check whether they had anything additional to share. The interviewees confirmed that the transcript appeared to be consistent with the interview and did not have anything else to discuss.

Results

Phase one of the pilot study employed random assignment of students into two groups, and the same instructor taught both sections of the course. Phase one of this pilot study (N=53) resulted in higher levels of perceived cognitive presence, M = 4.06 (*SD* = 1.03) vs. M = 3.42 (*SD* = 1.19), social presence, M = 3.85 (*SD* = 1.11); M = 3.30 (*SD* = 1.24), teaching presence, M = 4.34 (*SD* = .85); M = 3.75 (*SD* = 1.09), perceived learning, M = 4.26 (*SD* = .82); M = 3.59 (*SD* = 1.13), and student satisfaction, M = 4.29 (*SD* = .96); M = 3.50 (*SD* = 1.30) (Table 5).

Table 5. Synchronous vs. Asynchronous Learning – Pilot Study: Cognitive Presence, Social Presence, Teaching Presence, Perceived Learning, and Student Satisfaction

	Synchronous		*Asynchronous*	
Domain	Mean	SD	Mean	SD
Cognitive Presence	4.06	1.03	3.42	1.19
Social Presence	3.85	1.11	3.30	1.24
Teaching Presence	4.34	.85	3.75	1.09
Perceived Learning	4.26	.82	3.59	1.13
Student Satisfaction	4.29	.96	3.50	1.30

Note: 5-point scale

Phase two of the pilot study (N=47) did not employ random assignment, and two different instructors taught two separate sections of the course. The results of this phase of the pilot study are presented in Table 6.

Table 6. Synchronous vs. Asynchronous Learning - Pilot Study: Cognitive Presence, Social Presence, Teaching Presence, Perceived Learning, Learner-Instructor Interaction, and Learner-Learner Interaction

	Synchronous		*Asynchronous*	
Domain	Mean	SD	Mean	SD
Cognitive Presence	4.23	1.02	4.25	.85
Social Presence	4.18	1.01	4.27	.80
Teaching Presence	4.56	.93	4.63	.56
Perceived Learning	4.3	.99	4.47	.59
Learner-Instructor Interaction	4.45	.96	4.45	.80
Learner-Learner Interaction	4.18	1.06	4.05	1.09

Note: 5-point scale

Interviews/Thematic Analysis

Student Interviews

During phases one and two of the interviews, participants chose primarily to discuss the

benefits of their experience with synchronous learning. Four interviews with four participants were conducted in phases one and two of the pilot study. Drawbacks noted in phase one of the interviews included a preference for weekly synchronous class discussions in contrast to limiting the meetings to four sessions per semester and a desire to have meeting dates and times established at the beginning of the semester. Additionally, one of the interviewees discussed that she would have benefitted from learning how to use the synchronous conferencing tool to collaborate with her classmates throughout the semester. After examining the interview data from phases one and two of the pilot study, four key themes emerged in both of student discussions including direct instruction, collaboration, clarification, and interaction.

Direct Instruction

Direct instruction aligns the teacher at the heart of the learning process (Baumann, 1983). Through direct instruction, the teacher "shows, models, demonstrates, and teaches the skills to be learned" (Baumann, 1983, p. 287). The construct of teaching presence also includes direct instruction (Anderson et. al, 2001). Teaching presence, defined as the "the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p .5), provides one possible advantage of integrating synchronous learning into the distance learning environment (Tolu, 2010). One student interviewee discussed how she "liked it when [the instructor] went through the modules that were a little bit harder when the activities were a little more difficult and challenging" and "it was a little bit better to have it live and be able to go through it step-by-step." Another interviewee, mentioned that she is "taking French online this semester too, and that has like no interactive meetings, no tutorials, nothing like that and it's a lot harder like to

know what to expect…so in comparing the two, I would much rather be able to have these meetings weekly…and be able to have walk-throughs of things." She also commented that she "liked how [the instructor] could walk through everything and kind of do a tutorial while we got to ask questions and she would do a screenshot on the whiteboard and go through our assignments and show us how to do things."

Another student commented that she "really appreciated that this online course had this option because I felt that I really got to know about the important content of the week." She "liked that [she] was able to get examples of the assignments for the current module that we were working on for the week." She felt that "the online meetings on Blackboard enhanced [her] learning because [she] was able to get a first look at the assignments that needed to be completed for the week." She commented that she used the meetings to her "advantage to stay on track and prepared."

Another interview participant appreciated that "everything [she] needed to know for the upcoming week was discussed and talked about so there was no confusion with the assignments" and communicated that "if we didn't have the meetings I would have been confused a little bit in each module with what was supposed to be done."

The student interview participants communicated that synchronous learning afforded direct instruction. Instructor demonstration and modeling provided support for the students which they felt was beneficial to their learning experience. In light of these encouraging comments, future research should be conducted to examine the prevalence of this theme with additional students who participate in a synchronous-enhanced distance learning environment.

Collaboration

During the interviews, students also discussed how synchronous learning in the online environment provided an opportunity for collaboration, defined in this study as the process by which students work together toward a common goal. According to the 2012 Horizon Report, collaborative learning models in higher education are among other key developments predicted to emerge over the next few years (Johnson et al., 2012). Collaboration is a key factor in the Community of Inquiry Model (Garrison et al., 2000). Student interviews revealed how collaboration benefited students in the synchronous learning environment. A student interviewee commented that "I think it's really great. I think that more online teachers should be able to use it as a way to communicate and to work in groups without actually having to meet, and I think that's awesome because that's the problem with online courses is most of the time you can't meet with groups or even have groups, just depending, and this gives us the opportunity to do that." She also mentioned "I like group work and I do well with group work and being able to share my opinions and have the opinions of others shared with me. It gives me a better understanding of the material." Another student interview participant mentioned that this type of learning environment supported collaboration, an important factor to her learning.

Another interview participant discussed that she "liked the fact that [she] could work with [her] peers and get different opinions about the different assignments that were being posted." She also commented that "when we got into groups, I felt that I could talk to the students that I was with. I could ask them their opinion about the questions, and it helped me to get new ideas about what the assignment was about." In her opinion, "[she] was able to think more about the assignment" through working with her peers. She also mentioned that, in her experience, the synchronous environment was more conducive to facilitating collaboration than some traditional

classroom environments. She discussed that "on some of these online meetings I got to know some of my classmates more than I would have in a regular classroom." In her experience in a traditional classroom setting, "all of the students are paying more attention to what the instructor is doing, and so, we really don't have time to talk within ourselves." She also added that she felt that the "classroom is kind of rushed… in an actual class setting at school like versus online where we have a set time to talk with the students and we are put into groups to talk with other students."

Another interviewee discussed that she felt the online class discussions were beneficial to her experience through enhancing collaboration. She mentioned that she "really enjoyed that [they] worked in groups" and that she "like[d] how we could communicate with other students and talk about what was confusing or what we really enjoyed."

Clarification

Participants also noted clarification, defined in this study as a way to make information easier to understand, as a benefit of synchronous Web-based learning. Clarification is a key element in cognitive presence. Integrating synchronous learning into the online environment via cognitive presence in the Community of Inquiry Model (Garrison et al., 2000) may benefit students seeking clarification which is important in the learning process.

One interviewee noted that synchronous learning was beneficial "for clarification on our projects, because you can go through the tutorial, and she might say something, but when she is doing the tutorial on here, if you don't understand a portion or if they leave something out." She commented that "it makes things clearer and you can ask questions," "it's just a lot… easier to understand things," and "it was a little bit better to have it live…and ask her any questions along

the way."

Another interviewee mentioned that the online class discussions were "very helpful because if I had any questions about the module they could be answered immediately." She appreciated "that [she] was able to get the instant contact during the meetings and talk about anything that was needed for the upcoming modules." In her opinion, "online class meetings makes learning easy and gave me a sense of comfort knowing that other students were asking the same questions."

Interaction

Finally, interaction—defined in this study as interaction from student-to-student, student-to-instructor, or student-to-content (Moore, 1989)—is a theme that emerged through interviews with both students in the synchronous-enhanced course. Moore (1989) describes interaction as pivotal to the learning process. Fulford and Zhang (1993) assert that online courses should place interaction at the heart of distance education practices. As noted in the review of literature and supported in survey responses, synchronous learning may help to facilitate interaction (Mabrito, 2006; Zsiray et al., 2001). The interviewees in the synchronous-enhanced distance learning environment discussed the benefits to student-student and student-instructor interaction.

One interviewee discussed the importance of the synchronous meetings in terms of her ability to interact effectively with her instructor and classmates though the synchronous conferencing platform. She mentioned that "I did enjoy it. I didn't think of it as a hassle or anything like that. I mean, it's important, and I think it's a great way to build a relationship with your students even over the Internet. I feel really close to Professor X. She's just been so helpful, and I think that it's a great way to still maintain that community in your classroom even

with it being online." She commented that she appreciated the various ways the platform facilitated interaction. She stated that "there were multiple ways of communicating through there whether it was through, you know, the microphone or, you know, the little text box and it was just a good experience overall, and being able to see her screen which was really helpful too."

Another student interviewee discussed that she enjoyed this environment because she values communicating with others. She commented that "I like to talk, and I like to be, have communication with people and stuff, so that was more, kind of my learning style than just typing or… messaging people and stuff. I like to have that communication and things and be able to answer questions and talk and have questions answered and stuff, and to be able to go through it like that really helped me understand what was going on instead of just having to just sit and watch the videos."

Another interviewee discussed that she "liked that I could talk to my teacher and my classmates." She "liked the one-on-one communication with the instructor and having evidence that they are actually there and helping me to learn." She "liked that the instructor was there at the moment instead of…versus email, or not communicating at all." This participant appreciated the opportunity to interact with her instructor. She mentioned that she "liked getting to know my instructor, and I think it helped me to do better on my assignments, knowing that I could get that feedback at any time." She also discussed that "compared to other classes that I have taken online, having the ability to speak with my teacher through the Blackboard online meetings made learning easier and more comfortable." The interviewee mentioned that "with this online course that had the live discussion, I really did like that because sometimes in online classes you don't

get to communicate with your instructor."

Instructor Interview

An interview with the instructor of the course was also conducted in order to explore her experience teaching one section of the *EME 2040* distance learning course in the synchronous-enhanced format. The instructor had taught this course over four years in both distance learning and face-to-face modes at the same university prior to the spring 2013 semester when this pilot study was conducted; however, it was the first semester that *EME 2040* was taught in the synchronous-enhanced mode, including online class discussions with students and the instructor. The interviewee provided insight regarding her approach to integrating online class meetings in the distance learning environment and offered recommendations for future implementation. The instructor recommended polling students to establish a schedule for the meetings throughout the semester. The class discussions were scheduled for one hour, and an announcement was sent out to students prior to the meeting and approximately half of the class attended each of the online class sessions.

According to the instructor, the meetings were structured to include a review and discussion based upon an upcoming assignment related to the course. The instructor would typically "walk through the assignment which would look like or feel like how I do in a face-to-face class" and "give them a brief overview and highlight places that I know that students tend to get confused or overlook something and so forth." Additionally, the instructor would review "any particular activity that I know would get them started toward their assignment or build some background knowledge that will help them with their assignment." The instructor would allow students to participate and ask for clarification as well. She would relay information by

"sharing [her] screen and walking through and highlighting words and so forth, and they could raise their hand and ask a question or grab the microphone and ask a question as we went through it." Students could also type a question in the chat box.

She also included an opportunity for students to collaborate on assignments. For example, to allow students to share ideas for a digital story assignment required in this course, the instructor "put them into breakout rooms, so they were in small groups, maybe three students, and talk about different ideas that they had for a story they might do." The interviewee designed the structure of the meetings to allow for this type of discussion. According to the instructor, "most of the time we ended with that kind of an activity, and so I would go from room to room, check in on them, listen in, ask if they had any questions, and loop back around when we were getting near the end of our time." The instructor made use of breakout rooms to assign students to private groups and allow them to collaborate online during the synchronous sessions. Breakout rooms are a feature integrated within the Elluminate Live!® software. In breakout rooms, students were permitted use of "all the tools, also the chat box, writing on the whiteboard…and [I] gave them all moderator privileges" to facilitate collaboration.

The interviewee was also asked to discuss whether she felt that the course was enhanced by the use of online class meetings. According to the instructor, she received feedback from her students during the semester and felt like "it really did enhance the distance learning." She commented that "the students that attended it said that it really reduced their stress." She also mentioned that "a few of them I would run into in the iTeach lounge or in the hallway would say or send me a personal email or put it in their reflections, so I got the feedback in several different ways." According to the interviewee "those that attended said that they understood the

assignment better, they didn't feel as overwhelmed, and they felt like that really helped them do a much better job on the assignments."

When asked about whether she would do anything different in the future, the instructor mentioned that "rather than the week prior, putting out a Doodle® poll to set it," she would recommend setting the meetings up "weeks in advance and post it" before the online class discussions. For future implementation, the instructor recommended "thinking about what you do in a face-to-face version of your class," and "if you only teach it online, think about which assignments you find your students struggle with the most." The instructor recommended that future instructors "think about, if I could have their attention for one hour, what could I do, or what could we do together that would help them to be more successful with that assignment."

She also mentioned that the use of synchronous class meetings also reduced her workload and resulted in a higher quality of student work. According to the interviewee, "it really did reduce the amount of emails for help." Additionally, she felt that "the work they turned in was much better." She commented that "it's definitely to an instructor's advantage to invest the time in holding a synchronous session… It's less demand on your time for help or giving negative feedback on their assignments after they're turned in. It pays off."

Discussion

This two stage pilot study explored the process and analyses for examining cognitive presence, social presence, teaching presence, perceived learning, and student satisfaction in synchronous-enhanced and asynchronous distance learning courses. This pilot study also examined students' perceptions of their experiences in a synchronous-enhanced learning environment. Results of the end-of-course survey offered insight into the potential of

synchronous learning and revealed benefits to cognitive presence, social presence, teaching presence, perceived learning, and student satisfaction. During phase one of the pilot study, the same instructor taught both sections of the course and students were randomly assigned to groups. After the end of phase one of the pilot study, an end-of-course survey was delivered to students in both sections of the course. Results of this survey revealed higher mean estimates in the synchronous-enhanced group for all of the variables examined. Statistical significance was not examined during the pilot study. During phase two of the pilot study, two different instructors taught both sections of the course and students were not randomly assigned to groups. The results of phase two revealed slightly higher mean estimates for the asynchronous group for cognitive presence, social presence, teaching presence, and perceived learning. The mean estimates corresponding to student-instructor interaction were the same (M=4.45). The mean estimate was slightly higher in the synchronous-enhanced (M=4.18) versus the asynchronous group (M=4.05) in measuring student-student interaction.

Qualitative analysis revealed how students feel about the synchronous learning environment and provided recommendations for future implementation. During the interviews, students applied positive descriptors when they spoke about their experience in the synchronous-enhanced environment. In analyzing the interview transcripts through inductive analysis, key themes emerged through constant comparison. Interviews with four students from the synchronous-enhanced *EME 2040* distance learning classes during two semesters revealed that their experience meeting with their class through the Elluminate Live!® desktop conferencing platform assisted with direct instruction, collaboration, clarification, and interaction. This pilot study offers insight into potential benefits to cognitive presence, social presence, teaching

presence, perceived learning, and student satisfaction in a synchronous-enhanced versus asynchronous distance learning environment. It also illustrates how students from an undergraduate, synchronous-enhanced, distance education course perceive their experience and was used to inform the proposed research study.

CHAPTER FOUR – RESULTS

Results

The researcher used a mixed method design in this study to examine the research questions and hypotheses. A pilot study, conducted over two semesters at the same university, sought to inform the design and delivery of this research. This study employed quantitative methods to determine whether differences in students' educational experience, perceived learning, and interaction are present between synchronous-enhanced and asynchronous distance learning environments. Additionally, this research also qualitatively explored students' perceptions of synchronous-enhanced and asynchronous learning environments in the context of an undergraduate introductory technology distance learning course format.

This study (N=52) used an end-of-course survey to measure cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction in synchronous-enhanced and asynchronous distance learning course formats. Descriptive statistics were examined in both the synchronous-enhanced and asynchronous groups for cognitive presence, M = 4.02 (*SD* = 1.11) vs. M = 3.92 (*SD* = .96); social presence, M = 3.96 (*SD* = 1.22) vs. M = 3.87 (*SD* = .83); teaching presence, M = 4.23 (*SD* = 1.12) vs. M = 4.21 (*SD* = 0.83); perceived learning, M = 4.20 (*SD* = 1.09) vs. M = 4.11 (*SD* = .88); learner-instructor interaction, M = 4.22 (*SD* = 1.08) vs. M = 4.02 (*SD* = .87); and learner–learner interaction M = 3.86 (*SD* = 1.24) vs. M = 3.90 (*SD* = 0.95). Descriptive statistics are provided in Table 7.

The underlying statistical assumptions for a t-test include normality, independence, and homogeneity of variances. In examining normality, skewness ranged from -.76 to -1.68 and kurtosis ranged from -.09 to 2.92. The variables did not appear to be skewed and only one variable evidenced kurtosis outside of an acceptable range. However, kurtosis does not have dire influence on the statistical estimates (i.e., means and standard deviations). The t-test is robust to violations of normality, and therefore all of the data were included in the analysis. Additionally, the independence assumption was met as there was no relationship between the participants in each of the online sections of the *EME 2040* course. Homogeneity of variances was also tested and satisfied using the Folded-F test. For each of the variables measured, there were no statistically significant differences in variances between the two groups.

This study examined statistically significant differences in cognitive, social, and teaching presence as well as perceived learning, learner-instructor interaction, and learner-learner interaction through independent t-tests. Although raw scores on the end-of-course survey for the synchronous-enhanced group were slightly higher than the asynchronous group, results evidenced no statistically significant differences between the two groups for cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner–learner interaction. The greatest raw score differences between the two groups were in measuring learner-instructor interaction, M = 4.22 (*SD* = 1.08) vs. M = 4.02 (*SD* = .87); cognitive presence, M = 4.02 (*SD* = 1.11) vs. M = 3.92 (*SD* = .96); social presence, M = 3.96 (*SD* = 1.22) vs. M = 3.87 (*SD* = .83); and perceived learning, M = 4.20 (*SD* = 1.09) vs. M = 4.11 (*SD* = .88) (Table 7).

Table 7. Synchronous vs. Asynchronous Learning: Teaching Presence, Social Presence, Cognitive Presence, Perceived Learning, Learner-Instructor Interaction, and Learner-Learner Interaction

Teaching Presence							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	4.23	1.12	0.04	26	0.97	0.01
Asynchronous	25	4.21	0.83	0.04	24	0.97	0.01
Social Presence							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	3.96	1.22	0.32	26	0.75	0.09
Asynchronous	25	3.87	0.83	0.32	24	0.75	0.09
Cognitive Presence							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	4.02	1.11	0.74	26	0.74	0.10
Asynchronous	25	3.92	0.96	0.74	24	0.74	0.10
Perceived Learning							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	4.20	1.09	0.34	26	0.74	0.09
Asynchronous	25	4.11	0.88	0.34	24	0.74	0.09
Learner-Instructor Interaction							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	4.22	1.08	0.74	26	0.46	0.20
Asynchronous	25	4.02	0.87	0.74	24	0.46	0.20
Learner-Learner Interaction							
Group	N	M	SD	t	*df*	*p*	Diff (S-A)
Synchronous-enhanced	27	3.86	1.24	-0.13	26	0.90	-0.04
Asynchronous	25	3.90	0.95	-0.13	24	0.90	-0.04

Note: 5-point scale

Demographics

Demographic data were also collected through the end-of-course survey. Completion of each of the demographic items on the survey was voluntary. Students in both the synchronous-

enhanced and asynchronous groups were asked their age, gender, ethnic background, current status in their baccalaureate program, and the number of online classes taken prior to this course. The average age was 20 in the synchronous-enhanced group and 21 in the asynchronous group.

An average of three online classes were taken prior to this course in both the synchronous-enhanced and asynchronous groups. Twenty females and seven males participated in the synchronous-enhanced group, while 19 females and seven males were in the asynchronous group. Students' ethnic background and status in their baccalaureate program are illustrated in Figures 2 and 3.

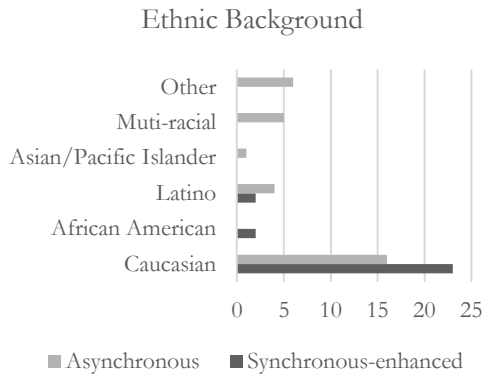

Figure 2. Ethnic Background

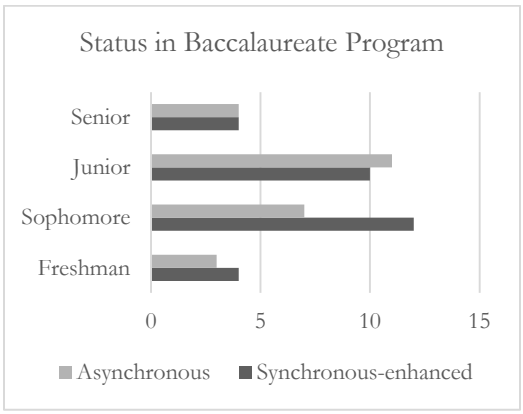

Figure 3. Status in Baccalaureate Program

Correlation Matrix

Pearson Correlation Coefficients, N=52
Prob > |r| under H0: Rho=0

	cogpres	socpres	teachpres	plearn	llint	liint
cogpres	1.00	0.91	0.87	0.94	0.87	0.88
		<.0001	<.0001	<.0001	<.0001	<.0001
socpres	0.91	1.00	0.85	0.85	0.86	0.80
	<.0001		<.0001	<.0001	<.0001	<.0001
teachpres	0.87	0.85	1.00	0.91	0.78	0.88
	<.0001	<.0001		<.0001	<.0001	<.0001
plearn	0.94	0.85	0.91	1.00	0.80	0.91
	<.0001	<.0001	<.0001		<.0001	<.0001
llint	0.87	0.86	0.78	0.80	1.00	0.83
	<.0001	<.0001	<.0001	<.0001		<.0001
liint	0.88	0.80	0.88	0.91	0.83	1.00
	<.0001	<.0001	<.0001	<.0001	<.0001	

Cognitive presence = cogpres; social presence = socpres; teaching presence = teachpres; perceived learning = plearn; learner-learner interaction = llint; learner-instructor interaction = lint

Figure 4. Correlation Matrix

A correlation matrix was also used to examine the relationships between the variables including cognitive presence, social presence, teaching presence, perceived learning, learner-learner interaction, and learner-instructor interaction. The strongest correlations among the variables occurred between cognitive presence and perceived learning, r =.94, cognitive presence and social presence, r = .91, perceived learning and learner-instructor interaction, r = .91, perceived learning and teaching presence, r = .91, cognitive presence and learner-instructor interaction, r = .88, teaching presence and learner-instructor interaction, r = .88.

Focus Group Interviews

Focus group interviews were used to explore the research questions examining how

students perceive their educational experience in a synchronous-enhanced and an asynchronous Web-based introductory technology course. Deductive coding and thematic analysis was used in the present study to examine the focus group interview transcripts, first to organize and analyze the qualitative data gathered through the interviews, and then to examine themes apparent in the data. Students were asked about their educational experience with regard to interaction, direct instruction, collaboration, and clarification which were determined as benefits of the synchronous-enhanced course during phases one and two of the pilot study.

Two focus groups consisting of five participants per group were conducted in this study. A total of 90 sentences in the synchronous-enhanced group and 53 sentences in the asynchronous group resulted from the focus group discussions. Two coders examined the interview transcripts. The two coders were instructors of the *EME 2040: Introduction to Technology for Educators* course. The two coders met to review the definitions for each code and the coding process prior to beginning the analysis. The interview data was coded using a blind review. Each sentence was examined using deductive coding. The focus group transcripts were coded according to whether interaction, direct instruction, collaboration, and clarification were discussed by participants as benefits of the *EME 2040* distance learning course. In coding the interview transcripts, more than one code or no code was applied per sentence. Each sentence was coded independently by two coders using deductive coding. The percent-agreement was calculated and inter-rater reliability was estimated to be .94 for the synchronous-enhanced group and .95 for the asynchronous group.

Results of deductive analysis revealed higher frequencies for each of the codes including interaction, direct instruction, collaboration, and clarification in the synchronous-enhanced in

contrast to the asynchronous group. The greatest disparity between the two groups was evidenced in students' discussion of clarification and interaction. Students in the synchronous-enhanced group commented on clarification as a benefit of the online course thirty-four times and interaction on twenty-seven occurrences, while those in the asynchronous group mentioned clarification as a benefit only twelve times and interaction on only nine occurrences. The results are presented in Table 8.

Table 8. Synchronous vs. Asynchronous Learning: Interaction, Direct Instruction, Collaboration, and Clarification

	Frequencies of Codes		
	Synchronous	Asynchronous	Diff (S-A)
Interaction	27	9	18
Direct instruction	19	15	4
Collaboration	17	5	12
Clarification	34	12	22

Clarification

Students in the synchronous-enhanced and asynchronous groups conveyed that clarification was supported throughout their *EME 2040* distance learning course. During the focus group conducted with the synchronous-enhanced class, one student mentioned that she "thought the online class meetings were really helpful too because it gave really good clarification on what needed to be done." Another participant in this focus group commented that "it just clarified everything a lot more than just reading it on the computer or on a piece of paper, and you could clarify stuff for us, or people in the group that we were in, could clarify if we had any questions." Participants in this group expressed their perception that the synchronous online class meetings were beneficial because they "helped me answer all of my questions and gave me a good example of what was expected." Students explained that they felt

the online class meetings "gave clarification on what was going on, and when we did the online meetings about the WebQuest, we had to evaluate it, and we were talking about it." Another student commented that "I believe that it is very helpful because, like I said, I'm a very visual learner and when you went through it, we knew what was expected of us and what we had to do to achieve it, so I believe it really helped." Another student mentioned how the online class meetings supported clarification. She thought that "they were really helpful just being able to know what everyone else was doing and not feeling so lost and completely on your own and being able to have a very approachable format like this. I like it a lot." In comparing the synchronous-enhanced online course to other classes, one participant noted that "in my past online course, I didn't have online class meetings, so I would just try to read the assignments and try and figure it out, but with the online class meetings, I'm getting a much better understanding and I'm learning more, and when assignments come along, I have an understanding of what is expected of me and what I should be doing and that I'm not on my own."

Participants in the second focus group conducted with the asynchronously delivered *EME 2040* distance learning course also discussed how clarification occurred in this course throughout the semester. It is important to note that the communication tools that students used in this section of the course were all asynchronous. One student mentioned that "emails were answered quickly in regards to any questions on assignments or modules or the course in general, and I felt like the instructor gave us really good feedback on the stuff that we did, and I feel like she communicated well with us when I had any questions." Another participant mentioned that the course "was easy to follow along, but I assume the learning community forum helped others if they needed to ask other students, and you were also very accessible if we needed you." An

additional student commented that "I, as well, didn't have many issues. For the most part the directions were easy to understand and, throughout the course, I thought you had brilliant instructions and I was able to contact you or my classmates for assistance." Another participant added that "I, also, had very little issues with this class, but there was a lot of different ways that one could, through the forum or through contacting you because you were always very open with, like, your comments on our work, and you just seem like a very personable person that I don't think anyone would have trouble going to you for problems." Another student conveyed that "this was my first time of taking an online class so I knew that I was going to have trouble actually, like getting the stuff done, because I'm more of a visual doing it in-class type of person. I liked how when I emailed questions or I needed clarification on something or if I didn't understand one of the modules or something like that, the response was really quick and I was able to get it done before deadlines and stuff like that."

In general, the asynchronously delivered section of the course did not express difficulty obtaining clarification throughout the semester given the array of asynchronous communication tools that were made available to them. Students in both the synchronous and asynchronous groups were provided all of the same communication tools available with the exception that the synchronous group participated in live online class meetings through Blackboard Collaborate. Asynchronous communication tools integrated within this course included email, discussion boards, wikis (Google Docs) and a learning community forum where students had the ability to post questions for their instructor and peers. When asked about their ability to obtain clarification throughout this course, students in the asynchronous group were much more concise in their discussion compared with those in the synchronous-enhanced group. Students in the

synchronous focus group talked much more about clarification as a benefit of the synchronous-enhanced learning environment. In evaluation of the focus group interview transcripts, thirty-four comments were noted about successfully receiving clarification in this course in the synchronous-enhanced group, while only twelve comments were made in the asynchronous group.

Interaction

Students in the synchronous-enhanced and asynchronous groups conveyed that interaction was supported throughout their *EME 2040* distance learning course. During the focus group conducted with the synchronous-enhanced class, one student commented that "this is the most interaction I've ever had with others during an online class." A student added that "it was nice to have an online class and really speak with you because in other online classes I've taken we don't speak to the instructor or anything." Another noted that "I've never had [a class] where you can talk to your professor online." Additionally, a student commented that "I thought I interacted with you just as much as I would have in a regular class that I was taking on campus." A student also added that "it made me participate more and I found that I actually enjoyed the stuff we learned, so it helped a lot." It was also conveyed that this synchronous-enhanced online course was more successful in supporting interaction in comparison with another online course. For example, a student noted that "as opposed to this course, with my other online course, there was like no interaction whatsoever so you were just basically left to do it on your own." Another commented, "I like that we were able to talk to each other more than just feeling like it's just you trying to figure out the class."

Students in the asynchronous group also discussed interaction in the course. There was a

distinction between the instances that interaction was mentioned in the two focus groups. Interaction was discussed as a benefit of the synchronous-enhanced group twenty-seven times while it was noted only nine times in the asynchronous group. Students in the asynchronous group commented that "I feel like I had more interacting with the students than with the instructor, maybe because I didn't have as many questions, so I didn't always have to go email the instructor or contact the instructor." Another student noted that "I always liked the feedback, and it is nice to know that the instructor is reading and looking at it and it makes a connection without having to be live in class." Others felt that there was minimal interaction in this course. For example, one student noted "I had little interaction with the instructor because of the emails and because the instructions for each module were so clear so I had little questions." Another added, "I also didn't have much interaction with others but it wasn't due to not being able to have that provided to me."

Collaboration

Students in the synchronous-enhanced and asynchronous sections of the course conveyed that collaboration was supported throughout their distance learning course. During the focus group that was conducted with the synchronous section, students mentioned that "collaboration was definitely enhanced through the class meetings because we got to work together." Another student added that "they [online class meetings] were really helpful just because we got to work through the assignment with you and our classmates, and it was like having a class, so I thought that worked out really well." Another student commented that "I think it was more beneficial to work together and have the online meetings too." Participants conveyed that participating in breakout rooms in which students were put into separate groups during the online class meetings

supported collaboration. Breakout rooms were often used after the online class discussion to give students the opportunity to work together as would be possible in a brick and mortar classroom environment. One participant expressed that "it did enhance collaboration just because you would put us in groups after the discussion so that we could work on our projects together, and so we still got to talk to other students and figure out how they were thinking about things." Another participant added that "the elements of collaboration in the online meetings when you would put us into the separate groups and everything and we would bounce ideas off of each other, so I think that helped a lot." They conveyed that "collaboration was enhanced through the online class meetings because you put us into groups and if I did have a question I could ask you or the people in my group." They expressed that "even in the online meetings you would have us set up with other classmates and partner with others to get their information and see what they were thinking and how they were gonna go through with their projects."

Students in the asynchronous group also discussed the element of collaboration experienced in this section of the course; however, based upon analysis of the transcripts, the element of collaboration was profoundly greater in the synchronous group in comparison with the asynchronous group. Participants did express that "there are options for collaborative work throughout the course... the first thing: the learning community forum that allowed us to post questions to other classmates and we got to work on many projects in Google Docs that allowed us to work on certain aspects of the projects while other students could work on other parts at the same time." Google Docs is a wiki that was used in both the asynchronous and synchronous-enhanced sections of the class to facilitate online collaboration for completion of an assigned group paper. Another student discussed that "I didn't have much interaction with my classmates

besides the digital issues paper when we had to collaborate with other students." Overall, seventeen comments were noted about the element of collaboration in this course while only five comments were expressed in the asynchronous group.

Direct Instruction

During the focus group interviews with students in the synchronous-enhanced and asynchronous groups, it was expressed that direct instruction was a benefit of their distance learning course. Students in the synchronous-enhanced group commented that they thought "the online meetings not only were helpful in explaining content, but they kept me on track as far as what I should be doing and what I should be learning and what assignment is due next." One student added that "I believe that the online class meetings directed my learning to help me focus on what I should be learning and what my outcome should be for after the module and the assignments that we'll be completing. The class meetings just helped contribute to my understanding of chapters in the book, what we should be learning, and just what the whole entire course was about the course content." Another student mentioned that "just by you demonstrating how you did things such as your digital story and how you gave examples, it helped me learn a lot and helped me to know what I should be doing with my project." Another student added that, "I could see it on my screen as you did it and then I could do it at the same time, so it was like you were there helping me with it, so I think it was very helpful." Additionally, they communicated that "when we did the online group and you ran through it, I realized that it is actually kind of easy to use once you get the hang of it."

Students in the asynchronously delivered distance learning course also discussed how direct instruction was provided throughout the semester. One student noted that "all the modules

and readings taught me valuable lessons to integrate technology into the classroom." Another student mentioned that "I felt that there were always extra information and examples in order to accomplish the assignment." It was also conveyed that "I thought the way that the assignments were setup in canvas was very well delivered, always giving us a lot of information to get the stuff done like the instructional videos that were provided sometimes." Overall, students communicated that they didn't have many issues with the delivery of the instruction. For example, one student mentioned that "I didn't run into any issues throughout the course because the directions for each module were instructive." A second student added that "I as well didn't have many issues for the most part the directions were easy to understand and throughout the course, I thought you had brilliant instructions and I was able to contact you or my classmates for assistance." Another participant added that "I definitely believe for each assignment there were elaborate directions that helped with my understanding and also the step-by-step videos definitely helped because I was able to like watch them step-by-step and go along with them." It is important to note that both *EME 2040* distance learning sections of the course presented the same content and assignments. The asynchronously delivered section of the course mirrored the synchronous section with the exception that online class meetings were integrated throughout the semester. Any instructions, videos, examples, screencasts, etc., provided in the synchronous-enhanced course section were also presented in the asynchronous section. Direct instruction appeared to be supported in the asynchronous group; however, students in the asynchronous group did not discuss direct instruction as a theme of this course at quite the same length as students who participated in the synchronous-enhanced distance learning course. Students in the synchronous-enhanced group commented on direct instruction as a benefit of the course on

nineteen instances, while those in the asynchronous class mentioned direct instruction as a theme fifteen times.

Limitations and Delimitations

Various limitations and delimitation are present in this study. With regard to limitations, this study employed a non-probability, convenience sample to evaluate the and hypotheses. The sample size and the particular undergraduate course selected for examination limited the study's generalizability. Additionally, the instructor served as the researcher in this study; however, from the student perspective, both distance learning sections of the online *EME 2040: Introduction to Technology for Educators* distance learning course appeared to be identical with the exception that bi-weekly synchronous online class meetings were included in the synchronous-enhanced course section.

Regarding delimitations, the researcher examined two distance learning sections of the same technology course. The same instructor taught both sections of the distance learning course at the same university during one semester. Students were separated into two separate courses and did not interact with one another. Two sections of the EME 2040 distance learning course were offered during the fall 2014 semester at this university, and the same instructor taught both sections of the class. Additional sections of the course taught by a different instructor could not be included as the instructor could be a confounding variable. Only data from one semester were included in this study due to the iterative redesign that occurs every semester in this course. Student assignment to one of the two distance learning sections of the *EME 2040* course was predetermined according to which course section students registered for at the beginning of the semester. Assignment to the two groups was random in the sense that

students were not made aware which course section integrated synchronous class meetings and which section did not include synchronous class meetings prior to the end of course registration at the university. The two distance learning course sections appeared to be identical to students during course registration. Only the course title, instructor, and indication that it would be taught in the distance learning mode were provided to students during registration. Ideally, students may have been provided the time and date that the synchronous sessions were to be held throughout the course; however, for the purpose of conducting this study and maintaining equality of the two groups, the online meetings were not announced during course registration. The instructor offered either two or three online sessions per week from which the students could attend. The online meetings were not archived nor made available to students.

Throughout the semester, the instructor taught both courses consistently by including the same learning modules and assignments in each section. The two sections of the course mirrored one another with the exception that bi-weekly synchronous class meetings were conducted in the synchronous-enhanced course, while synchronous class meetings were not conducted in the asynchronous course. The same instructor taught both sections of the course. The instructor who led both sections of the *EME 2040* course taught the class over the last five years at the university in which this study took place. The instructor taught the course in both face-to-face and distance learning modes prior to this study. The course modules, including the directions, materials, supplements, and assignments contained in each section of the course were identical, with the exception that one section of the course integrated synchronous class meetings. The same material was provided in both groups in text format. Content covered in the synchronous class meetings was included in the course modules in both groups. Any material (i.e., content,

directions, hyperlinks, videos) provided during the class meetings in the synchronous-enhanced group was embedded within students' learning modules in both groups.

CHAPTER FIVE – DISCUSSION

Discussion

This chapter summarizes the research purpose, method, questions, hypotheses, and results. Next, it discusses similarities and differences between the results and previous research. Additionally, this chapter offers recommendations for practice for educators and instructional designers. Finally, this chapter concludes by suggesting potential directions for future research based upon the results of this study.

This mixed method study examined synchronous-enhanced and asynchronous learning over one semester in two sections of the *EME 2040: Introduction to Technology for Educators* undergraduate course delivered in the distance learning format at a RU/VH: Research University (very high research activity) in the southeastern United States. The final phase of this research expanded upon the work of a two-phase pilot study examining the same introductory technology course over two prior semesters at the same university. The purpose of this mixed method study was to examine how integration of synchronous communication affects distance learning students' educational experience in an undergraduate, introductory technology course through the lens of the Community of Inquiry model (Garrison, Anderson, and Archer, 2000). It compared students' perceptions of cognitive presence, social presence, teaching presence, perceived learning, learner-learner interaction, and learner-instructor interaction in an undergraduate introductory technology distance learning course that included a synchronous

component with the same online course that did not include the element of synchronous learning. This research examined synchronous and asynchronous instruction to assess the effects on learners' educational experience, perceived learning, and interaction and investigate how students in each learning environment perceive their experience. During the final phase of this research, students participating in the synchronous-enhanced section of the *EME 2040* course participated in bi-weekly online class discussions with their instructor and classmates. The instructor used Blackboard Collaborate®, which is a synchronous communication tool that is available through the university, to facilitate instruction and collaboration. Six real-time, online class meetings were held throughout the semester in which the instructor conducted the class lesson on different topics. Several meeting times were offered to the students per session. Overall, attendance was very strong. The average synchronous class meeting attendance rate throughout the semester was 89%. Content presented during the online class meetings was made available to students in both the asynchronous and synchronous groups. Each assignment and module was identical in both the asynchronous and synchronous groups.

It was hypothesized that students participating in a distance learning environment that included synchronous Web-based class meetings over the course of the semester would perceive a statistically significantly stronger sense of cognitive, social, and teaching presence in comparison with the same asynchronous distance learning environment (Chou, 2002; de Freitas & Neumann, 2009; Hrastinski & Keller, 2007; Tolu, 2010). It was also predicted that the synchronous-enhanced environment would yield statistically significantly higher reported perceived learning and interaction in contrast to the asynchronous group (de Freitas & Neumann, 2009; Disbrow, 2008; Gillies, 2008; Koszalka & Ganesan, 2004; Mabrito, 2006; Skylar, 2009;

Zsiray, Smith, & West, 2001). Finally, this study qualitatively explored how students perceived their experiences in both synchronous-enhanced and asynchronous distance learning environments in an undergraduate introductory technology course through semi-structured and focus group interviews.

Summary of Research Questions, Hypotheses, and Results

Research Questions

1. How do undergraduate students perceive their educational experience in a synchronous-enhanced Web-based introductory technology course?
2. How do undergraduate students perceive their educational experience in an asynchronous Web-based introductory technology course?

Qualitative Analysis

Qualitative results of this study based upon semi-structured and focus group interviews suggest that a synchronous-enhanced distance learning course offers benefits to clarification, collaboration, interaction, and direct instruction in comparison with an asynchronously delivered distance learning course. Two focus groups were conducted in this study. The sentences were coded independently by two coders using deductive analysis.

Four themes that emerged through inductive analysis during phases one and two of the pilot study were used to analyze the interview transcripts: interaction, direct instruction, collaboration, and clarification. Through direct instruction, the teacher models and demonstrates the skills to be learned (Baumann, 1983, p. 287). The construct of direct instruction is integrated within teaching presence which is a key element in the Community of Inquiry model (Anderson

et. al, 2001). Teaching presence has been supported through the synchronous distance learning environment (Tolu, 2010). Collaboration involves individuals working with one another as equals (Friend and Cook, 1992) with a shared vision (Wig, 1992). Collaboration is at the core of the Community of Inquiry model (Garrison, Anderson, & Archer, 2001). Clarification was another theme identified as a benefit of the synchronous-enhanced learning environment. Embedded within the construct of cognitive presence is the exploration for "clarification and attempting to orient one's attention" (Garrison et al., 2000). Finally, the theme of interaction emerged through the interviews. The concept of interaction has been described by Moore (1989) as involving three elements including learner-instructor, learner-learner, and learner-content. Moore (1989) proposes that future educators will need to design distance learning environments to ensure optimal interaction of each type and appropriateness to the teaching task for learners at different stages. Ideally, the F2F (face-to-face) or distance learning course structure should draw on the expertise of both educators and communications specialists to support all three forms of interaction—learner-learner, learner-instructor, and learner-content interaction (Moore, 1989).

Focus groups were conducted in both the synchronous-enhanced and asynchronous sections of the course. Focus group interview transcripts were coded according to whether the themes were discussed as a benefit of the *EME 2040* distance learning course. Deductive analysis revealed higher frequencies for clarification, f =34 vs. f =12, interaction, f =27 vs. f =9, collaboration, f =17 vs. f = 5, and direct instruction, f =19 vs. f =15, in the synchronous-enhanced group in contrast to the asynchronous group. Comments discussing each of these themes, clarification, interaction, collaboration, and direct instruction were noted at a higher frequency in the synchronous-enhanced group in comparison with the asynchronous group.

Students in the synchronous-enhanced group communicated that this platform assisted them in getting clarification on assignments from their instructor and classmates. Students in the asynchronous group discussed their ability to gain clarification throughout the course at a much lower frequency in comparison with the synchronous-enhanced group, f =34 vs. f =12. The synchronous-enhanced group also felt that this platform facilitated interaction with their classmates and instructor. Participants discussed interaction as a benefit of the course at a high frequency in comparison with the asynchronous group, f =27 vs. f =9. Additionally, students in the synchronous-enhanced group communicated that collaboration and direct instruction were benefits of the course more often than those in the asynchronous group, f =17 vs. f = 5; f =19 vs. f =15, respectively.

Results of this analysis suggest that the synchronous-enhanced environment supported each of these themes, and students in the asynchronously delivered course may have benefitted from integration of synchronous learning through gaining clarification, interacting with their instructor and classmates, direct instruction, and collaboration. The greatest disparity between the frequencies of these themes was illustrated in students' discussion of clarification and interaction. Additionally, students communicated more in the synchronous-enhanced focus group in comparison with the asynchronous focus group.

A total of 90 sentences in the synchronous-enhanced group and 53 sentences in the asynchronous group resulted from the focus group discussions. Each focus group was composed of five interviewees, and participants were asked to respond to five questions in each group. Although this analysis is qualitative in nature and can't be generalized, it does offer insight into areas for future research.

Table 9. Focus Group Interviews: Interaction, Direct Instruction, Collaboration, and Clarification

	Frequencies		
	Synchronous	Asynchronous	Diff (1-2)
Interaction	27	9	18
Direct instruction	19	15	4
Collaboration	17	5	12
Clarification	34	12	22

Research Hypotheses

1. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will report a statistically significantly higher sense of social presence, teaching presence, and cognitive presence in contrast to students who use only asynchronous tools.
2. Undergraduate distance education students who use asynchronous tools and participate in synchronous class meetings throughout the course will evidence statistically significantly higher levels of perceived learning and interaction in contrast to those who use only asynchronous tools.

Quantitative Analysis

To address the research hypotheses, this study examined statistical differences in cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction through independent t-tests. The end-of-course survey revealed no statistically significant differences between the synchronous-enhanced and asynchronous groups for each of the variables measured where cognitive presence, M=4.02 (*SD*=1.11) vs. M=3.92 (*SD*=.96), social presence, M=3.96 (*SD*=1.22) vs. M=3.87 (*SD*=.83), teaching presence, M=4.23 (*SD*=1.12) vs. M=4.21 (*SD*=.83), perceived learning, M=4.2

(*SD*=1.09) vs. M=4.11 (*SD*=.88), learner-instructor interaction, M=4.22 (*SD*=1.08) vs. M=4.02 (*SD*=.87), and learner-learner interaction, M=3.86 (*SD*=1.24) vs. M=3.9 (*SD*=.95), respectively.

Some of the research on integrating synchronous learning supports the notion that there are benefits to students' educational experience through integrating synchronous communication tools (Chou, 2002; de Freitas & Neumann, 2009; Hrastinski and Keller, 2007; Tolu, 2010). Research examining the impact of synchronous learning on cognitive presence, social presence, and teaching presence is limited and much of the research conducted to date is qualitative in nature. This study employed a quasi-experimental design to examine whether integrating synchronous learning in an online environment statistically significantly affects students' educational experience. It was determined that there were no statistically significant differences between the two groups.

Tolu's (2010) qualitative case study suggested that synchronous learning enhances the development of an online Community of Inquiry (Garrison, Anderson, & Archer, 2001) by enabling interactions contributing to cognitive presence, social presence, and teaching presence (Tolu, 2010). Although the differences between the two groups in this study were not significant, in examining constructs supporting a Community of Inquiry, it should be noted that the synchronous-enhanced distance learning course examined in this study evidenced strong mean scores on a 5-point scale including teaching presence, M=4.23, social presence, M=3.96, and cognitive presence, M=4.02. The asynchronously delivered distance learning section of this course also evidenced high mean scores where teaching presence, M=4.21, social presence, M=3.87, and cognitive presence, M=3.92.

A study by Kyger (2008) examined course evaluations in synchronous and asynchronous

online learning environments. Course evaluation categories included positive regard, enthusiasm, practical and relevant, clear delivery, timely feedback, overall instructor rating, individual value score, overall course objective score, and composite. The sample included freshman-level students enrolled in an introductory level computer course. ANOVA and nonparametric Mann-Whitney *U* tests were used to evaluate statistical differences in the evaluations of courses that included synchronous lectures and those that did not include synchronous lectures. Quantitative analysis illustrated that statistical differences between the two groups did not exist with the exception of two categories: clear delivery and enthusiasm. There was no statistically significant difference between student retention. In this study, students evaluated the two categories including clear delivery and enthusiasm statistically significantly higher in the synchronous group. Enthusiasm was not examined in this study; however, clarification is one theme that emerged through the semi-structured interviews and was discussed as a benefit at a greater frequency in the synchronous-enhanced focus group. Repeating this study and examining these two variables in the synchronous and asynchronous environment is a potential area for future research.

Chou (2002) examined patterns of interactions among distance learners in asynchronous and synchronous environments and using data collected from undergraduate students' course transcripts held over one week through both asynchronous and synchronous modes. The qualitative study compared text-based asynchronous interaction through discussion boards and text-based chat within synchronous Web conferencing sessions. The researchers reported that a higher percentage of observed socioemotional interactions were observed in the synchronous condition (33%) in contrast to the asynchronous environment (8%). A higher percentage of task-

oriented content was reported in the asynchronous (92%) rather than synchronous mode (67%). It was also evidenced that the synchronous condition was more effective in facilitating feedback in the synchronous rather than the asynchronous condition (Chou, 2002). The present study examined learner-instructor and learner-learner interaction using a survey instrument developed by Johnson, Aragon, Shaik, & Palma-Rivas (2000). Although no statistically significant differences were found between the synchronous-enhanced and asynchronous groups, qualitative analysis suggests benefits to interaction in the synchronous-enhanced versus asynchronous environment based upon semi-structured and focus group interviews along with deductive analysis. The present study used an end-of-course survey in which students self reported social presence in each group. Future research could be conducted to observe social interactions in both synchronous-enhanced and asynchronous learning environments in order to examine patterns and determine differences between the two groups.

In a study by Skylar (2009) comparing perceived learning among students (N = 44) who participated in synchronous Web conferencing lectures and asynchronous text-based discussion, 87.8% of students agreed that the use of synchronous Web conferencing increased their understanding of the material. Additionally, 80.5% of participants exposed to Web conferencing lectures, delivered with the Elluminate Live!® platform, felt they performed better on course quizzes. The quantitative study conducted by Skylar (2009) used a variety of tools integrated within the synchronous learning platform including a Webcam. The present study did not make use of video camera technology integrated in the synchronous Web conferencing platform during the online class meeting sessions. Exploration into how use of this additional technological feature in the synchronous environment impacts learning in the online environment is another

area that could be examined through future research.

Interaction was also investigated in this study. Results of the quantitative arm of this study illustrated no statistically significant differences in interaction between the synchronous-enhanced and asynchronous groups. The qualitative arm of this study points to benefits to interaction through integration of synchronous communication tools in the online environment. Interaction is pivotal to the learning process (Moore, 1989). Moore (1989) asserts that educators should design distance learning environments to ensure optimal interaction including learner-instructor, learner-learner, and learner-content. Statistically significant differences in learner-learner and learner-instructor interaction were not found between the synchronous-enhanced and asynchronous groups in this study. Qualitative results based upon semi-structured and focus group interviews suggest a benefit to interaction in the synchronous-enhanced learning environment; however, these results cannot be generalized.

Future Research

This mixed method study examined students' perceptions of the synchronous-enhanced and asynchronous learning environment and measured statistical significance between the two groups based upon cognitive presence, social presence, teaching presence, perceived learning, learner-instructor interaction, and learner-learner interaction. No statistically significant differences were evidenced between the two groups based upon an end-of-course survey; however, qualitative analysis illustrated benefits to clarification, interaction, collaboration, and direct instruction in the synchronous-enhanced distance learning environment.

The course evaluated in this study is one of convenience. The researcher taught this course in both face-to-face and distance learning modes at the university over the last five years.

It is important to note that this course has been iteratively re-designed each semester over the last six years by the team of instructors. The instructors who teach this course are also part of a curriculum design team who meet each week to evaluate the *EME 2040* class and integrate new supports to facilitate learning. The team of *EME 2040* instructors also conducts design-based research based upon student and instructor feedback in order to enhance the course throughout the semester. It would be interesting to examine integration of synchronous communication tools in an online environment in a different course that does not have the array of supports (e.g., detailed instructions, examples, videos, screencast tutorials, etc.) that have been thoroughly integrated into the course investigated in this study.

One other caveat that should be noted is that the two sections of this course were delivered uniformly with the exception that students participated in synchronous class meetings in the synchronous-enhanced group while students did not partake in any synchronous class meetings in the asynchronous group. Content presented in the online class meetings was also available in the modules in both sections of the course. Therefore, it is possible that students who participated in the synchronous-enhanced group perceived the material presented in the online class meetings as redundant given that it was also offered in the corresponding assignment.

In this study, students in the synchronous-enhanced online section of the *EME 2040* course participated in six, one-hour, online class meetings throughout the semester with their instructor and classmates. Future research might also examine benefits to integrating weekly online class meetings in the distance learning environment that includes more than six, one-hour, online class discussions or that extend for a longer duration than one hour. Additionally, during

this study, the online class meetings were not recorded and archived for the students, due to the nature of this research. Recording the online sessions and making class meeting archives available to students would be extremely valuable in practice because it would allow learners to view the instruction on more than one occasion at their own pace.

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APPENDIX

Appendix 1: Dissertation

Demographic Survey

1. What is your age?
2. What is your gender?
   a. Female
   b. Male
3. What is your ethnic background?
   a. Caucasian
   b. African American
   c. Latino
   d. Asian/Pacific Islander
   e. Multi-racial
   f. Other
4. What is your current status in your baccalaureate program?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
5. How many distance education/online classes have you taken prior to this class as an undergraduate student?

Focus Group Interviews

Interview Guides

Interview Guide – Synchronous-Enhanced Group

1. Throughout the course of the semester, you participated in several class meetings delivered through Blackboard Collaborate. Can you tell me about your experience participating in the online class meetings during the course?

2. Can you describe the level of interaction that you had with your Instructor and classmates in this course?
3. Do you feel that the online class meetings enhanced collaboration in this course? If so, how?
4. Do you feel that the online class meetings helped to clarify issues throughout the course? If so, how?
5. Can you describe how the online class meetings directed your learning and contributed to your understanding of the course content?

Interview Guide – Asynchronous Group

1. Throughout the semester, you participated in an Introduction to Technology for Educators distance learning course. Can you describe your experience in this course?
2. Can you describe the level of interaction that you had with your Instructor and classmates in this course?
3. Can you describe the level of collaboration that you had in this course?
4. Can you describe how you were able to clarify issues throughout the course?
5. Can you describe how your instructor directed your learning and contributed to your understanding of the course content?

Informed Consent - Survey

IRB#: Pro00015756

INFORMED CONSENT TO PARTICIPATE IN RESEARCH
Information to Consider Before Taking Part in this Research Study
IRB Study # Pro 00015756
Researchers at the University of South Florida (USF) study many topics. To do this, we need the help of people who agree to take part in a research study. This form tells you about this online research study.
We are asking you to take part in a research study that is called: *A Mixed Method Study Examining Distance Education*
The person who is in charge of this research study is Kimberly M. Wheeler. This person is called the Principal Investigator. The research will be done by collecting your responses online through an electronic survey.

PURPOSE OF THE STUDY
The purpose of this study is to enhance the distance learning experience of the online *EME 2040: Introduction to Technology for Educators* course. Your participation will assist in improving the design of the online *EME 2040* course. The risks of participating in this study are minimal. This study will pose no additional risk than is normally incurred by participating in your *EME2040: Introduction to Technology for Educators* class. Your participation in this study is voluntary and will continue only through the course of this semester. Your participation will not be associated with your class grades. The results of this research study may be published,

but the results will not include your name and will not identify you in any way. Your participation is greatly appreciated and will assist in improving the design and delivery of the online *EME 2040: Introduction to Technology for Educators* course.

You are being asked because you are a student enrolled in the online *EME 2040: Introduction to Technology for Educators* course.

STUDY PROCEDURES
If you take part in this study, you will be asked to complete a voluntary, anonymous survey through Survey Monkey®. The survey will require approximately 15-20 minutes of your time and will be completed online through a link provided at the bottom of this form.
VOLUNTARY PARTICIPATION/WITHDRAWAL
You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Your decision to participate or not participate will not affect your student status (course grade).
ALTERNATIVES
You have an alternative should you choose not to participate in this research study. You may choose to complete a second option to receive extra credit if you would rather not complete the survey.
BENEFITS
We are unsure if you will receive any benefits by taking part in this research study.
RISKS OR DISCOMFORT
This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.
COMPENSATION
You will receive 3 points extra credit on your final exam by participating in this research study.
PRIVACY & CONFIDENTIALITY
Your responses on the survey will be strictly anonymous. Your survey responses will be collected using Survey Monkey® and your identification will not be known by either your instructor or the Principal Investigator. We must keep your study records as confidential as possible. It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. Your results will be password protected and may be stored for up to 5 years after the Final Report is filed with the IRB.
However, certain people may need to see your study records. These records will be anonymous and will not include any identifying information since name identification will not be collected. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:
• The research team, including the Principal Investigator, the Advising Professor, and all other research staff.
• Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.) These include:
o The University of South Florida Institutional Review Board (IRB) and the staff that work for the IRB. Other individuals who
work for USF that provide other kinds of oversight may also need to look at your records.
o The Department of Health and Human Services (DHHS).
CONTACT INFORMATION
If you have any questions please contact the USF IRB at 813-974-5638 or the Principal Investigator at 813-449-1668.

Your participation in this study is greatly appreciated and will assist in the effective design and delivery of the online *EME 2040: Introduction to Technology for Educators* course. We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people

know who you are. You can print a copy of this consent form for your records. If you agree please proceed with the survey below.

Informed Consent - Interview

IRB#: Pro00015756

INFORMED CONSENT TO PARTICIPATE IN RESEARCH
Information to Consider Before Taking Part in this Research Study
IRB Study # Pro 00015756
Researchers at the University of South Florida (USF) study many topics. To do this, we need the help of people who agree to take part in a research study. This form tells you about this online research study.
We are asking you to take part in a research study that is called: *A Mixed Method Study Examining Distance Education.*
The person who is in charge of this research study is Kimberly M. Wheeler. This person is called the Principal Investigator. The research will be conducted by Principal Investigator and will be held in the College of Education building or online.

PURPOSE OF THE STUDY
The purpose of this study is to enhance the distance learning experience of the online *EME 2040: Introduction to Technology for Educators* course. The risks of participating in this study are minimal. This study will pose no additional risk than is normally incurred by participating in your *EME2040: Introduction to Technology for Educators* class. Your participation in this study is voluntary. You are being asked to participate in one interview. The interview will be conducted after the conclusion of the course semester and after final course grades have been submitted. Your participation will not be associated with your class grades. The results of this research study may be published, but the results will not include your name and will not identify you in any way. Your participation will assist in improving the design of the online *EME 2040* course.

You are being asked because you are a student enrolled in the online *EME 2040: Introduction to Technology for Educators* course.

STUDY PROCEDURES
If you take part in this study, you will be asked to complete one voluntary, interview with the Principal Investigator. The interview will require approximately 30 minutes of your time and will be conducted in the College of Education building at the University of South Florida or online through Blackboard Collaborate®.
VOLUNTARY PARTICIPATION/WITHDRAWAL
You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study. Your decision to participate or not participate will not affect your student status (course grade).
BENEFITS
We are unsure if you will receive any benefits by taking part in this research study.

RISKS OR DISCOMFORT
This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.
COMPENSATION
You will receive a $15 gift card as compensation for participating in the interview for this research study.
PRIVACY & CONFIDENTIALITY
We must keep your study records as confidential as possible. No identifying information will be included in the published results of this study. If you choose to participate in the interview, your name will be changed in the published results. It is possible, although unlikely, that unauthorized individuals could gain access to your responses because you are responding online. Your results will be password protected and may be stored for up to 5 years after the Final Report is filed with the IRB.
However, certain people may need to see your study records. These records will be anonymous and will not include any identifying information since name identification will not be collected. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:
• The research team, including the Principal Investigator, the Advising Professor, and all other research staff.
• Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.) These include:
o The University of South Florida Institutional Review Board (IRB) and the staff that work for the IRB. Other individuals who
work for USF that provide other kinds of oversight may also need to look at your records.
o The Department of Health and Human Services (DHHS).
CONTACT INFORMATION
If you have any questions please contact the USF IRB at 813-974-5638 or the Principal Investigator at 813-449-1668.

Your participation in this study is greatly appreciated and will assist in the effective design and delivery of the online *EME 2040: Introduction to Technology for Educators* course.

We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. You can print a copy of this consent form for your records. If you agree please sign below.

_____ _____

Signature of Person Obtaining Informed Consent / Research Authorization Date

_____

Printed Name of Person Obtaining Informed Consent / Research Authorization

Appendix 2: Pilot Study

Demographic Survey

1. What is your age?
2. What is your gender?

a. Female
b. Male

3. What is your ethnic background?
   a. Caucasian
   b. African American
   c. Latino
   d. Asian/Pacific Islander
   e. Multi-racial
   f. Other
4. What is your current status in your baccalaureate program?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
5. How many distance education/online classes have you taken prior to this class as an undergraduate student?

Interview Guides

Student Interview Guide

When responding to the following questions, please think about your experience meeting with your instructor and classmates in Elluminate Live!®.

1. Throughout the course of the semester, you participated in several class meetings delivered through Elluminate Live®. Can you tell me about your experience participating in the online class meetings during the course?
2. What did you enjoy about the live online class meetings with your instructor and classmates? Why do you think that this was enjoyable to you?
3. What did you dislike about the online class meetings? What would you recommend to address (this issue or these issues)?
4. What recommendations in general would you suggest to improve the online class meetings?
5. Do you feel that the online class meetings enhanced your learning experience?
   a. How so or how not?
   b. Why do you feel that the online class meetings affected your learning experience in this way?
6. Do you feel that the online class meetings hindered your learning experience in any way? Why do you feel this way?
   a. How so or how not?
   b. Why did the online class meetings affect your learning experience

in this way?

7. How does your experience in this online course that included live class discussion with your instructor and classmates compare to your experience in other course delivery modes such as online courses that included no live discussion, blended courses, or traditional classroom courses? How did you feel about having meetings where you met with your teacher and classmates live over the Internet as opposed to not having these meetings at all in your online course?
8. Would you prefer to enroll in an online course that includes live, online class discussion with your instructor and classmates? Why or why not?

Instructor Interview Guide

1. As the instructor, can you tell me about how the synchronous class meetings were structured?
2. In general, what types of activities were conducted in the synchronous class meetings?
3. How did you encourage your students to participate in the synchronous meetings?
4. How did you interact with the students, and how did the students interact with one another during the synchronous meetings?
5. How much time did students typically spend in each of the synchronous class meetings?
6. How well attended were they synchronous meetings?
7. Did you observe that that the synchronous class meetings helped to enhance the distance learning course? (If yes) Can you describe how the online meetings enhanced the course? (If no) Why do feel that this was the case?
8. Is there anything that you would do differently in the future?
9. What recommendations do you have for future implementation of synchronous class meetings in distance education courses?
10. Is there anything else that you would like to share?

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On behalf of Kimberly Wheeler for her dissertation:

A Mixed Method Study Examining Synchronous-Enhanced Learning in Distance Education

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January 15, 2014

Kimberly Wheeler
Secondary Education
Tampa, FL 33624

RE: **Expedited Approval for Initial Review**
IRB#: Pro00015756
Title: A Mixed Method Study Examining Synchronous Enhanced Learning in Distance Education

Study Approval Period: 1/14/2014 to 1/14/2015

Dear Ms. Wheeler:

On 1/14/2014, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):
Protocol Document(s):
SummaryProtocol_Ver.1_1.7.14

Consent/Assent Document(s)*:
InformedConsent_Interview_Ver.1_1.7.14.pdf

InformedConsent_Survey_Ver.1_1.7.14 (**Granted a Waiver of Documentation)

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It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

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

**Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John A Schinka, Ph.D.

John Schinka, Ph.D., Chairperson
USF Institutional Review Board

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

1/2/2015

Kimberly Wheeler, M.Ed.
USF Educational and Psychological Studies
4202 E. Fowler Avenue, EDU105
Tampa, FL 33620

RE: **Expedited Approval for Continuing Review**
IRB#: CR1_Pro00015756
Title: A Mixed Method Study Examining Synchronous Enhanced Learning in Distance Education

Study Approval Period: 1/14/2015 to 1/14/2016

Dear Ms. Wheeler:

On 1/2/2015, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):
Protocol Document(s):
SummaryProtocol_Ver.4_03.31.14_CleanCopy

The IRB determined that your study qualified for expedited review based on federal expedited category number(s):

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

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

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Sincerely,

John A Schinka, Ph.D.

John Schinka, Ph.D., Chairperson
USF Institutional Review Board

ABOUT THE AUTHOR

Kimberly M. Wheeler was born and raised in Tampa, Florida. She received her International Baccalaureate Diploma following high school and graduated with her Bachelor's in Business Administration from Emory University. After discovering her interest in integrating technology to enhance learning, she began her Master's in Education with a concentration in Instructional Technology at the University of South Florida and continued on this path to the doctoral program.

While in the Ph.D. program at the University of South Florida, Kim developed an interest in research and statistical analysis, and she completed a cognate in statistics. Her passion for teaching developed while participating in the doctoral program where she was fortunate to have the opportunity to serve as an instructor in the classroom and in the distance learning environment for five years at the University of South Florida. During her five years as an instructor at the university, she gained curriculum design and teaching experience while conducting research to evaluate best practices for technology integration in the classroom. This experience helped her to develop her dissertation topic. Kim looks forward to continuing her research, writing, and teaching at the university level in the future as a professor.