An exploration of graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment

by

Brandie Colleen Wempe

B.S., Colorado State University-Pueblo, 2003
M.S., Kansas State University, 2007

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Educational Leadership
College of Education

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Abstract

Although online course enrollments have increased over the past two decades (Berry, 2017), low retention rates persist (Muilenburg & Berge, 2005; Ng, 2019) due to students feeling isolated and a lack of social connection with their instructor and classmates (Baxter, 2012; Lowenthal, 2009; Pinsk et al., 2014). High dropout rates have been reported (Muilenburg & Berge, 2005; Ng, 2019; Shelton et al., 2017), with a lack of social presence being a barrier to students engaging in and completing online courses. In April 2020, approximately 43% of the world population was in lockdown due to COVID-19 (Marinoni et al., 2020). Lockdown and social distancing measures immediately affected higher education, which required instructors to switch from teaching face-to-face to an online hybrid style that incorporated synchronous videoconferencing into the course delivery (Skulmowski & Rey, 2020). The communication theories of social presence and media richness were applied to better understand the relationship between the communication medium (videoconferencing) and the interactions within the mediated environments (e.g., Zoom). Looking through the lens of social constructivism, this correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related. The Pearson correlation analysis indicated a strong, positive correlation between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness. A moderate, negative correlation was indicated between Social Space (Negative Group Behavior)

and Social Presence; Social Space (Negative Group Behavior) and Sociability; and Social Space (Negative Group Behavior) and Media Richness.

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Major Professor
Royce Ann Collins, Ph.D.

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Although online course enrollments have increased over the past two decades (Berry, 2017), low retention rates persist (Muilenburg & Berge, 2005; Ng, 2019) due to students feeling isolated and a lack of social connection with their instructor and classmates (Baxter, 2012; Lowenthal, 2009; Pinsk et al., 2014). High dropout rates have been reported (Muilenburg & Berge, 2005; Ng, 2019; Shelton et al., 2017), with a lack of social presence being a barrier to students engaging in and completing online courses. In April 2020, approximately 43% of the world population was in lockdown due to COVID-19 (Marinoni et al., 2020). Lockdown and social distancing measures immediately affected higher education, which required instructors to switch from teaching face-to-face to an online hybrid style that incorporated synchronous videoconferencing into the course delivery (Skulmowski & Rey, 2020). The communication theories of social presence and media richness were applied to better understand the relationship between the communication medium (videoconferencing) and the interactions within the mediated environments (e.g., Zoom). Looking through the lens of social constructivism, this correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related. The Pearson correlation analysis indicated a strong, positive correlation between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness. A moderate, negative correlation was indicated between Social Space (Negative Group Behavior)

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Chapter 1 - Introduction

For more than half the countries worldwide, the legal age of majority is 18 years old (UNICEF, 2016). The term 'age of majority' is used to describe adulthood and occurs when a person is recognized or declared an adult by law. Adult learners who often have full-time jobs and possibly dependents are frequently referred to as non-traditional students (Garrett et al., 2019; Yarbrough, 2018). Non-traditional students are a growing presence on college campuses and represent a significant percentage of the student population (Yarbrough, 2018). Universities are expanding their distance learning options in response to the increasing number of non-traditional student enrollments (Yarbrough, 2018). As a result, online courses continue to increase in popularity due to having the potential to accommodate students who would not otherwise be able to attend traditional face-to-face classes (Haynes, 2018). Although online course enrollments have increased over the past two decades (Berry, 2017), low retention rates persist (Muilenburg & Berge, 2005; Ng, 2019) due to students feeling isolated and a lack of social connection with their instructor and classmates (Baxter, 2012; Lowenthal, 2009; Pinsk et al., 2014). The population for this research consisted of adult graduate students enrolled in a midwestern university who had implemented synchronous videoconferencing in their studies. This research explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment. Synchronous videoconferencing technology is used to mediate interactions and convey meaning between participants (Bower, 2019). Potential benefits from this study may include gaining a better understanding of what students want from the technologies they use to communicate and learn online, which may be especially beneficial for educators and curriculum designers in designing and developing future online courses.

Distance Education

Distance education began as correspondence courses in the nineteenth century. During the twentieth century, distance education grew into educational television, which later evolved into learning on the Web by the 1990s (Perry & Pilati, 2011). In 2002, enrollment of postsecondary students in online courses had grown to over 1.6 million, with enrollments nearly tripling by 2008 (Picciano et al., 2010). The research conducted by Seaman et al. (2018) showed that with the increase in the number of students taking only distance courses, coupled with the decline in total overall enrollments in 2012-2016, the number of students physically on campus dropped by over a million.

Distance Education in Higher Learning

Over the past two decades, online course enrollments have grown (Berry, 2017). Distance education averaged a 2.7% compound annual growth rate for overall enrollments from 2002 to 2012 (Seaman et al., 2018). It was estimated that over 25% of all higher education students in 2008 took at least one online class. Online enrollment numbers were growing 17% annually, with 1.2% for higher education as a whole (Picciano et al., 2010). Approximately 4.6 million out of a total population of 18 million students were enrolled in at least one online learning course in U.S. colleges and universities in 2008 (Picciano et al., 2010). Although the total number of students enrolled in 2012-2015 in higher education dropped, graduate enrollments actually grew 1% over the three-year period (Allen & Seaman, 2017).

Data from 4,836 degree-granting institutions showed that over six million students took at least one distance course in the Fall 2015 semester, an increase of 3.9% from the previous year, with 29.7% comprising of higher education enrollments (Allen & Seaman, 2017). From Fall 2015 to Fall 2016 semesters, distance education enrollments grew by 5.6%, with 68.9% of

all U.S. higher education students attending a public institution. Students taking at least one distance education course comprised 31.6 % of all higher education enrollments (Seaman et al., 2018). According to Garrett et al. (2019), about one-third of all master's students study fully online. When comparing 2016 to 2012 enrollments, almost a million additional students were taking distance education courses; public institutions showed the highest growth rate from 2015 to 2016. However, with 47.2% of all distance education students taking all of their classes online, fewer students are coming to campus than there have been since 2012 (Seaman et al., 2018).

More than one-fifth of the schools reported having 50% of their courses online, with only 8% reporting blended courses (Garrett et al., 2019). Although most online students take both online and face-to-face classes, they found that most online courses are asynchronous, with a significant amount having some required or optional face-to-face sessions. When asked which teaching and learning techniques actively play a role in their online or blended courses and programs, 11% indicated that the use of live video was *required or very common*, 42% responded with *optional but common*, and 47% with *rare or not used*. They also found that institutions pursuing a team-based approach to online course design were more likely to report using instructional tools that incorporated live audio and video as *required or very common* or *optional but common*, compared to when faculty develop courses independently (Garrett et al., 2019). In 2020, the survey conducted by Garrett et al. (2020a) sought to distinguish between fully online and blended courses. It received 367 institutional responses from chief online officers representing enterprise institutions, flagship, regional public institutions, regional private institutions, low-enrollment institutions, and community colleges. Garrett et al. (2020a)

confirmed from the findings of the earlier reports that fully online courses and programs dominate over blended ones at all institutions except community colleges.

Need for Social Connection in Online Learning

Technological breakthroughs that use a mix of interaction or particular tools is still no guarantee of a quality online course that supports social interaction and learning (Garrett et al., 2019). Learning is described as a social process in which social interaction is necessary for learning to occur (Bandura, 1979; Vygotsky, 1978). Engagement through classroom discussions needs to occur for learning and social interaction to happen in the learning environment. Instructional design expertise can help make online courses more effective with the consistent use of online tools or student-to-student interaction (Garrett et al., 2019). A higher proportion of chief online officers who require instructional design use in online course development judged their fully online students as performing "comparably to or better than on-ground students" than those who do not require instructional design support (Garrett et al., 2019, p.22).

With the use of technology, learning can occur in a hybrid/blended learning environment as well as an online-only learning environment (Perry & Pilati, 2011; Skulmowski & Rey, 2020). Increasing the use of technology in the classroom has influenced learning to occur both in and out of the traditional classroom setting (Jones, 2011). Videoconferencing in the online learning environment provides the visual of non-verbal facial and physical cues that are present in face-to-face courses but lacking in text-based only discussion posts. It allows students to experience each other as actual *real* humans instead of text on a screen, therefore increasing social presence. Social presence is not about experiencing the environment; instead, it is the perception of another in the environment (Felnhofer et al., 2014). The synchronous videoconferencing environment provides immediate social interaction, which helps create feelings of group affiliation by

increasing participation and engagement. When feelings of group affiliation and cohesion occur, collaboration and learning communities are formed (Pinsk et al., 2014). If cohesion and collaboration fail to occur, it can create a barrier to student learning.

Barriers to Online Learning

Eight factors that comprise student barriers to online learning are administrative issues, social interaction, academic skills, technical skills, learner motivation, time and support for studies, cost and access to the internet, and technical problems (Muilenburg & Berge, 2005). A lack of social interaction was found to be the single most important barrier to students' learning (Muilenburg & Berge, 2005). Ali et al. (2018) conducted an in-depth qualitative review of e-learning literature dating from 1990 to 2016, which led to the identification of 68 unique barriers to implementing e-learning. The 68 unique barriers relating to e-learning were further grouped into four conceptual categories identified as technology (barriers concerned with technical support, bandwidth, connectivity, software, interface design, poor quality of computers, virus attacks), individual (barriers dealing with computer anxiety, social loafing, individual culture, computer literacy), pedagogy (barriers related to the teaching methodology, faculty, supporting staff, and course content), and enabling conditions (barriers due to administrative support, limited funds, security, rules, regulation, language barriers, electricity, and ethical issues). Student motivation, sense of isolation due to less face-to-face interaction, and social support were also identified as individual barriers relating to e-learning (Ali et al., 2018). In Picciano et al.'s (2010) study, faculty opinions of online courses resulted in 70% of the respondents having viewed online learning as inferior, or somewhat inferior, to face-to-face learning. Additionally, Picciano et al.'s (2010) study also showed a lack of acceptance by faculty (61%), low retention rates (58%), and cost (58%) expressed as other major issues (Picciano et al., 2010).

In many online classes, discussion occurs either asynchronously or synchronously through the use of discussion boards (Collins & Zacharakis, 2009; Covelli, 2017) and video. Discussion boards are often used as a primary form of communication between students and instructors in the online classroom (Carr-Chellman & Duchastel, 2001). Asynchronous learning gives students enough time to reflect and provide more in-depth and clear responses and contributions to class activities (Guo et al., 2010). However, although communications using text-based discussion boards allow for reflective thinking, it can also lead to feelings of isolation, no social connection, and miscommunication (Baxter, 2012; Borup et al., 2013; McInnerney & Roberts, 2004). Baxter (2012) states that "feelings of exclusion precipitated by lack of ability to successfully form online friendships may be equally, if not more, powerful reasons than academic issues in terms of why distance learning students fail to progress" (p. 122).

Student retention and participatory issues were examined by Charbonneau-Gowdy (2018) from a sociocultural perspective, which placed importance on the contexts of the learning that existed within the learning spaces. Charbonneau-Gowdy (2018) states, "Our work in e-Learning over the last seventeen years has laid the basis for our epistemological beliefs that learning is a situated practice that hinges necessarily on the presence of engaged social interaction and where context is all important" (p. 58). The research findings demonstrated mixed results, which showed evidence of self-directedness of those who had dynamic experiences in the Zoom classes; lackluster engagement and investment of many learners towards social interactive learning and communication; resistance and reluctance of learners to engage with others in the face-to-face online classroom; a lack of institutional infrastructure and support; and instructors who were unable to encourage social learning practices in the face-to-face Zoom classes (Charbonneau-Gowdy, 2018). The Charbonneau-Gowdy (2018) findings suggested that

technology is not effective in the online learning environment without instructors who are knowledgeable in ways of using it to facilitate meaningful social interactions, that "throwing technology at a problem will not fix it" (Charbonneau-Gowdy, 2018, p. 65).

Online Learning Communities

The use of web-based community-oriented applications supports interaction and access to knowledge networks that allow peer-to-peer, peer-to-near-peer, and novice-to-expert connections within reach (Polin, 2008). An online learning community can meet, communicate, share common interests and goals, and support each other in their learning. In addition, it offers a place for academic discourse and enhances information skills by allowing students to gain a deeper understanding of the subject matter (Domínguez-Flores & Wang, 2011). As a result, online learning communities have become an essential element in higher education (Yeh, 2010).

Community of Practice

With the increase of social networking tools available, professional online education shifted towards a community of practice model (Polin, 2008). A community of practice is a socio-cultural concept that describes a group of individuals who help each other achieve a common goal of pursuing a shared interest through collaboration and participation within a community setting based on shared norms and practices (Ng, 2019). Communities of practice are formed by people who share a concern or a passion for something they do (Lave, 1991). They engage in collective learning, and through regular interaction, they learn how to do it better (Wenger, 2009). A community of practice promotes engagement in online communities where motivation is supported by the participation and collaboration of distance learners (Ng, 2019).

Community of Inquiry

The Community of Inquiry (COI) model was introduced by Garrison et al. (2000) as a "conceptual framework that identifies the elements that are crucial prerequisites for a successful higher educational experience" (p. 87). Garrison et al. (2000, 2010) identify the three interconnected essential elements in an educational experience: cognitive presence, social presence, and teaching presence. The COI consists of individuals who collaboratively seek to engage in critical discourse and reflections to construct meaning and mutual understanding (CoI, n.d.; Rourke et al., 1999). Garrison and Cleveland-Innes (2005) state that a community of inquiry must also include interaction among content, teachers, and students and that "higher-order learning emerges in a community of inquiry" (p. 137). Within a community of inquiry, the integration of cognitive presence, social presence, and teaching presence is central to a successful online educational experience (Garrison et al., 2000).

Numerous studies have utilized the COI model within various content areas, different learning technologies, and the types of presence (Akyol et al., 2009; Garrison et al., 2000; Rourke et al., 1999; Whiteside, 2015). Szeto (2015) incorporated the COI as three instructional components to contextualize blended synchronous learning and teaching experiences. Morueta et al. (2016) used the COI framework to explore social and cognitive relationships among students while solving complex cognitive tasks in online discussion forums. Armellini and De Stefani (2016) aimed to establish the role of cognitive, social, and teaching presences in the professional development of 40 English language teachers in continuous professional development programs delivered in blended learning settings. Covelli (2017) conducted research that indicated the use of audio and video supports creating a community within online learning, but few directly test the use of video (with audio) using the community of inquiry framework. "The next step in

digital learning research is developing insights into how strategies are employed to further enhance the online environment and the adult students' connection to learning and to others" (Covelli, 2017, p. 144). Whiteside (2015) suggested although discoveries have been made about "social presence in relation to learning environments, emerging technologies, innovative pedagogies and instructional strategies…we still struggle to understand the potential of social presence in programs, especially blended learning programs" (p. 3).

Social Presence, Social Space and Sociability

Numerous scholars have studied the impact social interaction has on cognitive development and have noted that cognitive processes develop through social interaction and that learning is mediated by the social interaction of peers and others who are more knowledgeable (Bandura, 1979; Vygotsky, 1978). Computer-mediated or technology-mediated learning is the technological means by which information is conveyed, and people are linked together (Bower, 2019). Kreijns et al. (2013) suggest that "simply enabling social interaction, therefore is not enough; it must be stimulated" (p. 230). Kreijns et al. (2013) also postulate that sociability, social space, and social presence influence the social interaction that is needed for both learning and the emergence of a social space. Therefore, suggesting that sociability facilitates socioemotional interaction and the emergence of a social space (Kreijns et al., 2013).

Social space is often used as a generic metaphor to describe the "broad background to the social phenomenon being studied" (Hardy, 2012, p. 229), as a "symbolic space, a space of lifestyles and status groups characterized by different lifestyles" (Bourdieu, 1989, p. 20). Bourdieu described social space as being "a multi-dimensional space, an open set of fields that are relatively autonomous" (Bourdieu, 1985, p. 736) that presents "itself in the form of agents endowed with different properties that are systematically linked among themselves" (Bourdieu,

1989, p. 19). Within the online learning environment, a social space is created through social relationships and group cohesion (Kreijns & Kirschner, 2001). Weidlich and Bastiaens (2017) suggest that "creating a sociable learning environment is a viable approach to fostering socioemotional aspects that ultimately benefit the quality of the learning experience" (p. 479).

Social presence is another variable that affects the degree to which a social space will emerge (Kreijns et al., 2013). It is defined as "the degree of psychological sensation in which the illusion exists that the other in the communication appears to be a 'real' person" (Kreijns et al., 2013, p. 236). Social presence originated from computer-mediated communication (CMC), which grew out of the telecommunication era of the late 1960s and 1970s. The use of CMC allows students to repeat classes they missed and provides an alternative to face-to-face classes for students with a disability or illness (Guo et al., 2010). At that time, organizations began investing more time, money, and infrastructure into teleconferencing communications (Whiteside, 2015). Computer-mediated communication researchers viewed social presence as missing from the communicative presence. Unlike spatial presence researchers who explored the sense of being in the virtual place, social presence researchers explored the sense of being with another through a communication medium (Biocca et al., 2003; Felnhofer et al., 2014). As the focus shifted from interactive television to online learning, research on how social presence affects teaching and learning has continued (Whiteside, 2015). Kreijns et al. (2013) view the degree of social presence as being influenced both by sociability and the techniques used by teachers to allow the students to get to know each other and form impressions of one another.

A theoretical framework introduced by Kreijns et al. (2013) serves as a framework for systematic social computer-supported collaborative learning (CSCL) social interaction research. The framework consists of three core elements: sociability, social space, and social presence.

Kreijns et al. (2013) suggest that the three core elements influence the social interaction needed for both learning and the emergence of social space. “Sociability, social space, and social presence constitute the theoretical framework for research on social interaction in CSCL environments” (Kreijns et al., 2013, p. 231). Their proposed model emphasized the social aspects of online collaborative learning (Kreijns & Kirschner, 2018). Three instruments were constructed and validated by Kreijns et al. (2004b, 2007, 2011) to determine sociability, social space, and social presence in collaborative online groups.

Media Richness Theory

Media richness theory is a computer media communication theory that examines the methods in which certain mediums are selected for communication (Oregon et al., 2018). The media richness theory developed by Daft et al. (1987) proposes that the communication efficiency between people is affected by choice of media and the characteristics of the communication task. It was one of the first theories to describe how and why people chose a particular medium to communicate with others in the workplace (Ferry et al., 2001). The theory was developed to help determine when face-to-face or other communication media are appropriate for task completion. Communication media can differ in their ability to facilitate understanding and can be characterized as high or low in ‘richness’ (Daft et al., 1987, p. 358). The richness of a medium is based on its capacity to facilitate shared meaning and is determined upon a blend of the following four criteria: immediate feedback, multiple cues, language variety, and personal focus (Daft et al., 1987).

Media richness theory suggests that communication aims to reduce uncertainty and equivocality (ambiguity) to communicate effectively (Daft et al., 1987; Sun & Cheng, 2007). A case study was conducted by Oregon et al. (2018) to determine the impact of media richness

theory and social presence theory in course design and instruction on attrition in an online graduate program. They found a distinct correlation between using rich media technologies and enhancing social presence. Their study concluded a positive relationship between academic satisfaction and a student's intention to continue their degree. Campbell (2006) explored the impact of communication apprehension and participation on user perceptions of task and media characteristics in a videoconferencing context. The findings indicated that the media richness and social presence aspects of media choice theory are important considerations for videoconferencing users (Campbell, 2006). Therefore, both communication theories of social presence and media richness were applied to this research to better understand the relationship between the communication medium (videoconferencing) and the interactions within the mediated environments (e.g., Zoom).

Problem Statement

Online courses continue to increase in popularity due to having the potential to accommodate students who would not otherwise be able to attend traditional face-to-face classes (Haynes, 2018). However, although online course enrollments have increased over the past two decades (Berry, 2017), low retention rates persist (Muilenburg & Berge, 2005; Ng, 2019). High dropout rates have been reported (Muilenburg & Berge, 2005; Ng, 2019; Shelton et al., 2017), with a lack of social presence being a barrier to students engaging in and completing online courses. Students participating in online learning often feel isolated and lack a social connection with their instructor and classmates (Baxter, 2012; Pinsk et al., 2014). Most of the research on student motivation in distance learning after 2000 has aligned predominately with the socio-cognitive perspective, with fewer studies examining the learners' motivation from a sociocultural perspective (Ng, 2019). Feelings of isolation, lack of social connection, and high dropout rates

indicate that the learners' learning needs are not being sufficiently addressed in the online learning environment (Baxter, 2012; Borup et al., 2013; McInnerney & Roberts, 2004; Shelton et al., 2017).

Social presence in online courses is often described as one of the critical factors in student satisfaction and success (Gunawardena & Zittle, 1997; Ladyshewsky, 2013; Pinsk et al., 2014; Shelton et al., 2017). While social presence is easier to achieve through social interaction in traditional face-to-face classrooms, it is often very difficult to manifest in the online learning environment (Anderson et al., 2001; Pinsk et al., 2014), which presents a barrier to students engaging in and completing online courses. Studies have been conducted on the use of asynchronous and synchronous discussion posts, which included audio and video clips (Covelli, 2017; Garrett et al., 2019), but little is known of students' perceptions of social presence, social space, sociability, and media richness in a synchronous videoconferencing learning environment.

Purpose Statement

The purpose of this survey research was to test the theories of social presence and media richness as it related to students in the online videoconferencing learning environment. This correlational cross-sectional survey study explored students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related.

Research Question

The research question for this study was designed to explore students' perceptions on the social presence, social space, sociability, and media richness scales by investigating how strongly and in what direction they were related in a synchronous videoconferencing online

learning environment. The research question and six null hypotheses underlying this research were:

RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

$H_0$1: Social presence is not related to social space in a synchronous videoconferencing learning environment.

$H_0$2: Social presence is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$3: Social presence is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$4: Social space is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$5: Social space is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$6: Sociability is not related to media richness in a synchronous videoconferencing learning environment.

Rationale for a Correlational Research Design

Quantitative research looks for the emergence of meaning from the repetition of phenomena, and qualitative research looks for the emergence of meaning in a single instance (Gliner et al., 2016; Stake, 1995). Quantitative research designs are often used to look at causal relationships and can also be used to look at associations or relationships between variables (Gliner et al., 2016). In quantitative research, the researcher forms a hypothesis, collects data in the investigation of the problem, uses the data from the investigation after analysis to prove the

hypotheses as not false or false (Salkind, 2010). A survey approach is a common form of quantitative, correlational research. Correlational research is non-experimental research that is conducted when the variables of interest cannot be controlled through the means of manipulation, inclusion, exclusion, or group assignment (Edmonds & Kennedy, 2017; Gliner et al., 2016). Correlational research is supported by relational theories that attempt to test relationships by explaining how phenomena are related to one another. Correlational research designs describe and measure the degree or association between two or more variables or sets of scores (Creswell & Creswell, 2017). The correlational research design was chosen for this study to describe and measure the degree of association among social presence, social space, sociability, and media richness. The rationale for using a correlational cross-sectional study design was because it enabled the researcher to conduct the measures and test relationships within a short amount of time without altering or controlling the environment.

This research used a correlational cross-sectional study design to explore students' perceived social experiences with the use of videoconferencing in the online learning environment by applying social presence theory and media richness theory to investigate the relationship between social presence, social space, sociability, and media richness. A cross-sectional survey was used to capture quantitative data. Students who were currently using synchronous video conferencing as a part of their learning experience received an email with the link to access the survey. Surveys are a popular method for gathering large amounts of data in a short period of time (Byrne, 2017b; Fowler, 2009). The quantitative data was gathered from survey responses from participants that were administered via Qualtrics, an online survey tool. Online surveys are an inexpensive and convenient way to collect information (Byrne, 2017b; Fowler, 2009). Qualtrics is an inexpensive and convenient online survey tool that allows a

respondent to complete survey responses by clicking on an online form with data directly collected by the tool (Byrne, 2017b). Online surveys are useful for populations with email accounts and web access (Byrne, 2017b; Fowler, 2009). This study selected an online survey since the sample population had web access and email accounts.

Population

The population for this research consisted of adult graduate students enrolled in a midwestern university using synchronous videoconferencing. Participant recruitment for this study targeted students who were currently enrolled in a course using synchronous videoconferencing (e.g., Zoom) as part of their online learning experience. Students taking at least one distance education course comprise 31.6 % of all higher education enrollments (Seaman et al., 2018), with about one-third of all master's students studying exclusively online (Garrett et al., 2019). However, in April 2020, approximately 43% of the world population was in lockdown due to COVID-19 (Marinoni et al., 2020). Lockdown and social distancing measures immediately affected higher education. Survey results from 424 universities and other higher education institutions from 109 countries found that two-thirds of the institutions reported that classroom teaching had been replaced by distance teaching and learning due to COVID-19 (Marinoni et al., 2020). With COVID-19, many instructors chose to teach with a hybrid style that incorporated synchronous videoconferencing into their course delivery (Skulmowski & Rey, 2020).

Data Collection

This research employed a survey design to make inferences about the relationship between media richness, social presence, social space, and sociability. A cross-sectional survey was used to collect demographic data and questions related to perceived media richness, social

presence, social space, and sociability. The cross-sectional survey was used as the primary data collection source for this study. Cross-sectional surveys are used to collect data to make inferences about a population of interest at a single point in time (Creswell & Creswell, 2017; Hall, 2008). Cross-sectional surveys give 'snapshots' of populations that may be repeated periodically and can be conducted using telephone interviews, face-to-face interviews, mailed questionnaires, web data collection, or a mixture of different modes (Fowler, 2009). This research utilized a web data collection approach by administering the survey via Qualtrics, a web-based survey tool to collect the survey responses. A link to the survey was provided to the participants via email. The link to the Qualtrics online survey allowed respondents to complete their responses by clicking on an online form where the data was directly collected by the survey tool. The data was then directly processed into data storage for the researcher to retrieve. The survey consisted of a Likert-type scale consisting of multiple questions, phrases, statements, and demographic questions. The participants were asked to answer demographic questions and then select answers that best indicated the extent to which the phrase or statement was descriptive of their feelings of using Zoom (videoconferencing) in the online learning environment.

Data Analysis

The quantitative data gathered from the survey responses were examined for completeness, consistency, and duplication. The data was then organized into files and analyzed using SPSS data analysis software and Intellectus Statistics online computer software to run descriptive and parametric statistics (Intellectus Statistics, 2021). Descriptive statistics were used to summarize the demographic data of the participants (age, ethnicity, gender, student status). Factor analyses were previously conducted on the instruments to assess the construct validity of the survey instruments. Factor analysis is used for theory and instrument development, assessing

the construct validity of an established instrument, and identifying underlying factors behind a set of data (Pett et al., 2003). Cronbach's alpha, developed by Lee Cronbach in 1951, is a test used to measure the reliability or internal consistency of a composite score (Creswell & Creswell, 2017; Cronbach, 1951). Cronbach's alpha tests to see if multiple question Likert-type scale surveys are reliable and are often used in conjunction with a data reduction technique or factor analysis (Creswell & Creswell, 2017; Cronbach, 1951). Cronbach's alpha coefficient was used to estimate and determine the reliability of the scales used in this research. Media Richness (Multiple Channels) was 0.83; Media Richness (Immediacy Feedback) 0.76; Social Presence (Awareness) 0.85; Social Presence (Proximity) 0.95; Social Space (Positive Group Behavior) 0.91; Social Space (Negative Group Behavior) 0.81; and Sociability 0.94. Using the guidelines suggested by George and Mallery (2018) where > .9 excellent, > .8 good, > .7 acceptable, > .6 questionable, > .5 poor, and ≤ .5 unacceptable, each of the scales' Cronbach's alpha values were within optimal ranges with values ranging between acceptable and excellent (Creswell & Creswell, 2017).

The parametric test used in this study to measure linear correlation was the Pearson correlation coefficient. Parametric tests assume normal distribution and measurement at interval or ratio level. Correlation is a bivariate analysis that measures the strength of association between two variables and the direction of the relationship. The correlation coefficient (r) measures the extent to which two variables tend to change together by describing both the strength and the direction of the relationship (Chen & Popovich, 2002). A correlation coefficient ranges from -1 to 1; it describes the strength of the relationship between the variables. The Pearson correlation coefficient analysis was used in this study to identify linear relationships between two variables (Conover & Iman, 1981). It is a measure of the strength and direction of

the linear association between two variables with no assumption of causality (Allen, 2017; Chen & Popovich, 2002).

A test for statistical significance examines whether the null hypothesis is confirmed or rejected (Byrne, 2017a; Salkind, 2010). The two-tailed test is used in null-hypothesis testing and testing for statistical significance (Salkind, 2007). A two-tailed test is a method in which the critical area of a distribution is two-sided and tests whether a sample is greater or less than a range of values (Salkind, 2007). The scores obtained from the significance testing were converted to a *p*-value using a probability table. The *p*-value is the probability of obtaining the observed results if the null hypothesis is true. A result is usually considered statistically significant if the *p*-value is $\leq .05$ (Byrne, 2017a; Salkind, 2010). To test the assumption of normality, Skewness and Kurtosis were applied to Media Richness, Social Presence, Social Space, and Sociability. Kurtosis, skewness, and their standard errors are common univariate descriptive statistics that measure the shape of the distribution (DeCarlo, 1997; Lewis-Beck et al., 2004; Westfall & Henning, 2013). Skewness measures the symmetry of the distribution and the relative size of the two tails. Kurtosis measures peakedness and the tail behavior of a distribution (DeCarlo, 1997; Lewis-Beck et al., 2004; Westfall & Henning, 2013). If the left tail is more pronounced (longer), the curve is considered to be negatively skewed (Allen, 2017). If the right tail is more pronounced, the curve is considered to be positively skewed (Allen, 2017). A curve that has a symmetric shape is considered to have zero skewness. Scatterplots were then used to graphically display the linear relationship between the two variables. Scatterplots use horizontal and vertical axes to plot data points to show how much one variable is affected by another (Vogt, 2005).

Significance of the Research

Researchers have acknowledged the importance of social interaction in the learning environment and have identified it as a vital element in the learning process (Bandura, 1979; Vygotsky, 1978). Social interaction is needed for group cohesion and collaboration to occur (Kreijns & Kirschner, 2001; Weidlich & Bastiaens, 2017). When cohesion and collaboration fail to occur, barriers to student learning, increased feelings of isolation (Baxter, 2012; Borup et al., 2013; McInnerney & Roberts, 2004), and class dropout can result (Shelton et al., 2017). Numerous studies have researched barriers to students learning (Ali et al., 2018; Muilenburg & Berge, 2005), student motivation (Muilenburg & Berge, 2005; Ng, 2019), social interaction, social presence (Gunawardena & Zittle, 1997; Kreijns et al., 2013; Ladyshewsky, 2013), and media richness (Campbell, 2006; Daft et al., 1987; Oregon et al., 2018). However, much of the research focused on asynchronous communication platforms. The findings of this research may benefit educators and curriculum designers with conceptual and practical teaching strategies that will help make online students' experiences as comparable and rich to that of their traditional on-campus face-to-face student counterparts. The findings from this research may also contribute to a better understanding of what students want from the technologies they use for communicating and learning, which will help contribute to the future design and development of online courses.

Researcher Background

As the Assistant Director for the Curriculum Development and Evaluation within the Federal Emergency Management Agency (FEMA) at the Center for Domestic Preparedness, my main passion in educating adults has focused on developing effective distributed learning techniques. The research topic for this study was chosen based on the interest in creating an online learning environment that motivates students to collaborate and learn. The interest in this

research topic is especially significant for curriculum designers and educators like myself, as the findings from this study may have potential practical implications for the design and development of future online courses.

Limitations

This research has several limitations:

1) External technical problems can often occur from using internet services to obtain data collection.
2) The emailed survey announcement may have been interpreted as junk mail and deleted or was potentially automatically diverted to 'junk' or 'spam' folders by email screening programs.
3) Normal assumptions for calculation sampling errors do not apply to nonprobability convenience samples (Fowler, 2009).
4) A disadvantage of convenience sampling is that the sample lacks clear generalizability to the population as a whole.
5) Since this cross-sectional survey study was a one-time measurement of exposure and outcome, it could be difficult to derive causal relationships from the cross-sectional analysis.
6) Since participation was voluntary, and the participants were not randomly selected, this study relied on self-administered questions with self-reported measures, which may have been subjective.
7) The questionnaire relied on self-reports of perceived effectiveness. It can be difficult to assess how accurately respondents reported their perceptions of media richness, social presence, social space, and sociability and whether their perceptions reflected

the actual use of the videoconferencing medium in conveying communication messages.

8) Limitations to using a Likert-type scale include: the data will not allow for rich descriptive details that can be found in qualitative data (Creswell & Creswell, 2017), and the assumption is made that the answers are accurate measures of the characteristics of the respondents (Fowler, 2009).
9) It is not clear if the survey results would be the same for students in other disciplines. The participants in this study may be more comfortable with using videoconferencing technology and speaking publicly than other degree-seeking students.
10) A Pearson correlation coefficient can be affected by the degree of linearity and small sample sizes.
11) Since the majority of the participants in this study were White, the results cannot be generalized to other ethnicities.
12) Although the survey's Likert-type matrix questions met 508 and other standards of compliance, they may not have been accessible to screen-reading programs.
13) Participants with sensory impairments did not have an option for opting out of Question 10, "Seeing the faces and hearing the voices of others in class is."

Definitions

Media richness: A communication medium's capacity to facilitate the processing of rich information (Daft et al., 1987).

Sociability: The perceived quality of the learning environment to facilitate social interaction (Kreijns et al., 2007; Weidlich & Bastiaens, 2019).

Social interaction: The process in which task-oriented or socio-emotional-oriented messages are exchanged between members of the group (Kreijns et al., 2013).

Social presence: The psychological phenomenon that the other is perceived 'real' in the communication (Kreijns et al., 2020; Weidlich et al., 2018).

Social space: The perceived network of interpersonal relationships among group members (Kreijns et al., 2004a, 2004b; Weidlich & Bastiaens, 2019).

Synchronous videoconferencing: A communication medium that allows users to share audio and visual facilities in real-time (Al-Samarraie et al., 2019).

Chapter Summary

As discussed within this chapter, universities continue to expand their distance learning options in response to the increasing number of non-traditional student enrollments (Yarbrough, 2018). In April 2020, approximately 43% of the world population was in lockdown due to COVID-19 (Marinoni et al., 2020). Lockdown and social distancing measures immediately impacted higher education, which required instructors to switch from teaching face-to-face to an online hybrid style that incorporated synchronous videoconferencing into the course delivery (Skulmowski & Rey, 2020). Online courses continue to increase in popularity due to having the potential to accommodate students who would not otherwise be able to attend traditional face-to-face classes (Haynes, 2018). However, feelings of isolation, lack of social connection, and high dropout rates indicate that the learners' online learning needs are not being sufficiently addressed (McInnerney & Roberts, 2004; Ng, 2019; Shelton et al., 2017). This correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related. The findings from this

research may help to inform educators and curriculum designers better understand what students want from the technologies they use for communicating and learning.

Chapter 2 - Literature Review

For over the past two decades, the use of online technology to deliver classroom instruction has continued to increase (Allen & Seaman, 2017; Berry, 2017; Weidlich & Bastiaens, 2017). While face-to-face learning naturally creates a social environment with rich social interaction opportunities, the online learning environment relies on technology to mediate social interaction opportunities (Kreijns et al., 2004a, 2004b; Weidlich & Bastiaens, 2017). Educators recognize that social interaction is a vital element in interactive learning processes (Bandura, 1979; Kreijns & Kirschner, 2001; Vygotsky, 1978). As a result, researchers have turned to studying social presence theory to better understand different learning climates, experiences, and interpersonal connections among online learners (Kreijns et al., 2004b; Weidlich & Bastiaens, 2017). This chapter will provide an overview of the literature, social constructivism, online learning, social software, social space, social presence theory, social presence research, and media richness theory. It will conclude with a description of the conceptual framework and a chapter summary.

Background

Due to new technologies and media, online educational environments and practices are continuously changing (Cocquyt et al., 2017). According to Siemens (2005), "Over the last twenty years, technology has reorganized how we live, how we communicate, and how we learn" (p. 1). As a result, new educational environments and learning formats can often affect the learning and education of adults. When introducing new and emerging technologies into the learning environment, the helpfulness of different media for satisfying students' communication needs may also change (Guo et al., 2010). To satisfy the students' communication needs, heutagogy's approach to learning could be applied to emerging technologies in distance

education, where the internet can provide the resources for a self-directed experience (Blaschke, 2012; Halsall et al., 2016). Heutagogy is a form of self-determined learning with practices and principles rooted in andragogy. From a continuum perspective – of pedagogy, andragogy, to heutagogy – heutagogy can be viewed as a continuum of andragogical adult learning theory with learners progressing in maturity and autonomy (Blaschke, 2012; Hase & Kenyon, 2015; Kenyon & Hase, 2001). Pedagogy is the art and science of teaching, and Knowles (1973) focused andragogy on the education of adults (Knowles, 1973). Pedagogy is described as being objective-based learning, and andragogy as competency-based learning. Heutagogy is capability-based learning (Halupa, 2015) and is often referred to as a "net-centric" theory (Blaschke, 2012, p. 57).

Heutagogy is influenced by humanistic and constructivist concepts, with the learner being central to the learning process as a humanistic concept, and that by placing the learner at the heart of the educational experience is a constructivist concept (Halsall et al., 2016; Hase & Kenyon, 2015). Therefore, the "essence of heutagogy is that in some learning situations, the focus should be on what and how the learner wants to learn, not on what is to be taught" (Hase & Kenyon, 2015, p. 7). A heutagogical approach to learning facilitates the development of capable learners and emphasizes both the development of learner competencies and the development of the learner's capability and capacity to learn (Bhoyrub et al., 2010; Blaschke, 2012; Kenyon & Hase, 2001). Since the learner chooses what is to be learned, learning is no longer seen as a requirement and therefore becomes a pleasurable and rewarding experience (Hase & Kenyon, 2015). Motivation, emotion, and desire play an integral part in learning, which can make the heutagogical approach to learning so successful. Hase and Kenyon (2015) state that "motivation

to learn is enhanced by: greater involvement in and control by the learner in the learning process; self-initiated learning; the opportunity to develop and share patterns; and relevance" (p 26).

Self-directed and self-determined approaches to learning are needed for successful online learning. Brookfield (2013) describes self-directed learning as the process in which the learner decides what and how to learn. Self-determination is a theory based on human motivation and personality that is concerned with people's inherent growth tendencies and innate psychological needs (Deci et al., 1991). Self-directed learning is identified as one of the key attributes of a successful online learner (Abd-El-Fattah, 2010; Garrison, 1997). Within the concept of self-directed learning, the learner decides what is worthwhile to learn and how they will approach the learning task. Self-directed learning is viewed from a collaborative constructivist perspective, which means it does not occur in isolation (Brookfield, 2013; Garrison, 1997). Although self-directed learning has the learner taking individual responsibility for constructing meaning, it also occurs while including the participation of others in confirming worthwhile knowledge (Garrison, 1997).

Self-determination theory supports the premise that psychological need satisfaction can be replicated in the virtual context (Deci et al., 1991). The three types of psychological need satisfaction include autonomy (self-determination), competence, and relatedness (Deci & Ryan, 2008; Ryan & Deci, 2017; Ryan et al., 2006). Self-determination theory suggests that autonomy, competence, and relatedness are cross-culturally universal psychological needs, and when the social context nurtures the psychological needs, it will promote students' positive functioning (Jang et al., 2009). Therefore, if one's social context is supportive of meaningful relationships, one will experience a heightened sense of psychological need satisfaction that can be fostered through social interactions and relationships. Ang et al. (2015) conducted a study based on the

theories of uses and gratifications and self-determination by examining a model linking computer-mediated communication attributes to the psychological need satisfaction in online friendships and life satisfaction. The participants consisted of 1,572 school-aged adolescents. Their findings suggested direct links between media orientations (attitude toward online relationship formation and internet habit strength) and psychological need satisfaction in online friendships.

New technologies and communication mediums have also created a need for new pedagogical approaches in the online learning environment. Research suggests that students experience a heightened sense of psychological need satisfaction that can be fostered through social interactions and relationships (Deci & Ryan, 2008; Jang et al., 2009; Ryan & Deci, 2017; Ryan et al., 2006), and when introducing new and emerging technologies into the learning environment, the helpfulness of different media for satisfying student's communication needs may also change (Guo et al., 2010). Not only is online interaction necessary to bolster high-quality learning, but it is also necessary to support social participation, social connectedness, and psychological need satisfaction of the students (Cocquyt et al., 2017). Online learners need an interactive, collaborative learning environment, which is the subject of constructivist learning theories.

Social Constructivism

Although the perspectives of constructivism and constructionism share several features and are often used interchangeably, they have differing epistemologies and ontologies (Young & Collin, 2004). Constructivism focuses on meaning-making and the constructing of the social and psychological worlds through individual cognitive processes. It proposes that each individual mentally constructs their understanding of the world through cognitive processes. Constructivism

considers learning as a constructive process where the learner is building an internal illustration of knowledge and a personal interpretation of experience (Amineh & Asl, 2015). The epistemological perspective of constructivism is concerned with how learners create their knowledge constructs and develop meaning (Young & Collin, 2004). Constructionism emphasizes that the social and psychological worlds are constructed through social processes and interaction (Galbin, 2014; Young & Collin, 2004). Social constructivism is a form of cognitive constructivism that emphasizes the collaborative nature of learning (Adams, 2006). Social constructivism suggests that influences on individual construction are derived from social relationships (Young & Collin, 2004). It emphasizes the role of others in the individual construction of knowledge (Adams, 2006; Young & Collin, 2004). Social constructionism also has a social focus and contends that knowledge is sustained by social processes and is dependent on how groups of people collectively elaborate their ideas (Raskin, 2002). Unlike social constructivism, it is not concerned with the cognitive processes that accompany knowledge. Instead, it is concerned with the ways knowledge is historically situated and embedded in cultural values and practices. Therefore, it is always fluid and dynamic (Galbin, 2014; Raskin, 2002; Young & Collin, 2004). Applying the lens of social constructivism, this research explored students' perceived social experiences with the use of videoconferencing in the online learning environment.

Teaching approaches in constructivism are learner-centered approaches that shift the focus from the teacher to the learner, which incorporate multiple perspectives in collaborative learning activities to develop shared ideas (Bonk & Khoo, 2014). Social constructivism is a cognitive learning theory that focuses on both the learner and the environment. Social constructivism shifted from the individual making meaning (a cognitivist approach) to the

interaction between the learner and the environment collectively making meaning. It posits that learner construction of knowledge is the product of social interaction, interpretation, and understanding (Adams, 2006; Amineh & Asl, 2015). Cognitivists seek to understand how students create knowledge constructs and what influences their thought processes (Adams, 2006). A cognitivist approach to learning perceives learners as active seekers of information who can assert greater control over their own learning (Bonk & Khoo, 2014).

The design of a social constructivist learning environment can include the following principles: instruction should focus on learning, not performance; learners are active co-constructors of meaning and knowledge; teachers as learning guides, not instructors; learners should be engaged in tasks seen as ends in themselves and consequently as having implicit worth; promote assessment as an active process of uncovering and acknowledging shared understanding (Adams, 2006). Social constructivism emphasizes the role of others in the individual construction of knowledge, which means students are actively involved, and interaction becomes crucial in social constructivist classrooms (Adams, 2006; Amineh & Asl, 2015).

Using a social constructivist approach in the online learning environment means acknowledging the role of social and contextual processes in how adults learn and is demonstrated through popular learning approaches and instructional ideas such as situated cognition, problem-based learning, communities of practice, and various ecological perspectives on learning (Bonk & Khoo, 2014). A social constructivist approach to online learning environments provides learners multiple means of electronic access and interaction with learning materials (Bonk & Khoo, 2014).

Computer-supported collaborative learning environments that embrace social constructivist learning emphasize the importance of social interaction, which suggests that shared understanding and knowledge construction are based on the social negotiation of views and meanings (Kreijns & Kirschner, 2001). Social relationships and group cohesion are needed to create a social space in the online learning environment (Kreijns & Kirschner, 2001). A sound social space in the online classroom enables the reinforcement of social interaction (Kreijns & Kirschner, 2001), which suggests that "creating a sociable learning environment is a viable approach to fostering socioemotional aspects that ultimately benefit the quality of the learning experience" (Weidlich & Bastiaens, 2017, p. 479).

When communication in the online learning environment is predominantly text-based, impression formation can be inhibited (Kreijns & Kirschner, 2001; Walther, 1993). Impression formation is a social cognitive process where overall impressions of someone's character and abilities are formed based on the available information (Kreijns & Kirschner, 2001; Neuberg & Fiske, 1987; Symbaluk & Cameron, 1998; Walther, 1993). While communication occurs, the communicators will form an impression of one another during social interaction. A primary factor in forming an impression of someone is through non-verbal cues such as facial expressions, posture, voice volume, and inflection, transmitted by vision, olfaction, and audition (Kreijns & Kirschner, 2001; Walther, 1993). Learners develop individuating impressions of their fellow learners within the group through such cues (Kreijns & Kirschner, 2001; Neuberg & Fiske, 1987; Symbaluk & Cameron, 1998). However, because computer-mediated communication is often text-based, the non-verbal cues cannot transfer this kind of information within the social interaction, thereby inhibiting impression formation, which ultimately can hamper the creation of a sound social space (Kreijns & Kirschner, 2001; Walther, 1993).

As a cognitivist, Vygotsky (1978) rejected the assumption that it was possible to separate learning from a social context; instead, he believed that all cognitive functions originate in social interactions through the process in which learners were integrated into a knowledge community. Vygotsky (1978) argued that language and culture are essential in human development and how people perceive the world. He believed that the learner's construction of knowledge is the product of social interaction, interpretations, and understanding. This means knowledge is first constructed in a social context and then internalized and used by the individual (Adams, 2006; Amineh & Asl, 2015; Vygotsky, 1978). Adams (2006) states that learning aims to become aware of the realities of others as well as their relationship with one's self, which means that the role of *others* in the individual construction of knowledge is primarily a social process within the social constructivist theory (Adams, 2006; Vygotsky, 1978). Piaget (1973) emphasized self-initiated discovery, whereas Vygotsky emphasized the social contributions to the process of development. Vygotsky (1978) believed the community played a vital role in meaning-making and therefore stressed the fundamental role of social interaction in the development of cognition. He believed that human consciousness is achieved by internalizing social interaction (Amineh & Asl, 2015; Britton, 1987; McLeod, 2018; Vygotsky, 1978).

Peer Learning

Social constructivist approaches to learning acknowledge the need for peer-to-peer interactions within the learning environment (Adams, 2006; Amineh & Asl, 2015). Information technology has infused peer learning in numerous ways: creating learning groups, structuring learning activities, and facilitating group interactions (Topping, 2005). Collaborative peer learning occurs when students work in groups to discuss ideas and solve problems together by working alongside one another while also providing opportunities for self-reflection and learning

during the collaborative discourse that occurs within the learning environment (Boud et al., 1999; Topping, 2005). Topping (2005) defines peer learning as the "acquisition of knowledge and skill through active helping and supporting among status equals or matched companions" (p. 631). Often for an instructor, peer learning works well when introducing the class to a new concept, as the students are learning from one another as students assist one another through learning tasks or concepts (Corneli, 2012). Peer-to-peer learning can be mutually beneficial to those involved in the sharing of knowledge and ideas. It can also be an effective way of managing the different rates at which students learn (Boud et al., 1999).

Within online learning environments, peer-produced content can be easily created and widely shared to promote learning within any given community (Herlo, 2014). Corneli (2012) expands on the concept of paragogy as a "conscious practice of peer learning" (p. 267), which means that the learning environment is, therefore, co-created by peers. Paragogy is described as addressing the challenges of "producing a useful and supportive context for self-directed learning, based on connectivism between peers in the digital era" (Herlo, 2014, p. 35). Connectivism emphasizes the importance of networked learning communities, information technologies, and information resources throughout the learning process (Dunaway, 2011). It is a theoretical construct for learning in the digital age that acknowledges the role of information technology in the processes of learning by accessing information from multiple sources, developing skills for evaluating connections between different information sources in a dynamic network, and that maintaining and nurturing connections is needed to facilitate continual learning (Dunaway, 2011; Siemens, 2005).

Paragogy focuses on peer-to-peer learning, whereas andragogy and heutagogy are mostly focused on individual (self) learning (Blaschke, 2012; Halsall et al., 2016; Halupa, 2015).

Heutagogy and paragogy focus on process over content by asking the "how" instead of the "what." Both heutagogy and paragogy are: self-determined, peer-led, decentered, and non-linear learning. Non-linear learning provides a variety of options for learning; students choose their own path; different learners can follow different paths; the outcomes are emergent and cannot be foretold. Heutagogy and paragogy extend constructivist frameworks for a digitally connected global learning community. With the learning emphasis being placed on developing capabilities in a learner-directed, non-linear way, makes them well suited for the digital generation, where connectivity is foundational for global communication and collaboration (Blaschke, 2012; Halsall et al., 2016; Halupa, 2015).

Heutagogy and paragogy are peer-led approaches that extend constructivist frameworks by acknowledging the role information technology has in the learning process (Blaschke, 2012; Halsall et al., 2016; Halupa, 2015; Herlo, 2014). Connectivism emphasizes the importance of networked learning communities in a globally connected digital world. Using information technology in the online learning environment has enabled students to connect worldwide while enabling peer-to-peer learning and social interaction in numerous ways (Topping, 2005). Creating a sociable learning environment is considered a "viable approach to fostering socioemotional aspects that ultimately benefit the quality of the learning experience" (Weidlich & Bastiaens, 2017, p. 479). However, because computer-mediated communication is often text-based and asynchronous, it cannot transfer the necessary non-verbal cues within the social interaction that is needed for impression formation, which results in hampering the creation of a sound social space (Kreijns & Kirschner, 2001; Walther, 1993).

The social constructivist approach to learning shifts meaning-making from the individual to shared meaning-making through peer-to-peer learning and interactions (Amineh & Asl, 2015).

Since social interactions provide students a heightened sense of psychological need satisfaction (Deci et al., 1991), technologies in the online classroom should both include and stimulate meaningful social interactions. With new and emerging technologies, the ways students communicate, interact, and learn are continuously changing, which means instructional approaches to online delivery need to also continue to adapt to fulfill the students' digital learning needs (Guo et al., 2010).

Online Learning

Online learning has evolved from asynchronous delivery to synchronous delivery, with learner engagement being a central theme of the research. While this research focuses on synchronous learning, adult learners will have probably had some experience with asynchronous learning. Therefore, a short discussion of asynchronous learning will precede the discussion on synchronous learning.

Asynchronous Learning

Asynchronous learning is when education, instruction, and learning do not occur in the same place nor at the same time (Glossary of Education Reform, 2013a). Various forms of asynchronous learning can include a variety of instructional interactions, such as email exchanges, prerecorded videos, and online discussion boards (Glossary of Education Reform, 2013a). Garrison and Cleveland-Innes (2005) state that asynchronous, text-based online learning provides reflective and collaborative properties that are adapted to deep approaches to learning, with interaction being central to an online educational experience. Asynchronous online discussion is one format that facilitates student-centered learning (Jo et al., 2017). Whether the class is face-to-face, online, or blended, the purpose of the educational experience is to create knowledge constructs and achieve the learning outcome.

A literature review conducted by Covelli (2017) summarized the research around best practices and strategies within the practice of online learning, specific to the roles of the instructor, the student, and the course design of the discussion board. The discussion board is a common area for dialogue and a sense of community to occur (Covelli, 2017). However, according to Covelli (2017), despite the large amount of research conducted on discussion boards, many online classrooms still fail to effectively use the discussion board to encourage social interaction and learning. "For the online student, engaging in the discussion board and being an active participant are important aspects that impact the sense of community" (Covelli, 2017, p. 143).

Asynchronous Video

The use of video can increase student satisfaction, engagement, and success in online classes (Pinsk et al., 2014; Richardson & Swan, 2003; Rourke et al., 1999). Pinsk et al. (2014) conducted a case study of five online undergraduate students who used self-created video discussion posts and the influence it had on social presence. The researchers explored students' perceptions of using student-generated videos in online discussions as a mechanism to establish social presence. The students were then interviewed at the end of the course to discuss their perceptions of technology use. The students indicated that they felt a strong social presence in the online class due to using the self-created discussion video posts. Additionally, course management, projection of self, and connections to classmates and instructors also emerged as significant research themes (Pinsk et al., 2014).

Research on social presence within asynchronous learning environments emphasizes the use of discussions as a primary venue for the development of social presence (Borup et al., 2013; Clark et al., 2015; Collins et al., 2019; Kreijns et al., 2004b; Pinsk et al., 2014). Berry (2017)

analyzed message boards and 50 hours of video footage from four online classrooms. She triangulated the observations of the classroom community with interviews from 13 first-year doctoral students to explore their perspectives on instructor strategies that promoted community in the online classroom. The findings indicated that instructors helped students develop a sense of community by creating a warm and welcoming tone in the classroom and using technology in various ways to engage and create a personalized learning experience for all students (Berry, 2017).

Asynchronous video and text-based communication were investigated by Collins et al. (2019) in a quasi-experimental design study to determine which increased students' perceptions of instructor social presence and student engagement in an online graduate classroom. One group received video-based instructor-generated announcements, and the other group received text-based instructor-generated announcements. Student engagement was measured by the number and length of student posts on voluntary discussion forums. Significance was found for student engagement based on the number of discussion posts and length of discussion posts. Increased student engagement was demonstrated in the group who received text-based communication as opposed to the group of students who received asynchronous video (Collins et al., 2019). The authors confirmed they did not find significance for instructor social presence between the two groups. However, factors such as student demographics, expectations of the students, and course content need to be considered when determining instructor enhancement of student learning behaviors in the online classroom.

As online learning has continued to develop over time, researchers have begun to look more at how users interact with different communication technologies and how it allows them to perceive others (Mulder, 2019). Using technology in the online learning environment enables

learners to interact and provide feedback to one another through both asynchronous and synchronous means. Students benefit more from specific, detailed feedback when it helps them not only to understand what mistakes they made but also why they made the mistakes and how they can avoid them in the future (Wisniewski et al., 2020). Detailed written or video comments are more effective than just providing grades (Wisniewski et al., 2020). Video-based feedback and interactions can be either asynchronous or synchronous. When using an asynchronous text-based medium online, students have a level of personal anonymity that face-to-face students do not have (Christopherson, 2007; Mulder, 2019). Since asynchronous communication mediums can afford more opportunities to keep oneself anonymous, it can influence how individuals behave within groups (Christopherson, 2007). Conrad and Donaldson (2011) found that asynchronous communication allows for more reflection before responding while providing an opportunity for all students to respond, which is not always possible during synchronous communication. According to Borup et al. (2013), the asynchronous video had a substantial impact on teaching presence and social presence as students felt as if they were talking to their instructor when they made video comments. When viewing the teacher's video communication, it helped students to perceive the instructor as a real person. Adding audio and visual elements as components within online discussion platforms can add texture and personal elements to the learning environment, which humanizes the classroom (Covelli, 2017; Martin et al., 2017).

Synchronous Learning

Synchronous learning occurs when education, instruction, and learning occur at the same time but not in the same location. It is commonly applied to various forms, such as televisual, digital, and online learning that is occurring in real-time, but not in person (Glossary of Education Reform, 2013b). Clark et al. (2015) investigated whether asynchronous video posts

and synchronous videoconferencing created higher levels of teaching and social presence within an online course when compared to a text-based discussion platform. Undergraduate students were randomly assigned to either the text-based discussion platform or the video-based discussion platform. A switched replications design was used where students switched platforms halfway through the semester. Social presence was measured using a modified version of the Kreijns et al. (2004b) sociability scale, social presence scale, and social space scale. The student interviews and surveys indicated perceptions of social and teaching presence were significantly higher when using video-enabled discussion in both asynchronous and synchronous contexts (Clark et al., 2015).

Synchronous Videoconferencing

A form of synchronous learning can occur through the use of video. Using synchronous video involves real-time communication with the use of videoconferencing software tools such as Skype, Zoom, Adobe Connect, or Microsoft Teams (Mulder, 2019). Videoconferencing is a software tool that allows two or more parties to communicate via video and audio through an internet connection. It enables the parties to conduct live conferences, remote meetings, and even online learning by transmitting audio, video, and text (Glossary of Education Reform, 2013b). McInnerney and Roberts (2004) found that increased use of synchronous communication helps to combat the feeling of isolation and create a greater sense of community among learners. Using synchronous technologies such as chat rooms, instant messaging, and videoconferencing can add a human feel or real-life experience to the online learning environment (Martin et al., 2017). The social interaction that occurs in synchronous videoconferencing courses affects both socio-emotional and cognitive processes (Kreijns et al., 2013). Synchronous learning has been researched at the high school and college levels.

A qualitative case study underpinned by an interpretive epistemology was conducted by Wagner et al. (2016) that sought to understand the role of synchronous videoconferences from the perspectives of students and faculty taking part in online business courses at the undergraduate level. Wagner et al. (2016) confirmed from the research that the objective was to contribute to the literature by extending their understanding of how academic integrity may be enhanced through online videoconferences. The semi-structured interviews were conducted along with surveys and end-of-course student evaluations that were imported into a web-based qualitative data analysis application and then coded and organized into data. They discussed the videoconferencing protocol of their online program with suggestions for best practices when using videoconferencing to address concerns about online coursework and programs. They also examined their protocol from a theoretical perspective of the social shaping of technology to highlight the importance of videoconferencing as a social and technical practice. The evidence from their study suggested addressing academic integrity issues in three important ways: provide a space for faculty to be present with students in a face-to-face manner; provide important checks to avoid impersonation schemes; and assist students with staying on schedule to lessen the temptation to cheat. Therefore, the three main benefits of videoconferencing provided opportunities to address academic integrity issues included: faculty presence and development of personal relationships, authentication of work, and assessing student progress at regular intervals (Wagner et al., 2016).

Another synchronous delivery, live video, was researched for effectiveness. The Kobayashi (2017) study examined students' preferred media preference in online learning and its relationship with their learner characteristics and online technology self-efficacy. It consisted of 106 college students from a mid-sized university who responded to a survey. The survey

compared three different types of internet-based live lectures: live lectures with two-way audio and slide presentations, two-way video and audio, and one-way video and two-way audio. The authors confirmed from the research that the frequency analysis showed that students did not necessarily favor rich media over lean media in online learning due to often interrupted bandwidth issues. Instead, students preferred recorded online slide presentations with audio over the live video lectures in two-way video and audio interactions. Online discussion boards and chat groups were less favored than other types of media. Online technology self-efficacy was correlated with a type of media requiring a relatively higher level of technology skills. Kobayashi (2017) suggests that it is quite possible that shy or introverted students may not feel comfortable with being on live videos, which can limit their participation. Therefore, two-way video and audio may not always be the best synchronous online learning option (Kobayashi, 2017).

At the high school level, teacher presence was examined using synchronous videoconferencing software (Rehn et al., 2016). Presence was based on the results of a teaching presence survey that the student participants completed, observations made in the classroom, and interviews with both the teachers and students. The collective case study used mixed methods to unpack the notion of presence from teachers' and their students' perspectives by implementing surveys, observations, interviews, and questionnaires. The Technological Pedagogical Content Knowledge (TPACK) survey instrument measured the teachers' perceptions of teaching presence. The authors reported four key findings which have implications for building presence in a videoconference course: teachers' confidence and experience aligned with higher presence; teaching videoconference and face-to-face classes simultaneously led to challenges with

developing presence; immediacy behaviors correlated with higher presence; and students' learning preference related to perceived teacher presence (Rehn et al., 2016).

Another research study examined the use of Remind, a communication platform that helps educators reach students and parents (Remind, n.d.). Basko and Hartman (2017) conducted a study of 58 undergraduate courses with 1,302 enrolled students to examine efficient ways to combine tech tools such as Remind and videoconferencing to increase student engagement and communication. Real-time messages can be sent to an entire class, small group, or a single person (Remind, n.d.). The authors found that by combining videoconferencing and Remind, instructors increased the number of students who attended their videoconferences, which also increased student achievement in the courses (Basko & Hartman, 2017).

To build an online community, Berry (2019) interviewed 13 instructors to explore the strategies they use to help students develop a sense of community in synchronous virtual classrooms. From the interviews with the instructors, she identified four strategies for building community online. The four strategies for building community online were identified as: reaching out to students often, limiting time spent lecturing, using video and chat as modes to engage students, and allowing class time to be used for personal and professional updates (Berry, 2019).

Social Software

As online learning has developed, additional application tools have also become available. Computer-supported collaborative learning (CSCL) environments use social software applications for discussion and collaboration in the online learning environment (Kreijns et al., 2013). Social software applications allow the interactive application of the technology to connect users with one another, enabling them to communicate, share, and collaborate by enabling the

communication dimension to exist outside the traditional face-to-face classroom, by allowing students from around the world to communicate by text, video, audio, and photographs (Hitrec et al., 2011). Hitrec et al. (2011) examined the use of social software in education, which specifically looked at VoIP, Social Bookmark, Social Networks, Facebook, and YouTube. The research study aimed to determine how students and instructors approached social software and social networks. Of the 247 respondents, 57.49% believed that social software should be used as working tools or assistance in teaching, while 44.94% agreed that social software could be used as a supplement to other working methods in the classes (Hitrec et al., 2011).

There are many different ways that video can be used in courses to support online social interaction in either asynchronous or synchronous formats (Mulder, 2019). Social interaction among faculty and students is the main element in collaborative learning as shared understanding and the construction of knowledge are reached through the social negotiation of views and meanings (Hiltz, 1997). “Knowledge is viewed as a social construct, and therefore the educational process is facilitated by social interaction in an environment that facilitates peer interaction, evaluation and cooperation” (Hiltz, 1997, p. 3). Computer-supported collaborative learning provides the necessary tools for online education that supports social interaction, communication, sharing, and collaboration.

Enabling Social Interaction Is Not Enough

Interaction in an online classroom is not as straightforward as it is in a face-to-face environment (Mulder, 2019). Dewey (1938) suggests that educators should contribute to building experiences that utilize physical and social surroundings to create significant and valuable educative experiences that are worthwhile for the learner. A condition of learning is described by Knowles (1973) as having a learning environment that is “characterized by physical comfort,

mutual trust and respect, mutual helpfulness, freedom of expression, and acceptance of differences" (p. 70). In an educational experience, meaningfulness and worthwhileness reflect cognitive and social perspectives of learning (Garrison, 1997). Meaningful interactions can reduce feelings of isolation and anonymity in online courses that may otherwise result in student dissatisfaction, poor performance, and ultimately dropping out (Christopherson, 2007; Jun, 2005; McInnerney & Roberts, 2004; Mulder, 2019; Shelton et al., 2017). However, "simply enabling social interaction, therefore is not enough; it must be stimulated," and that sociability, social space, and social presence influence the social interaction that is needed for both learning and the emergence of a sound social space (Kreijns et al., 2013, p. 230). Just assigning students learning tasks and placing them within groups does not in itself promote cooperation and collaboration among the students (Kreijns et al., 2002).

Using technologies in the online learning environment enables learners to interact and provide feedback to one another through both asynchronous and synchronous means. However, increased use of synchronous communication provides a greater sense of community among the learners (McInnerney & Roberts, 2004). Synchronous technologies such as chat rooms, instant messaging, and videoconferencing can add a human feel or real-life experience to the online learning environment (Martin et al., 2017), but for meaningful social interactions to occur, it must be stimulated. Sociability, social space, and social presence influence social interactions (Kreijns et al., 2013). When meaningful social interactions occur, feelings of isolation and anonymity are reduced, which may have otherwise resulted in student dissatisfaction, poor performance, and dropping out (Christopherson, 2007; Jun, 2005; McInnerney & Roberts, 2004; Mulder, 2019; Shelton et al., 2017).

Previous research conducted on synchronous videoconferencing examined how it related to engagement and communication (Basko & Hartman, 2017); combating feelings of isolation (McInnerney & Roberts, 2004); creating a sense of community (Berry, 2019; McInnerney & Roberts, 2004); and learner characteristics and online technology self-efficacy (Kobayashi, 2017). Communication platforms such as Remind (Basko & Hartman, 2017), VoIP, Social Bookmark, Social Networks, Facebook, and YouTube (Hitrec et al., 2011) were also examined. The participants in the research studies consisted of high school (Rehn et al., 2016) and undergraduate level (Basko & Hartman, 2017; Clark et al., 2015; Wagner et al., 2016) students and faculty. Student perspectives of social presence (Clark et al., 2015) and teaching presence (Clark et al., 2015; Rehn et al., 2016) were also investigated. Although previous research has examined students' needs and online engagement in asynchronous and synchronous online classes, limited research has been conducted on synchronous videoconferencing. The systematic review conducted by Martin et al. (2017) of 157 articles from thirty-four countries identified a number of meta-analyses and systematic reviews conducted on distance education and online learning, but none specifically examined synchronous online learning.

Social Space

The concept of social space is the extent to which salient interpersonal relationships among students in the learning environment emerge, which also includes aspects of cohesion, climate, and community (Kreijns et al., 2004a, 2014). The effectiveness of group learning also depends on the social interaction that occurs during collaborative activities during the course (Kreijns et al., 2004a). Social interaction is essential for developing social relationships, building group cohesion, and creating a sense of community. Such qualities determine the existence of a sound social space, which is essential for social interaction. Social presence leads to a social

space, and social space supports social interaction in the cognitive dimension of interaction (Kreijns et al., 2004a).

For the synchronous videoconferencing classroom environment to emerge as a social space for the students, social interaction will need to occur. Social interaction is also influenced by sociability and social presence. Kreijns et al. (2013) postulate that sociability, social space, and social presence influence the social interaction needed for both learning and the emergence of a sound social space. Sociability, social space, and social presence constitute the theoretical framework of the SIPS model, which is used for computer-supported collaborative learning social interaction research (Kreijns et al., 2013). Social presence and the SIPS model will be discussed in the following sections.

Social Presence

According to Kreijns et al. (2013), social presence is a variable that affects the degree to which a social space will emerge in a collaborative online learning environment. In educational settings that rely on computer-mediated communication to facilitate online learning and computer-supported collaborative learning, social presence is considered to be an important aspect of the learning experience since it affects participation and social interaction, which are both necessary for effective collaboration and knowledge construction (Garrison, 1997, 2007; Kreijns et al., 2011). When using computer-mediated or technology-mediated learning, it is important for educators to select technologies that will help best facilitate social interaction and the intended learning tasks (Bower, 2019; Oliveira et al., 2021). Motivating students to interact and participate in quality discussions will improve the social presence in the online learning environment (Lowenthal & Dennen, 2017; Ng, 2019; Shelton et al., 2017). Therefore, social

presence leads to a social space, and social space supports social interaction (Kreijns et al., 2004a).

Defining Social Presence

The term social presence has been difficult to define. Researchers were continually finding additional layers to the phenomena. With a lack of clarity and consistency in defining social presence, definitions tend to fall on a continuum (Biocca et al., 2003; Lowenthal, 2009; Lowenthal & Snelson, 2017). At one end of the continuum, researchers conceptualize social presence as the degree to which a person is perceived as being "real" and being "there" and whether others perceived this person as being there and being "real" (Felnhofer et al., 2014; Lowenthal, 2009, p. 15). These included (1) Short et al. (1976) coining the term social presence and defining it as "the degree of salience of the other person in the communication and the consequent salience of the interpersonal relationships" (p. 65); (2) Gunawardena and Zittle (1997) defining social presence as the degree to which a person is perceived as a "real person" in mediated communication, and as a construct, it comprises a number of dimensions relating to the degree of interpersonal contact (p. 9); and (3) Kreijns et al. (2011) defining social presence as the degree to which the other in a communication setting appears to be a real person. At the other end of the continuum, researchers tend to focus on whether there is an interpersonal emotional connection between the online communicators (Lowenthal, 2009; Lowenthal & Snelson, 2017). These included: (1) Rourke et al. (1999) describing social presence as "the ability of learners to project themselves socially and affectively into a community of inquiry" (p. 50); and (2) Tu (2002) suggesting that social presence is comprised of three dimensions: social context, online communication and interactivity, and online privacy.

The classification of social presence definitions is categorized by Biocca et al. (2003) into the following three main categories of copresence: colocation, mutual awareness; psychological involvement; and behavioral engagement. The continuum of social presence definitions spans from the salience of the other person in the interaction; to the salience of the interpersonal relationships; and to interpersonal emotional connections (Kreijns et al., 2018). This study was situated on the continuum where social presence is used to describe "the psychological phenomenon that the other is perceived 'real' in the communication, the subjective feeling of being with the other salient social actors in a technologically mediated space" (Weidlich et al., 2018, p. 2146), which is based on the original social presence definition of Short et al. (1976).

Social Presence Theory

According to Kreijns et al. (2011), "Social presence theory has often been used to rank telecommunication media according to the degree of social presence (i.e., face-to-face > video-conferencing > audio). According to the theory, media higher in social presence are more appropriate for carrying-out interpersonal tasks" (p. 367). In the view of Short et al. (1976), technology is a determinant of the perception of social presence. In contrast, others such as Gunawardena (1995) and Tu (2002) argue that media attributes are irrelevant, that social factors are instead what is important in determining social presence (Kreijns et al., 2011). Social presence has been examined as one of the social conditions capable of supporting online learning and is often described as a mechanism governing beneficial learning climates and interpersonal connections among online learners (Weidlich & Bastiaens, 2017).

Researchers have linked social presence to important variables such as satisfaction (Siriaraya & Ang, 2012) and perceived learning (Gunawardena & Zittle, 1997; Richardson & Swan, 2003), online retention rates (Muilenburg & Berge, 2005), and online social interaction

(Kreijns et al., 2004a, 2004b). Hostetter (2013) examined the relationship between social presence and students' learning outcomes. The research was conducted with 121 student participants who sought to understand the connection between the feeling of community and the knowledge gained in the course (Hostetter, 2013). Over a period of two years, the students participated in a mixed-methods study that examined the amount of social presence they perceived, the amount of social presence they demonstrated, and the relationship between those factors and their achievement on a classroom assessment technique (CAT). Hostetter (2013) concluded that the social presence scale that originated with Gunawardena and Zittle (1997) seemed to be a useful tool to measure the students' perceptions of social presence and that social presence may be a critical element to successful online instruction. "The regression model revealed that students with higher demonstrations of social presence in discussion forum posts had statistically significantly higher ratings on the CAT," which "seems to indicate that social presence influences student outcomes on written assignments" (Hostetter, 2013, p. 77). Bickle et al. (2019) conducted research with 228 student participants to examine students' satisfaction with online learning and identify attributes contributing to humanizing the online classroom. Bickle et al. (2019) attempted to determine whether students perceived social presence in the online course as a result of the use of a variety of communication tools in group participation projects. The findings revealed that students' perceptions of a high-quality course were dependent upon continual communication with the instructor, a method of connecting students with another, and the ability for a student to express their opinions (Bickle et al., 2019).

Limited research has examined the influence age and gender has on social presence. Felnhofer et al. (2014) evaluated gender-specific experiences of social and physical presence in a collaborative virtual environment with respect to empathy. The results indicated no differences

in social presence between the two age groups; no significant main effect of gender; and no influence of empathy on social presence (Felnhofer et al., 2014). Bailenson et al. 2003 conducted two studies with 80 participants between the ages of 18 to 30. Participants were immersed in a single virtual environment containing a virtual human. The study measured interpersonal distance, memory, social presence, and affect ratings. The participants were asked to examine the virtual humans and provided social presence and affect ratings. Participants indicated a greater sense of social presence with virtual humans that demonstrated mutual gaze and more social presence with the male virtual human than with the female (Bailenson et al., 2003). Siriaraya and Ang (2012) conducted an online experiment to investigate age differences in the perception of presence, the quality of social interaction, and the display of non-verbal behaviors in the virtual world. A total of 60 participants (thirty aged 55+ and thirty aged 20s to early 30s) were paired up and asked to enter the virtual island to carry out a simple social interaction task. The findings indicated that social presence was significantly correlated with user overall satisfaction and that participants aged 55+ tended to experience lower levels of social presence (Siriaraya & Ang, 2012). Although the findings from these studies indicated differences in interpersonal distance and mutual gaze between male and female participants (Bailenson et al., 2003) and lower levels of social presence in older adults (Siriaraya & Ang, 2012), no significant gender differences were found.

Social Presence Within the Community of Inquiry

Social presence also has a prominent role in the community of inquiry theoretical framework (Akyol et al., 2009; Garrison, 1997, 2007, 2009; Garrison et al., 2000, 2010). According to Covelli (2017), “the literature is moving toward supporting a constructivist approach to online learning, and the Community of Inquiry (CoI) framework has been

popularized as one model to explain and promote online teaching presence, social presence, and cognitive presence" (p. 143). The community of inquiry theoretical framework, to include methodology and instruments, was developed during a research-funded project that lasted from 1997 to 2001 (CoI, n.d.). In researching text-based environment, central to the original study was the creation of the model of a community inquiry, which comprised the following three essential elements of an educational experience: cognitive presence, social presence, and teaching presence (CoI, n.d.). Teaching presence involves the instructional design and organization of the course, facilitation, and direct instruction. Social presence involves open communication, affective expression, and group cohesion. The goal of the community of inquiry is to build a solid foundation of all three within a course (Garrison, 2007).

As stated by Garrison (1997, 2007), social presence is an important concept for understanding the social context and for creating a social climate. It is described by Garrison (2009) as the ability of participants to identify with the community, communicate purposefully in a trusting environment, and develop interpersonal relationships in a way that projects their individual personalities. Social presence is the ability to project oneself socially through digital means into the community of inquiry as real-life three-dimensional people. It, therefore, enables getting to know one another despite the fact that the meeting is not occurring in a face-to-face environment. Social presence is described as the foundation of building trust and presence in the online learning environment for teaching and learning experiences (Garrison, 2009). Social presence supports cognitive presence by creating the environment necessary to sustain the communication required to construct meaning (Arbaugh et al., 2008). Not only is individual presence important in the development of a CoI, but there must also be group cohesion as well (Garrison, 1997, 2007).

Cognitive Presence

Cognitive presence is defined by Garrison et al. (2001) as being the extent that learners are able to construct meaning through reflection and discourse; and requires attention and effort from both the teacher and the learner. It occurs when the learners thoughtfully participate in the discussions, respond to content, and sustain discourse in an online learning environment. Cognitive presence is the extent that learners can construct meaning through reflection and discourse and achieve learning outcomes and understanding on an intellectual level (Garrison et al., 2001).

Teaching Presence

Teaching presence is "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p. 5). It begins before the course commences and continues during the occurrence of the class. For the creation and sustainability of a community of inquiry that is focused on the exploration, integration, and testing of concepts and solutions, teaching presence is important (Garrison & Cleveland-Innes, 2005). The three categories of teaching presence include design and organization, facilitating discourse, and direct instruction (Anderson et al., 2001). Design and organization are described as the process of designing and planning the online course, which includes setting curriculum, designing methods, establishing time parameters, utilizing medium effectively, and establishing netiquette (Anderson et al., 2001). Facilitating discourse is where the teacher sets the climate for learning by regularly reading and commenting on student postings and encouraging, acknowledging, or reinforcing contributions (Anderson et al., 2001). Direct instruction occurs when the teacher provides intellectual and scholarly leadership by sharing their subject matter knowledge, diagnosing

misconceptions, presenting content and questions, and summarizing the discussion (Anderson et al., 2001). Technology is not effective in the online classroom without instructors who are knowledgeable about both the technology itself and its implementation of it to meet the educational goals (DeCoito & Richardson, 2018). Faculty on-boarding should include online training to better equip instructors in creating a positive online learning environment for the students, as well as modeling the best use of the technology to create a baseline learning environment across the institutions' online degree programs (Rehn et al., 2016; Wagner et al., 2016).

Social Presence Research

Convoluted and unclear definitions of social presence create issues with attempts at measuring social presence (Biocca et al., 2003; Kreijns et al., 2018; Lowenthal, 2009; Lowenthal & Snelson, 2017; Weidlich et al., 2018); therefore, a number of instruments have been developed by researchers to measure it (Arbaugh et al., 2008; Gunawardena & Zittle, 1997; Kreijns et al., 2004b; Tu, 2002). Many of the instruments, however, also measure aspects of other social constructs such as social climate, social interaction, cohesiveness, social space, sociability, social environment, and attitude (Kreijns et al., 2004b, 2018). A community of inquiry survey instrument has been developed and validated (Arbaugh et al., 2008), as well as Gunawardena and Zittle (1997), Tu (2002), and others have also developed different questionnaires to assess social presence (Kreijns et al., 2018). However, Kreijns et al. (2011) and Kreijns et al. (2014) have shown that many of the measures do not exclusively measure social presence but also "measure varying aspects of an amorphous set of variables—including social presence—to varying degrees" (Kreijns et al., 2011, p. 371).

Although many researchers suggest that social presence is multidimensional and multifaceted, Weidlich et al. (2018) found it necessary to clearly define social presence and, therefore, "untangle" it from its correlates (p. 2143). The correlates of social presence that Weidlich et al. (2018) referred to are social interaction; cohesion, climate, and community; satisfaction and perceived learning; and achievement. Many researchers discuss the close relationship between social interaction and social presence, while other researchers assert that social presence will increase social interaction and that it is a predictor variable for social interaction (Weidlich et al., 2018). Biocca et al. (2003) suggest that social presence is the theory of mediated interaction, and therefore the concept of interaction is included. Kim (2011) established four factor constructs of social presence: mutual attention and support, affective connectedness, sense of community, and open communication. Frequently when referring to social presence, researchers will also include aspects relating to group cohesion, learning climate, and sense of community (Garrison, 2009; Weidlich et al., 2018).

Social presence as a property of communication media can vary depending on the communication system's capacity to transmit cues. Cues such as facial expressions, gaze, posture, physical appearance, and voice inflection are rich with interpersonal and "impression-bearing" information (Walther, 1993, p. 383). Computer-mediated communication lacking non-verbal and backchanneling cues is low in social presence (Walther, 1993). Backchanneling cues signify that the listener is paying attention, understands, or is in agreement with the communicator. The following section will discuss the evolution of the SIPS model, the social presence scale, the social space scale, and the sociability scale.

Evolution of the SIPS Model

The social information processing (SIP) theory was the first of several theoretical models of online interpersonal interaction that explained how people formed impressions and developed relational communication via text-based electronic communication (Walther et al., 2015). Walther's (1993, 1996; Walther et al., 2015) SIP theory introduced a new set of assumptions that focused on what people do when communicating using different channels and how they respond to a severe reduction in nonverbal cues by CMC. Walther's SIP (1993) theory suggested that despite online communication lacking the full richness of face-to-face communication, communicating partners could still develop interpersonal relationships (Kreijns & Kirschner, 2018; Walther, 1993, 1996). The theory seeks to explain how CMC users are able to form an impression of and relations with others online through the process of impression management, which is the conscious or subconscious process of how people attempt to control or influence how they are perceived by others during communication (Walther, 1993, 1996). Impression management involves self-presentation, which includes impressions the communicator tries to convey to others by how they present themselves online (Walther, 1993). The SIP theory seeks to explain how the mental models and online identities of the communicating partners through impression development are formed, thereby affecting social presence (Walther, 1993). Walther (1993) suggested that impression development in computer-mediated communication can be somewhat limited when compared to face-to-face communication due to greater time requirements to exchange messages, as well as the lack of non-verbal cues conveyed.

PIP Model

The PIP model (*p*articipation, social *i*nteraction, *p*erformance) was introduced by Kreijns et al. (2003) to illustrate the dual function of social interaction for meta-cognitive and socio-

cognitive processes and for the social and social-emotional processes and how they affect learning and social performances. The model captures both the educational and social (psychological) dimensions of social interaction. When a learning community has zero history together and is not acquainted with one another, it is essential to form a group and develop group structure and group dynamics (Kreijns et al., 2003). Therefore, the Kreijns et al. (2003) PIP model suggests that the key to effective collaborative learning is through social interaction, and to have a valued learning experience, pedagogy, content, and community must all exist at the same time.

SIPS Model

Since much of the social presence research had been conducted without having an online context in mind, the SIPS model was adapted to explain and predict the socio-emotional aspects of online and distance learning. The SIPS model (*s*ociability, social *i*nteraction, social *p*resence, and social *s*pace) introduced by Kreijns et al. (2013) proposes a framework for understanding the social aspects of online learning in computer-supported collaborative learning environments (Kreijns et al., 2004b, 2013). It contains social variables and their relationships to each other and is based on an ecological approach to fostering social aspects. The framework suggests an explanation of how these aspects evolve and is adapted to explain and predict the socio-emotional aspects of online and distance learning.

The sociability of a learning environment is expected to be a predictor of how much social interaction will take place. Therefore, learning in a sociable environment will hopefully facilitate and promote social interaction, which will, in turn, foster the emergence of social presence and the development of a sound social space. The SIPS model suggests that sociability will influence social presence directly, as well as through social interaction (Kreijns et al., 2004b,

2013). When meaningful social interaction occurs, learners demonstrate positive communication behavior and group cohesion. The communicators will form an impression of one another as social interaction occurs. The process of impression formation determines the emergence of social presence. “As these impressions become increasingly salient through ongoing social interaction, a perception of non-mediation -social presence- will emerge” (Weidlich & Bastiaens, 2017, p. 481). By creating a sense of face-to-face conversation feelings where the degree of a psychological sensation of the others in the communication appears to be ‘real’ (social presence), the development of a sound social space will occur (Kreijns et al., 2013).

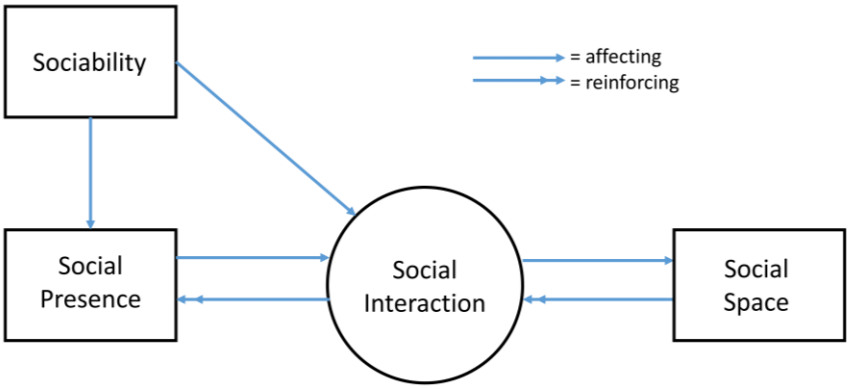
The single most important barrier to students’ learning is a lack of social interaction (Muilenburg & Berge, 2005). A lack of social interaction can also impede group formation and group dynamics. Social interaction is necessary for group members to learn from each other and for the occurrence of socioemotional processes, which help to create a social space where trust, interpersonal relationships, and a sense of community exist.

The theoretical framework introduced by Kreijns et al. (2013) postulates that the three core elements influence the social interaction needed for both learning and the emergence of a social space. The theoretical framework consists of three core elements: sociability, social space, and social presence that serve as a framework for computer-supported collaborative learning social interaction research. Kreijns et al. (2013) describe a sound social space as what “makes it possible for group members to gain a feeling of relatedness, group cohesiveness, trust, and respect for each other” (Kreijns et al., 2013, p. 239). The sociability of a CSCL environment is its potential to encourage socioemotional interaction within the learning environment. The more sociable the environment is, the better it will facilitate socioemotional interactions to take place, which will determine the group development of the learners. The three core elements influence

the social interaction needed for both learning and the emergence of social space (Figure 1). The arrows represent each relationship as either affecting or reinforcing while indicating the direction of influence. Sociability is depicted as facilitating both social presence and social interaction, which are important processes necessary for socioemotional interaction that can result in the emergence of a social space (Kreijns et al., 2013).

Figure 1

SIPS Model Social Aspects



Note. Adapted from "Social Aspects of CSCL Environments: A Research Framework" by K. Kreijns, P. A. Kirschner, and M. Vermeulen, 2013, *Educational Psychologist, 48*(4), 229-242. Reprinted with permission.

This research used the SIPS model to investigate the synchronous online learning environment because it serves specifically as a framework for computer-supported collaborative learning environments (Kreijns et al., 2004b, 2013). Since the SIPS model contains the relevant social variables, and their relationships to each other (sociability, social presence, and social space), it provided a framework for this research to examine the social aspects of the synchronous videoconferencing learning environment. The advantage of using the SIPS model is

that it offered an explanation of how the social aspects of the synchronous learning environment developed.

Social Presence Scale

An instrument for measuring social presence was produced by Kreijns et al. (2011) that captured the psychological sensation associated with social presence. Weidlich and Bastiaens (2017), using the Kreijns et al. (2011) social presence measure, demonstrated no relationship of social presence with satisfaction. They did, however, identify a relationship between social presence and perceived learning. Although the Kreijns et al. (2011) social presence measure addressed the realness of the other in the communication, Kreijns et al. (2018) believed that a distinction between a synchronous and an asynchronous communication setting should not have been made because it limited the applicability of the measure and violated the invariance assumption necessary for Rasch Analysis. Therefore, Kreijns et al. (2018) proposed an alternative measure to social presence by introducing a unidimensional definition of social presence that emphasizes the realness of the other in the interaction. Unlike previous measures, the new Kreijns et al. (2018) social presence measure is based on the Rasch measurement model.

The Rasch measurement model was named after the Danish mathematician Georg Rasch. The Rasch model is a unidimensional measurement model that can be used for the development of a new scale; reviewing the psychometric properties of existing ordinal scales; constructing item banks as the basis of computer adaptive testing; whenever change scores need to be calculated from ordinal scales; and for converting ordinal scores to interval level measures (Elhan et al., 2010; Pallant & Tennant, 2007). Wright (1997) suggests that the model is theory-driven, that the data must fit, or better must be found. If interval scale measurement is to be achieved, the Rasch measurement model shows what should be expected in responses to items

(Elhan et al., 2010; Pallant & Tennant, 2007). Rasch analysis is designed for binary or ordinal data and makes no distributional assumptions. To address the different definitions and measures used for social presence, Kreijns et al. (2018) conducted a Rasch analysis to present an operationalizable definition of social presence and a solid social presence measure with good psychometric qualities.

With many definitions of social presence differing from each other, they lack clear analytic boundaries that allow the differentiation of social presence from other related variables (Kreijns et al., 2018). Kreijns et al. (2018) suggested there is no reason to conflate social presence and social interaction since both have been defined differently and are distinguishable. Weidlich et al. (2018), therefore, defined social presence as "the psychological phenomenon that the other is perceived 'real' in the communication, the subjective feeling of being with the other salient social actors in a technologically mediated space" (p. 2146). Therefore, when measuring social presence, "items that assesses social presence should all tap this realness aspect and none of the items should tap correlates of social presence like social interaction, group cohesion, learning climate, sense of community, or satisfaction" (Weidlich et al., 2018, p. 2146).

Social space has been empirically validated by Weidlich and Bastiaens (2017). According to Weidlich et al. (2018), "it is expected that social presence is a prerequisite for the development of a sound social space" and deviates from many other social presence researchers who argue that social presence is a multidimensional construct by describing their new unidimensional social presence model as being "based on a precise definition and demonstrates sound psychometric properties" (p. 2146). Weidlich et al. (2018) also state they "believe that a precisely defined construct that is measured in a psychometrically sound way is the necessary groundwork for cumulative research on social presence" (p. 2148). However, since the previous

social presence instruments did not measure the physical realness of others as a single trait of interest, nor did they account for the nonlinearity of rating scale steps and other issues, Kreijns et al. (2020) aimed to fill the gap by developing a robust social presence measure by using the Rasch measurement model as a rigid construct validation method. The findings of the Kreijns et al. (2020) Rasch analysis revealed two dimensions of social presence: awareness of others and proximity with others. Awareness of others was measured with 15 items, and the proximity with others was measured with 12 items.

Social Space Scale

To measure social space, Kreijns et al. (2004a) developed an additional instrument. The scale was developed to isolate the social space aspects, which are indirectly measured by most previously existing social presence measures (Kreijns et al., 2011). Kreijns et al. (2004a) defined social space as "the network of social relationships amongst group members embedded in group structures of norms and values, rules and roles, beliefs and ideals" (p. 608). A sound social space is, therefore, "characterized by affective relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community" (Kreijns et al., 2004a, p. 608).

Sociability Scale

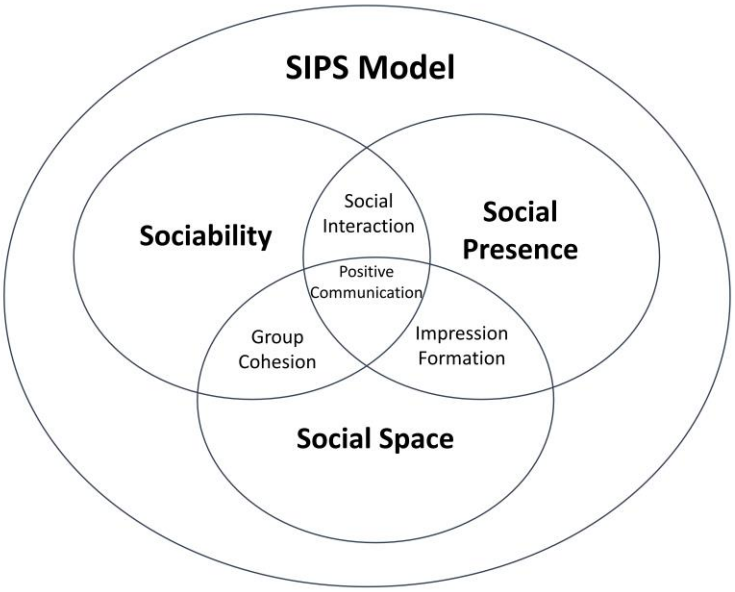
An instrument for determining sociability was developed by Kreijns et al. (2004b) and later refined by Kreijns et al. (2007). The reduction of social interaction was found by Arbaugh (2000) to be a factor that negatively impacted student satisfaction in distance education. The flexibility of the communication medium and the ability to develop an interactive course environment has a larger role in determining student satisfaction than the ease or frequency with which the medium could be used (Arbaugh, 2000). The sociability scale was developed to isolate

aspects dealing with properties of the CSCL environment that make it more inviting for informal and chance interactions (Kreijns et al., 2011).

This research used the three scales within the SIPS model: social presence scale, social space scale, and sociability scale to measure the perceived social aspects of the synchronous videoconferencing learning environment (Figure 2). The three scales are described by Jochems and Kreijns (2006) as providing "a base for research on the interaction in computer-supported group-based learning" (p. 119). The perceived quality of the learning environment to facilitate social interaction was measured by the Kreijns et al. (2007) sociability scale. The Kreijns et al. (2004a) social space scale measured the perceived network of interpersonal relationships between students, and the Kreijns et al. (2020) social presence scale measured the perceived physical realness of the other in the communication.

Figure 2

SIPS Model



Note. A visual depiction by the researcher of sociability, social space, and social presence within the SIPS model.

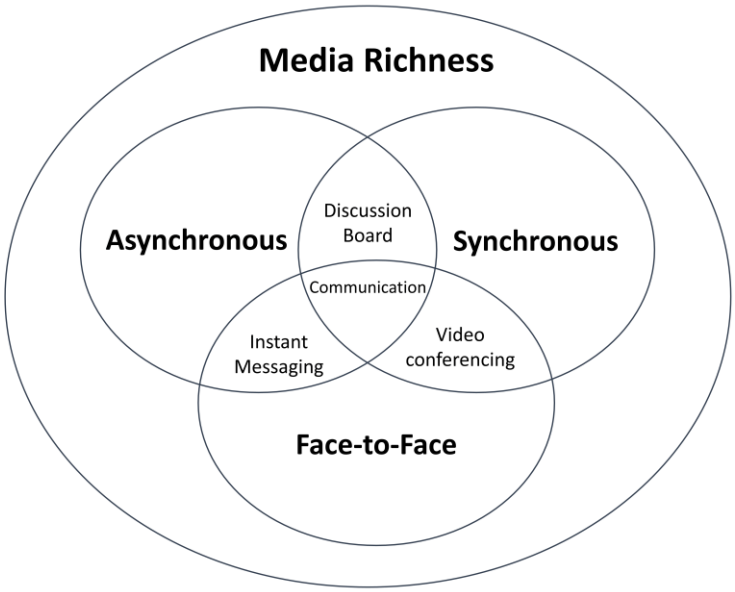
Media Richness Theory

Originating from information processing theory, media richness theory developed by Daft et al. (1987) proposes that the communication efficiency between people is affected by the choice of media and the characteristics of the communication task. Media richness theory was one of the first theories to describe how and why people chose a particular medium to communicate with others in the workplace (Ferry et al., 2001). The theory was developed to help determine when face-to-face or other communication media are appropriate. Communication media can differ in their ability to facilitate understanding and can be characterized as high or low in richness (Daft et al., 1987). The richness of a medium is based on its capacity to facilitate shared meaning and is determined upon a blend of the following four criteria: immediate

feedback, multiple cues, language variety, and personal focus. The capacity to transmit multiple cues includes physical presence, voice inflections, body gestures, words, numbers, and graphic symbols. Language variety can be conveyed by language symbols and numbers, whereas natural language can be used to convey concepts and ideas. The capacity of the medium to have a personal focus is when the message is conveyed with emotions and feelings or when it can be tailored to the perspectives of the receiver. Face-to-face is described as the richest communication medium since it allows for immediate mutual feedback, simultaneously transmits multiple cues via body language and tone of voice, uses a high variety of natural language, and conveys emotion (Daft et al., 1987; Sun & Cheng, 2007). Figure 3 illustrates media richness by depicting how discussion board communication can occur both asynchronously and synchronously; instant messaging can occur asynchronously and face-to-face; and videoconferencing can occur synchronously and face-to-face.

Figure 3

Media Richness



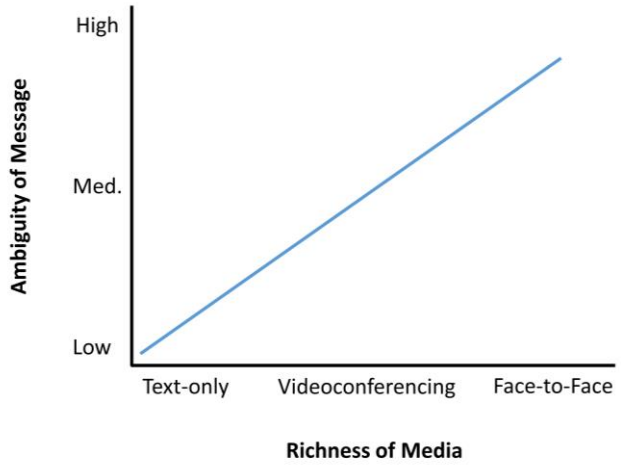
Note: A visual depiction by the researcher of asynchronous, synchronous, and face-to-face media richness.

Communication media differ in their ability to convey rich information. Media richness classifications range from *rich* face-to-face to *lean* unaddressed documents. Media richness theory suggests the purpose of communication is to reduce uncertainty and equivocality (ambiguity) in order to communicate effectively (Daft et al., 1987; Sun & Cheng, 2007). Tasks with different levels of uncertainty and equivocality need an appropriate communication medium that matches the task. This means that the task at hand requires the matching of media richness to deliver the communication effectively. Suggesting that simple tasks may be conveyed effectively using lean media while using lean media for tasks with a high level of uncertainty, and equivocality is conveyed ineffectively. For tasks with higher uncertainty and equivocality, using high richness media will result in being better able to convey the information efficiently and

effectively (Daft et al., 1987). The more ambiguous the task, the more complex the medium needs to be for efficient and effective communication (Figure 4). With regard to online instruction, the medium used to deliver instructional material has its own transmission capacity for the information and, therefore, should be selected carefully (Sun & Cheng, 2007). A study conducted by Sun and Cheng (2007) found that a course with high uncertainty and equivocality in content needs high richness media representation. Conversely, Dennis and Kinney (1998) tested media richness theory and found that matching media richness to task equivocality did not improve performance. Liu et al. (2009) studied students' acceptance of streaming media for e-learning and found that presentations that used streaming media, such as audio and video, were positively correlated with higher concentration levels but showed mixed results when correlated with perceived usefulness. Liu et al.'s (2009) research confirmed the influence of media richness as an external variable on the students' intention to use e-learning technology, as well as the need for connecting the media to the user's required task. This suggests that if an instructor selects an unsuitable choice of media for course delivery, then the information conveyed will not be beneficial to the learners.

Figure 4

Ambiguity of Message in Relationship to Media Richness



Note. A visual depiction by the researcher illustrating the ambiguity of a communication message in relationship to media choice.

Face-to-face communication is described as the richest communication medium in both media richness theory and social presence theory (Baehr, 2012; Robert & Dennis, 2005). Robert and Dennis (2005) categorized two dimensions that can be used to classify the extent of social presence or media richness perceived by users of a medium as spatial (co-located and distributed) and temporal (asynchronous and synchronous). They proposed that media providing same-time and same-place interaction are perceived to be higher in social presence and media richness than media providing different-time and different-place interaction. Baehr (2012) suggested that synchronous learning offers high-to-moderate levels of richness and asynchronous learning offers moderate-to-low levels of richness. However, Robert and Dennis (2005) argued that the use of rich media, high in social presence, increases motivation but decreases the ability

to process information and that the use of lean media, low in social presence, decreases motivation but increases the ability to process information. Tseng et al. (2019) collected 247 responses from an online survey measuring how aspects of media richness affect user loyalty to mobile instant messaging apps found that immediate feedback and personal focus are the main aspects of media richness that are positively related to social presence.

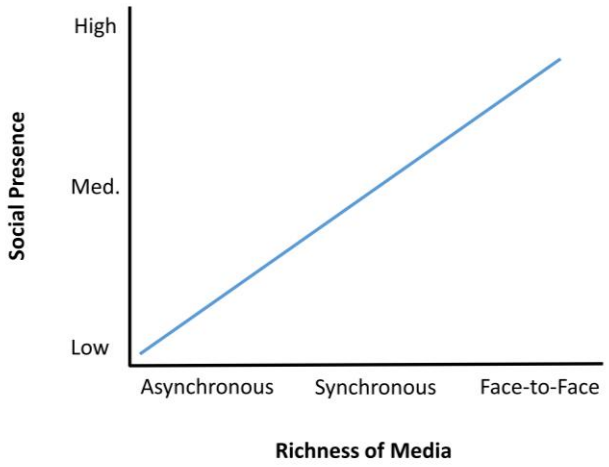
Media richness has been researched in several different contexts. Oregon et al. (2018) researched the impact of media richness theory and social presence theory in course design and instruction on attrition in the graduate recreation and sports administration online program and found a distinct correlation between using rich media technologies and enhancing social presence due to the positive impact it had on retention rates in the program. They concluded there was a positive relationship between academic satisfaction and a student's intention to continue their degree. Campbell (2006) explored the impact of communication apprehension and participation on user perceptions of task and media characteristics in a videoconferencing context. The findings indicated that the media richness and social presence aspects of media choice theory are important considerations for videoconferencing users (Campbell, 2006). Social presence is a perception that varies from individual to individual and can be situational and vary across time for the same individual (Oregon et al., 2018). Therefore, applying the two communication theories of social presence and media richness helps to explain the relationship between the characteristics of a communication medium and the communication interactions within the mediated environments.

Media richness theory suggests that the more ambiguous the task, the more complex the medium needs to be for effective communication (Baehr, 2012; Liu et al., 2009). Communication media that are higher in media richness are capable of reducing ambiguity more

efficiently than leaner media. As online learning becomes a more media-rich and complex experience, understanding the user's experience becomes even more essential when choosing instructional tools and media forms. Understanding how to best optimize the pairing of content with delivery mode, and media type helps to create a more effective educational communication exchange between instructor, content, and student. Robert and Dennis (2005) argue that media richness and social presence are linked and can be measured in two dimensions: time and space. Time can be either asynchronous or synchronous, and space co-located or distributed. The levels of social presence in relationship to media richness vary on the choice of media used (Figure 5). Therefore, synchronous forms of communication tend to offer high-to-moderate levels of richness, while asynchronous forms offer moderate-to-low levels of richness (Baehr, 2012).

Figure 5

Social Presence in Relationship to Richness of Media



Note. A visual depiction by the researcher of the levels of social presence in relationship with media choice.

According to Kuyath and Winter (2006), a communication medium's ability to provide a sense that the communication partner is immediately available "has been found to affect communication content, satisfaction, and the ability to communicate complex information" and that students find "a delay in responses from other students or the instructor to be the most frustrating characteristic of online classes" (p.68). Lean communications media, such as documents, email, and class announcements, are effective for routine messages of low equivocality or ambiguity, but as the content of a message becomes increasingly more ambiguous or complicated, a richer communication media such as face-to-face is required but is not always possible with online students (Kuyath & Winter, 2006). "The immediacy of a communication medium plays a role in its social presence such that greater delays in the communication media can contribute to a lower social presence" (Kuyath & Winter, 2006, p. 70). A study conducted by Conradie et al. (2014) measured student satisfaction related to media richness with Edmodo, a learning management system, found a significant correlation between immediate feedback, capacity to transmit multiple perspectives, and language variety, with student satisfaction. Lee et al. (2009) conducted three field studies to investigate workers' perceived use of email with avatars as compared to traditional non-avatar email. The findings indicated that users of avatar emails had lengthier messages than those who used traditional email (Lee et al., 2009). While online students and their on-campus counterparts may not have equal access to their instructors, unlike email, videoconferencing provides a medium for communication that makes the online students' experience comparable to that of the traditional face-to-face on-campus student with its capability to immediately transmit complex information.

Research studies that have measured both media richness and social presence have examined instant messaging (Guo et al., 2010; Kuyath & Winter, 2006; Oregon et al., 2018;

Tseng et al., 2019), recorded videos (Oregon et al., 2018), SMS text messaging (Oregon et al., 2018), traditional email and email with avatars (Guo et al., 2010; Kuyath & Winter, 2006; Lee et al., 2009), telephone (Kuyath & Winter, 2006), Social Networking Services (Guo et al., 2010), and learning management systems as communication mediums (Thien et al., 2013). Campbell (2006) explored videoconferencing in an office setting, and Dennis and Kinney (1998) studied the effects of media richness on decision making with two-person teams using computer-mediated and video communication with 132 undergrad students. Although previous studies measured both media richness and social presence, none of them explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by applying social presence theory and media richness theory to investigate the relationship between social presence, social space, sociability, and media richness. Table 1 provides a brief overview of the studies measuring media richness and social presence discussed in this research.

Table 1

Studies Measuring Both Media Richness and Social Presence

Author	Research	Media
Tseng et al. (2019)	Collected 247 responses from an online survey to examine if mobile instant messaging apps provide rich and instant information in employees' communication.	Instant messaging (IM)
Oregon et al. (2018)	Conducted a case study on a graduate sport management program to determine if the use of online social communities and richer media technologies, specifically Media Richness Theory (MRT) and Social Presence Theory, could increase retention.	Recorded videos, 15min synchronous videoconference, IM, and SMS text messaging
Thien et al. (2013)	Conducted a study on learning management systems with 536 undergrad students over the course of a semester and found Edmodo to be more appropriate in Vietnam due to low internet bandwidth concerns.	Learning management systems
Guo et al. (2010)	Conducted a study with 15 undergrad students that identified seven dimensions of motivation from the perspective of uses and gratifications (U&G), including information seeking, convenience, connectivity, problem-solving, content management, social presence, and social context cues.	Email, IM, the Web, forum, and Social Networking Services (SNS)
Lee et al. (2009)	Conducted three field studies of 36 business major students who had experienced both e-mail systems, avatar, and traditional e-mail.	Avatar email and traditional email
Campbell (2006)	Explored the impact of communication apprehension and participation on user perceptions of task and media characteristics in a videoconferencing context with 64 office staff.	Videoconferencing
Kuyath and Winter (2006)	Conducted a study to determine the levels of features associated with perceived social presence and perceived media richness for email, IM, and telephone with 72 high school and college-aged participants.	Email, IM, and telephone
Dennis and Kinney (1998)	Studied the effects of media richness on decision making in two-person teams using "new media" (i.e., computer-mediated and video communication) with 132 undergrad students.	Videoconferencing

Media Richness Scale

Each of the studies mentioned modified the media richness scale to measure the communication medium being studied. The media richness scale developed by Ferry et al. (2001) provides a means for measuring the perceptions of media richness. It enables researchers the ability to identify which characteristics of communication media that are most important for defining richness in practice (Ferry et al., 2001). The richer the medium used in the communication, the higher the capacity to transmit rich information. The lower the richness of the communication medium, the lower the capacity to transmit rich information. This study used the Ferry et al. (2001) media richness scale to measure students' perceptions of media richness with the use of synchronous videoconferencing as a communication medium in the online learning environment.

Conceptual Framework

A conceptual framework categorizes, describes, and links concepts, empirical research, and relevant theories by mapping the relationships among them to the study (Jabareen, 2009; Rocco & Plakhotnik, 2009). The conceptual framework comprises the underlying thinking, structure, plan, and practice of the entire research project (Kivunja, 2018). It is the logical conceptualization of the research project to include: research topic, problem to be investigated, research questions, literature review, applicable theories, methodology, methods, procedures, instruments, analysis, findings, recommendations, and conclusions (Kivunja, 2018). The conceptual framework for this study provided a comprehensive understanding of the interlinked concepts within social constructivist theory, social presence theory, and media richness theory. The concepts that situate this study focused on understanding the relationship between the

videoconferencing communication medium and the social interactions within the mediated Zoom environment from a student's perspective.

In educational settings that rely on computer-mediated or technology-mediated communication to facilitate online learning, social presence is considered to be an essential aspect of the learning experience since it affects participation and social interaction, which are both necessary for effective collaboration and knowledge construction (Garrison, 1997, 2007; Kreijns et al., 2011). As the use of technology to enhance teaching and learning continues to grow, emerging technologies and tools continue to become increasingly popular in education (Can et al., 2019). The social constructivist approach to learning emphasizes the need for shared meaning-making through peer-to-peer learning and interactions (Amineh & Asl, 2015). Using technologies in the online learning environment enables learners to interact and provide feedback to one another asynchronously and synchronously. Synchronous technologies such as chat rooms, instant messaging, and videoconferencing can add a human feel or real-life experience to the online learning environment, which provides a greater sense of social presence and community among the learners (Guo et al., 2010; Martin et al., 2017; McInnerney & Roberts, 2004). When meaningful positive social interactions occur, feelings of isolation and anonymity are reduced (McInnerney & Roberts, 2004), which may have otherwise resulted in student dissatisfaction, poor performance, and dropping out (Christopherson, 2007; Jun, 2005; Mulder, 2019; Shelton et al., 2017).

When meaningful social interaction occurs, learners demonstrate positive communication behavior and group cohesion by forming an impression of one another as the social interaction occurs. The process of impression formation determines the emergence of social presence. "As these impressions become increasingly salient through ongoing social interaction, a perception of

non-mediation -social presence- will emerge" (Weidlich & Bastiaens, 2017, p. 481). By creating a sense of face-to-face conversation feelings where the degree of a psychological sensation of the others in the communication appears to be 'real' (social presence), the development of a sound social space will occur (Kreijns et al., 2013). A "sound social space makes it possible for group members to gain a feeling of relatedness, group cohesiveness, trust, and respect for each other" (Kreijns et al., 2013, p. 239). The SIPS model by Kreijns et al. (2013) introduced a theoretical framework that consisted of three core elements: sociability, social space, and social presence that serve as a framework for systematic social computer-supported collaborative learning social interaction research. The SIPS model was selected for this study because it provided a framework for studying the social aspects of online learning.

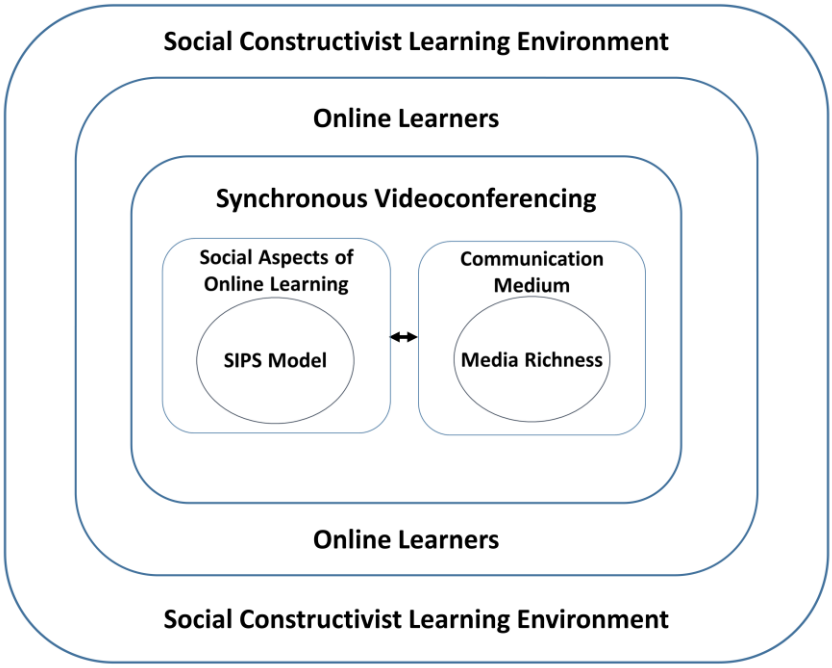
Media richness theory suggests that media vary in capacity to transmit rich information and that individuals seek to match the richness of a communication medium with the complexity of the communication task at hand (Daft & Lengel, 1983). Face-to-face communication is described as the richest medium because it provides immediate feedback, whereas emails and memos are described as "leaner" forms of media and are preferred for less complicated tasks (Daft & Lengel, 1983; Guo et al., 2010, p. 344). Computer-mediated communication technologies have been described as lacking nonverbal cues, which means that a lack of social presence and information richness affected the nature of interpersonal interaction via the communication media. The use of synchronous videoconferencing in online courses allows for social interaction in real-time and should support the theory of media richness.

For educators, it is imperative to understand what students want from the technologies they use for communicating and learning. When educators understand how students engage with and interact during the use of various media in learning contexts, they will be better able to

accommodate students' needs within their instructional strategies (Guo et al., 2010). This study investigated the use of synchronous videoconferencing to better understand how to increase its effective use in higher education for teaching and learning. The concepts and theories of social constructivism, social presence, and media richness were used as the conceptual framework to situate this study's focus on understanding how students engage and interact within the videoconferencing learning environment. Looking through the lens of social constructivism and applying social presence theory and media richness theory, this study investigated how strongly and in what direction social presence, social space, sociability, and media richness were related in a synchronous videoconferencing learning environment from the students' perspective (Figure 6). The concepts of social constructivism focused on the interaction between the learner and the environment collectively making meaning (Amineh & Asl, 2015). To capture the social interaction of the students, the Kreijns et al. (2013) SIPS model provided a framework for measuring the social aspects of the online learning environment. The scales within the SIPS model were used in this study to measure students' perceived social presence, social space, and sociability. The media richness scale was applied to measure students' perceived media richness of the synchronous videoconferencing communication medium.

Figure 6

Conceptual Framework



Note. Shown is a conceptual illustration by the researcher to provide a visual representation of how social presence, social space, sociability, and media richness are related in a synchronous videoconferencing learning environment.

Chapter Summary

This chapter discussed social constructivism, online learning, social software, social space, social presence theory, media richness theory, and the conceptual framework for this study. Social presence was discussed as an important construct in computer-mediated communication. It is hypothesized that social presence influences the degree of perceived learning and learning outcomes in online collaborative learning environments (Kreijns et al., 2018). Researchers have linked social presence to important variables such as satisfaction (Siriaraya & Ang, 2012) and perceived learning (Gunawardena & Zittle, 1997; Richardson & Swan, 2003), online retention rates (Muilenburg & Berge, 2005), and online social interaction

(Kreijns et al., 2004b). Communication media can differ in their ability to facilitate understanding and can be characterized as high or low in richness (Daft et al., 1987). A communication medium's ability to provide a sense that the communication partner is immediately available has been found to affect communication content, satisfaction, and the ability to communicate complex information (Kuyath & Winter, 2006). Students find delays in responses from their peers and instructors to be the most frustrating characteristic of online classes (Kuyath & Winter, 2006). Videoconferencing is a communication medium, high in richness, that makes the online students' experience comparable to that of their traditional face-to-face on-campus student counterparts. Although previous research has examined students' needs and online engagement in asynchronous and synchronous online classes, little is known of students' perceptions of social presence, social space, sociability, and media richness in a synchronous videoconferencing learning environment.

Chapter 3 - Methodology

This chapter will describe the research methodology and design. It will begin by highlighting the theoretical perspective, purpose of the research, the research question, a description of correlational research design, and a justification for its use in this research. An explanation of the population, sampling procedures, instrumentation, data collection, preparation, and analysis will also be discussed.

Theoretical Perspective

The theoretical perspective for this study applied the theories of social constructivism, social presence, and media richness to explore graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment. A theoretical perspective, or framework, is founded on already developed theories that help provide structure interpreting the meaning embedded within the data (Kivunja, 2018; Rocco & Plakhotnik, 2009). It provides the *lens* by which a study is developed; summarizes the concepts and theories that ground the research; and frames the inquiry for data analysis and interpretation (Kivunja, 2018; Varpio et al., 2020). The theoretical framework provides a structure for what to look for in the data and how the data fits together (Kivunja, 2018). The theories of social constructivism, social presence, and media richness provided structure which helped to inform the lens in which the data for this research was examined, analyzed, and interpreted.

This research applied the communication theories of social presence and media richness to better understand the relationship between the videoconferencing communication medium and the interactions within the mediated Zoom environment. Looking through the lens of Vygotsky's (1978) social constructivism theory, this study focused on testing the theories of social presence and media richness by investigating how strongly and in what direction social presence, social

space, sociability, and media richness were related in a synchronous videoconferencing learning environment. Applying Vygotsky's (1978) social constructivism theory emphasized the collaborative nature of learning by maintaining the idea that social interaction is central to learning and knowledge construction. Walther's (1993) media richness theory was applied to study the capacity of the videoconferencing medium to transmit rich information during communication. Short et al.'s (1976) social presence theory was applied to study the perceived physical realness of the communication partner. Social presence theory indicates that the realness of the perceived other is also increased when the richness of the communication medium is increased. This study used the Ferry et al. (2001) media richness scale to measure graduate students' perceived media richness of a synchronous videoconferencing communication medium, and the Kreijns et al. (2013) SIPS model was used to measure the students' perceived social aspects (sociability, social space, and social presence) within the Zoom learning environment.

Research Purpose

The purpose of this survey study was to test the theories of social presence and media richness as it related to students in the online videoconferencing learning environment. This correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related.

Research Question

The research question for this study was designed to explore students' perceptions on the social presence, social space, sociability, and media richness scales by investigating how

strongly and in what direction they were related in a synchronous videoconferencing learning environment. The research question and six null hypotheses underlying this research were:

RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

$H_0$1: Social presence is not related to social space in a synchronous videoconferencing learning environment.

$H_0$2: Social presence is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$3: Social presence is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$4: Social space is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$5: Social space is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$6: Sociability is not related to media richness in a synchronous videoconferencing learning environment.

Hypothesis Development

Media richness theory suggests that the communication efficiency between people is affected by the choice of media and the characteristics of the communication task. (Daft et al., 1987). The richer the communication medium, the higher the capacity to transmit rich information. Conversely, the lower the richness of the communication medium, the lower the capacity to transmit rich information. The richness of a medium is based on its capacity to facilitate shared meaning and is determined upon a blend of the following four criteria:

immediate feedback, multiple cues, language variety, and personal focus (Daft et al., 1987). Media providing same-time and same-place interaction are perceived to be higher in social presence and media richness than media providing different-time and different-place interaction (Robert & Dennis, 2005). The capacity to transmit multiple cues includes physical presence, voice inflections, body gestures, words, numbers, and graphic symbols (Daft et al., 1987; Sun & Cheng, 2007). Synchronous videoconferencing is media that provides same-time interaction with the capability to capture voice inflections, body gestures, words, numbers, and graphic symbols. The null hypotheses in this study were aligned with the research question (Appendix A) and were tested using data retrieved from the web-based Qualtrics survey.

Correlational Research Design

This study used a quantitative correlational survey approach. Correlational research explores relationships between existing variables (Suter, 2012). It measures individual differences on two or more variables and describes their linkage with a statistical summary. Correlational findings, however, do not imply cause-and-effect relationships (Suter, 2012). Correlational research begins with a hypothesis that probes the association between variables. Correlational hypotheses probe whether there is a variation in one variable as another variable changes its values (Reinard, 2006). The research design selected for this study was a cross-sectional study that utilized an electronic self-administered survey to examine the associations of variables. The quantitative data were collected from students participating in online classes that use videoconferencing as a communication medium. The source for data collection was an online survey using a Likert-type scale. The survey instrument in this study used items from the social presence scale, the social space scale, the sociability scale, and the media richness scale. Using a quantitative method for this study promoted an impartial and unbiased measurement of the data.

The data collected from the surveys provided a means for testing differences of variations, which allowed the researcher to measure the relationships between the independent and dependent variables.

Population

A population can include an entire group, objects, events, or measurements of the people, objects, or events that a researcher wants to draw conclusions about in a study (Boslaugh, 2007). The population for this research consisted of adult students enrolled in a midwestern university that had implemented the use of synchronous videoconferencing in their studies. Participant recruitment for this study specifically targeted students who were currently enrolled in a course using synchronous videoconferencing (Zoom) as part of their online learning experience. The types of degrees that the participants were pursuing was not a relevant factor in the recruiting process, nor was the length of time they had been a student at the university. In the Fall prior to this collection, there were approximately 1,100 graduate student enrollments. However, the number of graduate students using synchronous videoconferencing (Zoom) was unknown.

Sample Selection

A sample of a population is the specific group of individuals that a researcher collects data from (Boslaugh, 2007). A sample is representative of a population if the characteristics from the sample selection are present in the same way they are in the population (Fowler, 2009). Since it was not possible to get access to the entire student population to randomize the sample, this study used a nonprobability convenience sample instead. A nonprobability sample occurs when respondents are chosen based on their convenience and availability (Creswell & Creswell, 2017). Prior to collecting data, the effect size is necessary for estimating sample sizes needed to ensure statistical power (Salkind, 2007). An effect size also defines the degree to which the null

hypothesis is false (Salkind, 2007). A priori power analysis was conducted to compute the required sample size using G*Power 3.1.9.4 prior to collecting data. A priori analyses are performed during the planning process of the research project (Salkind, 2007). They allow the researcher to determine the sample size needed in order to reach the desired level of power (typically .80 in social science research). The statistical test to calculate the means using a one-sample case with the input parameters of two-tails, a medium effect size of .5, α err prob of 0.05, and power (1-β err prob) of 0.80 resulted in Df or 33, and a total sample size of 34.

Participant recruitment for this study specifically targeted adult students who were enrolled in a midwestern university using synchronous videoconferencing (Zoom) as a communication medium in their online learning experience. The recruitment process for this study was initiated by the researcher sending an introductory email that requested voluntary student participation in a quantitative survey study. The email was initially sent to the department chairs, who then distributed the email to instructors within the departments. The email, which contained a welcome message and the link to the anonymous online survey instrument, was then forwarded by the instructors to their students. A follow-up email solicitation was sent directly to the instructors several weeks after the initial email in an effort to encourage more student participation. The email contained a welcome message and a link to the anonymous online survey instrument. The first page of the survey contained the informed consent (Appendix B), and the last page provided a debrief statement to the student respondents. The inclusion requirement for this study was that the student participants were currently enrolled in a course using synchronous videoconferencing (Zoom) as part of their online learning experience. The exclusion requirement for this study was student participants who were not

currently enrolled in a course using synchronous videoconferencing (Zoom) as part of their online learning experience.

An initial total of 78 survey responses was recorded. All respondents were graduate students. Four declined to participate in the survey. Seventy-four decided to participate in the survey. Of those, 3 answered "Yes – I choose to participate" but didn't answer any additional questions; 3 did not answer any questions after answering their age; 2 stopped after question 12; 4 stopped after question 13; 1 stopped after question 15; and 1 stopped after question 17. The total excluded was 14. This left a total of 60 completed surveys, which were used for analysis.

Measures of effect can be utilized in both a priori and post hoc power analyses. Post hoc analyses are performed after the research has been conducted and can be used to assist in explaining any potential non-significant results (Salkind, 2007). For this study, the calculated post hoc analysis achieved power was .65 for the Pearson correlation with a sample size of 60. According to Cohen (1988), effect sizes can be categorized into small, medium, or large. Coefficients between .10 and .29 represent a small effect size, coefficients between .30 and .49 represent a medium effect size, and coefficients above .50 indicate a large effect size (Cohen, 1988). Effect size is a quantitative measure of the study's effect and indicates the practical significance of a research outcome (Schuele & Justice, 2006). Effect size measures are needed for interpreting statistical tests of significance and are the raw scores of a meta-analysis (Salkind, 2007). Cohen's standard indicated a large effect size for this study. A large effect size means that a research finding has practical significance, while a small effect size indicates limited practical applications (Schuele & Justice, 2006). A larger effect size indicates a stronger relationship between the two variables.

Survey Design

Surveys are used as a measurement device that creates quantitative data from a combination of questions and coding schemes that specify possible answers to those questions (Byrne, 2017b; Fowler, 2009). A survey design provides a quantitative description of trends, attitudes, opinions, and associations among variables of a population (Creswell & Creswell, 2017). Survey designs help researchers answer descriptive questions, questions about relationships between variables, and questions about predictive relationships between variables over time (Creswell & Creswell, 2017). This research employed a survey approach to make inferences about the relationship between media richness, social presence, social space, and sociability. The primary purpose of this cross-sectional study was to explore students' perceptions of social presence, social space, sociability, and media richness in a synchronous videoconferencing learning environment. This cross-sectional study utilized an electronic self-administered web-based survey to examine the associations of variables by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related.

Advantages of using web-based online surveys include the economy of the design, quick turnaround in data collection that is suitable for statistical analysis, and respondents can participate at their own convenience by deciding when and where to complete the survey (Byrne, 2017b; Fowler, 2009). Another advantage of using a web-based online survey tool is the researcher will not have access to the participants' email addresses, which guarantees participant anonymity (Byrne, 2017b; Fowler, 2009). An on-site paper and pencil survey collection method was not selected for this study due to the costliness and timeliness of the geographically dispersed locations of the online students. Lefever et al. (2007) suggest that collecting research

data through traditional methods by visiting institutions is costly and time-consuming, that using the internet to collect large amounts of data is instead more efficient and economical and can be completed within a relatively short timeframe.

Survey Item Construction

This research used a survey containing Likert-type scale questions. The distribution of the survey was administered using Qualtrics survey software. The cross-sectional survey was used to collect demographic data and questions related to perceived media richness, social presence, social space, and sociability. The demographic information regarding age, gender, ethnicity, and student status (graduate) was collected to determine if it was a representative sample of the target population and enhanced interpretation of the results (Appendix C). Demographic data is important to collect because they provide a broad understanding of the characteristics of a population, enhance interpretation of the results, and are necessary for determining whether the individuals in the study are a representative sample of the target population for generalization purposes (Asmal et al., 2022; Salkind, 2010).

After completing the demographic questions, and prior to completing the media richness, social presence, social space, and sociability scales, participants were asked eight additional questions that pertained to their use of Zoom in their class meetings (Appendix C). The questions inquired as to how often their Zoom classes met, how long they lasted, and whether the participants were satisfied or dissatisfied with their instructor and student interactions. Participants were also asked to rate their engagement in the Zoom sessions, what activities were included in the class meetings, how often their video was displayed during the Zoom meetings, and if seeing the faces and hearing the voices of others in class was important to them.

The survey item construction for this study relied on existing instruments (media richness scale, social presence scale, social space scale, and sociability scale). The four existing instruments were combined into one survey and were administered using Qualtrics, an online survey software tool. The survey contained 77 questions utilizing 5-point Likert-type questions. Multiple questions regarding each variable were included in the survey (Appendix C). The social presence, social space, sociability, and media richness scales consisted of phrases or statements in which the participants indicated the extent to which the phrase or statement was descriptive of their feelings at the time of taking the survey. The validity and reliability of each of the measures will be discussed in the following section.

Validity and Reliability

Validity and reliability are concepts used to evaluate the quality of research by indicating how well a method, technique, or test measures something (Creswell & Creswell, 2017). Validity is used to describe the accuracy of a measure and whether meaningful and useful inferences can be drawn from scores on the instruments (Creswell & Creswell, 2017). The three traditional forms of validity to look for: are content validity, predictive or concurrent validity, and construct validity. Reliability is used to describe the consistency or repeatability of an instrument (Creswell & Creswell, 2017). Threats to validity and reliability in educational research can include conceptual bias, design bias, sampling bias, and process bias (Oluwatayo, 2012). Conceptual bias arises from the faulty logic of the researcher, which leads to the faulty conceptualization of the research problem, interpretations, and conclusions. Design bias occurs when having a faulty design, methods, sampling procedures, and the use of inappropriate techniques of analysis. Sampling bias occurs when the sample does not represent the population

of interest. Process bias is the sum of all errors from the sampling method to data collection and analysis (Oluwatayo, 2012).

This research used four established instruments: the media richness scale, the social presence scale, the social space scale, and the sociability scale. The media richness scale was developed by Ferry et al. (2001) as a means of measuring the perception of richness that allows researchers the ability to identify characteristics of communication media that are most important for defining richness in practice. The SIPS model developed by Kreijns et al. (2004b) is comprised of the social presence scale, social space scale, and sociability scale and is used as a framework for measuring the social aspects of online learning. All of the scales used in this research are published, and permission was granted for use.

Media Richness Scale

The media richness scale provides a means of measuring the perceptions of richness while allowing researchers the ability to identify which characteristics of communication media are most important for defining richness in practice (Ferry et al., 2001). In an effort to provide a valid and reliable measurement tool for the perception of media, Ferry et al. (2001) developed an instrument for measuring perceptions of richness based on the definitions from the literature of the four characteristics of media richness as defined by Short et al. (1976), Daft and Lengel (1983), Webster and Trevino (1995), and Carlson and Davis (1998). The instrument was developed and tested extensively in two different studies with two different samples. The scale initially contained four dimensions of the variable: the ability of the medium to convey multiple cues through multiple channels (sight, sound, touch); its capacity for language variety (numeric data or pictures to convey a message); the capacity to provide timely feedback; and the degree of personalness. A total of 63 cases were used in the analysis. A confirmatory factor analysis

assuming four correlated factors using EQS (2) was conducted to examine the construct validity of the multi-item instrument. The final analysis resulted in a good fit to the data with an x^2=78.48 with 62 degrees of freedom (Ferry et al., 2001).

As an additional test of the discriminant validity of the items, a single factor model was constructed that forced 13 items remaining in the three-factor model to load on a single factor. The analysis resulted in an x^2=145.10 with 65 degrees of freedom. The resulting x^2 difference test (x^2diff=66.62, *df*=3) was significant (p<.001), confirming that the three-factor model is a better fit to the data than a one-factor model, which supported the discriminant validity of the 13 items. A repeated measures multivariate analysis of variance (MANOVA) was calculated using media as the repeated trials. Missing data across all measures and media resulted in a reduced sample size of 62 respondents. The multivariate Wilk's Lambda test for within-subjects effects resulted in an *F=208.40* with 9/59 *df,* which is significant beyond the p=.001 confidence level. Wilks' lambda is a test statistic commonly used in the one-way MANOVA (Allen, 2017). Univariate tests for multiple channels, immediacy of feedback, and personalness all indicated significant differences (at *p<.001)* across media (*F803.84, F-52.61,* and *F=87.48*) respectively, all with 3/183 *df* (Ferry et al., 2001). The results from the study were inconsistent with the other measures of media richness, which is why another study was needed (Ferry et al., 2001).

In the second Ferry et al. (2001) study, 161 people participated in a study of group decision media. A confirmatory factor analysis was conducted using only the first exposure to the media for each respondent. The model tested the 13 item, three-factor model that resulted from study 1. The three-factor model resulted in a very good fit to the data with an x^2=99.88 with 62 degrees of freedom (Ferry et al., 2001). The Bentler-Bonett fix index for the three-factor solution was 0.95, and the Comparative Fix index was 0.96, which indicated that both were a

very good fit of the three-factor model to the observed covariance matrix (Ferry et al., 2001). The coefficient alpha reliability estimates for multiple channels was .91, immediacy of feedback was .84, and personalness was also .84. As an additional test of the discriminant validity of the items, Ferry et al. (2001) constructed a single factor model forcing the 13 items remaining in the three-factor model to load on a single factor. The resulting x^2 difference test (x^2 diff – 522.46, *df*=3) was significant (p<.001), confirming that the three-factor model is a better fit to the data than a one-factor model, which supported the discriminant validity of the three factors. A repeated measures MANOVA was calculated using the media as the repeated trials. The multivariate Wilk's Lambda test for within-subjects effects resulted in an *F=49.33* with 6/384 *df,* which is significant beyond the *p=.001* confidence level. Univariate tests for multiple channels, immediacy of feedback, and personalness all indicated significant differences (at *p<.001)* across media (*F=138.47*, *F=69.78,* and *F=20.53* respectively, all with 3/194 *df*) (Ferry et al., 2001). A priori contrasts were calculated to compare face-to-face with each of the other media (email and GSS) by Ferry et al. (2001). The data in study 2 confirmed the three-factor structure of media richness using items measuring Multiple Channels, Immediacy of Feedback, and Personalness. The confirmatory factor analysis supported the convergent validity of items to discriminate among the three media richness constructs. The comparison of subscale measures for each of the media experienced by the respondents in study 2 confirmed that the three constructs differentiate across media (Ferry et al., 2001).

The results from both Ferry et al. (2001) studies showed strong evidence for the construct validity. The combined results of the two studies provided strong support for the usefulness of the media richness instrument. Since study 1 used a survey procedure and had a small sample size relative to the recommended limits of good factor analytic techniques, Ferry et al. (2001)

developed a setting in which they could assure a high number of respondents, so they developed study 2. In study 2, they retested their scale in a controlled setting, which allowed them to assess the validity of the instrument for differentiating across three different media while controlling for external factors through randomization.

This study used the Ferry et al. (2001) media richness scale (Table 2) to measure students' perceptions of media richness with the use of videoconferencing as a communication medium in the online learning environment. Items from the Ferry et al. (2001) media richness scale measured students' perceptions of the communication richness that videoconferencing provides by capturing its capacity for immediate feedback and transmitting multiple cues. Numerous studies have used and modified the language in the Ferry et al. (2001) media richness scale to fit the communication medium being used within their research studies. For instance, Tseng et al. (2019) used the scale to measure the richness of mobile instant messaging apps in employee communications, and Lee et al. (2009) used the scale to measure the richness of traditional email and avatar email. This study also modified the language in the Ferry et al. (2001) media richness scale to fit the communication medium used (videoconferencing). Item FB2 (Table 2) wording was modified to "When using Zoom, you can send/receive information immediately." Item FB3 wording was modified to "When using Zoom, you can immediately learn what others think about your ideas." Item FB5 (Table 2) wording was modified to "When using Zoom, you can immediately express your reactions to others."

Using a 5-point Likert-type scale with an attribute range of 5 to 1 (1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = always), this study used two of the three constructs from the Ferry et al. (2001) media richness scale (multiple channels and immediacy of feedback). The third construct (personalness) was removed since the Kreijns et al. (2020) social presence scale

measured items that were similar in scope (items PS1-PS5 in Table 2). In Q13 of the survey instrument (Appendix C), respondents were asked, “As you’re thinking of yourself in class using Zoom, please select a response that best describes how you feel.” Items pertaining to multiple channels and immediacy of feedback (Table 2) were measured on the media richness scale by the responses to Q13 on the survey instrument (Appendix C).

Table 2

Media Richness Scale

No. Item	Item
Multiple Channels	
MC1	To what extent can you send/receive information through spoken word?
MC3	To what extent can you understand others through voice inflection and intonations?
MC4	To what extent can you communicate (send/receive) through body language?
MC5	To what extent can you understand others by noticing their facial expressions or other nonverbal expressions?
Immediacy of Feedback	
FB1	To what extent can you know immediately what others in your group think about your ideas?
FB2	When you are able to express your reactions to others immediately, how long (on average) do you think it takes for them to receive your reactions?
FB3	On average, how long does it seem to take for you to learn what others think of your ideas?
FB5	On average, how long do you feel you have to wait to express your reactions to others?
~~Personalness~~	
~~PS1~~	~~When using this medium, to what extent do you sense the presence of your communications partner?~~
~~PS2~~	~~To what extent is this medium sociable or unsociable?~~
~~PS3~~	~~To what extent is this medium warm or cold?~~
~~PS4~~	~~To what extend is this medium personal or impersonal?~~
~~PS5~~	~~To what extent is this medium sensitive or insensitive?~~

Note. Items PS1-PS5 (personalness) were excluded because the Kreijns et al. (2020) social presence scale measured items similar in scope.

The Ferry et al. (2001) media richness scale was used to measure the constructs of Media Richness (Multiple Channels) and Media Richness (Immediacy Feedback). For this research (n = 60), a Cronbach alpha coefficient was calculated for the Media Richness scale and each of the two constructs (Table 3). The Media Richness scale, consisting of items MC1, MC3, MC4, MC5, FB1, FB2, FB3, and FB5, had a Cronbach's alpha coefficient of 0.87, indicating good reliability. The Cronbach's alpha coefficient was evaluated using the guidelines suggested by George and Mallery (2018) where > .9 excellent, > .8 good, > .7 acceptable, > .6 questionable, > .5 poor, and ≤ .5 unacceptable. Table 3 presents the results of the Media Richness scale reliability analysis.

Table 3

Cronbach's Alpha Coefficient for the Media Richness Scale

Scale	No. of Items	α	Lower Bound	Upper Bound
Media Richness	8	0.87	0.82	0.91

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Media Richness (Multiple Channels)

A Cronbach alpha coefficient was calculated for the Media Richness (Multiple Channels) items MC1, MC3, MC4, and MC5 of the Media Richness scale. Using the guidelines suggested by George and Mallery (2018), Cronbach's alpha coefficient of 0.83 indicated good reliability. Table 4 presents the results for the Media Richness (Multiple Channels) reliability analysis.

Table 4

Cronbach's Alpha Coefficient for Media Richness (Multiple Channels)

Scale	No. of Items	α	Lower Bound	Upper Bound
Multiple Channels	4	0.83	0.77	0.89

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Media Richness (Immediacy Feedback)

A Cronbach alpha coefficient was calculated for Media Richness (Immediacy Feedback), consisting of items FB1, FB2, FB3, and FB5 from the Media Richness scale. The Cronbach's alpha coefficient of 0.76 indicated acceptable reliability. Table 5 presents the results of the Media Richness (Immediacy Feedback) reliability analysis.

Table 5

Cronbach's Alpha Coefficient for Media Richness (Immediacy Feedback)

Scale	No. of Items	α	Lower Bound	Upper Bound
Immediacy Feedback	4	0.76	0.67	0.84

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Social Presence Scale

The social presence measure created by Short et al. (1976) used four semantic differential scales, but they never validated the scale. Although other social presence instruments had been developed, none of the instruments measured the physical realness of others as a single trait of interest. Meaning, that a robust scale for measuring perceptions of social presence was lacking. To fill the gap, Kreijns et al. (2020) developed the social presence scale by using the Rasch measurement model as a rigid construct validation method. The Rasch analysis was an iterative

process consisting of numerous steps (Kreijns et al., 2020). In the first series of the Rasch analysis on the set of 30 items revealed in the first and second step severe infit and outfit problems with two items of the set (Kreijns et al., 2020). The third step revealed that the scale had two dimensions: the unexplained variance in the first contrast was 4.94 Eigenvalue units, which corresponded to about five items. The Rasch analyses revealed that measuring the realness of the other in a mediated environment implied two distinct dimensions: awareness of others and proximity with others (Kreijns et al., 2020).

A Pearson correlation and disattenuated correlation of the first and third item clusters were 0.53 and 0.62. The findings suggested that while some items were measuring something else, there was still a moderate correlation between the items and other items. Kreijns et al. (2020) decided to continue with separate analyses with two sets of items; the first set contained 15 items and the second set contained 12 items. The items of the first set referred to awareness of others in mediated communication (15-item set), and the items of the second set referred to the proximity with others in mediated communication (12-item set) (Kreijns et al., 2020). The analysis indicated that the person measured as measured by the two item sets correlated with 0.63, whereas the disattenuated correlation was 0.71, which was substantial but not redundant. The findings concluded that there were indeed two distinct dimensions. Therefore, Kreijns et al. (2020) conducted separated Rasch analyses of the two dimensions. A separate series of Rasch analyses were performed on the awareness 15-item set (Kreijns et al., 2020). The Pearson correlation between the two sets of item calibrations was 0.998, and the disattenuated correlation 1.0. The Pearson correlation between the two sets of person measures was 0.999, and the disattenuated correlation 1.0. Pearson correlation and disattenuated correlation of the first and third clusters were 0.53 and 0.65, which indicated a moderate correlation. The conclusion was

that the awareness 15-item set was a unidimensional Rasch measurement (Kreijns et al., 2020). The average step category calibrations were ordered and increased monotonically, as did the step thresholds (Kreijns et al., 2020). The item rating scale step numbers are all in ascending order, which positively adds to the construct validity of the measure (Kreijns et al., 2020).

A separate series of Rasch analyses were also performed on the proximity 12-item set (Kreijns et al., 2020). The Pearson correlation between the two sets of item calibrations was 0.986, and the disattenuated correlation 1.0. The Pearson correlation between the two sets of person measurements was 0.997, and the disattenuated correlation 1.0. Pearson correlations and disattenuated correlation of the first and third item clusters were 0.64 and 0.82, indicating a high correlation between the first and third item cluster. The conclusion was that the proximity 12-item set is a unidimensional Rasch measurement model (Kreijns et al., 2020). The average step category calibrations were ordered and increased monotonically, as did the step thresholds. No irregularities were observed. The item rating scale step numbers are all in ascending order, which positively adds to the construct validity of the measure (Kreijns et al., 2020). The Rasch analyses concluded that the social presence scale assesses social presence across two distinct dimensions: 'awareness of the others' and 'proximity to the others.'

To measure students' perceived social experiences with the use of videoconferencing in the online learning environment, the Kreijns et al. (2020) social presence scale (Table 6) was used. The social presence scale measured students' awareness of others and proximity with others (impression formation). The process of impression formation determines the emergence of social presence, and "as these impressions become increasingly salient through ongoing social interaction, a perception of non-mediation -social presence- will emerge" (Weidlich & Bastiaens, 2017, p. 481). Using a 5-point Likert-type scale with an attribute range of 5 to 1 (1 = *totally*

disagree, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*), items A01-A15 (Table 6) was measured by the response to questions in Q14 on the survey instrument (Appendix C), and items P01-P12 (Table 6), was measured by the response to questions in Q15 (Appendix C). Each question began with asking respondents, "As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel." Table 6 presents the Kreijns et al. (2020) social presence scale.

Table 6

Social Presence Scale

No. Item	Item
Preamble: In this learning environment…	
Awareness of the others	
A01	…I only can get a glimpse of my fellow students
A02	…I can form distinct impressions of some of my fellow students
A03	…I know my fellow students are here too, but I do not 'see' them
A04	…my fellow students are not abstract at all, which was what I first expected
A05	…I feel my fellow students are far away
A06	…I do not know who my fellow students are
A07	…it feels as if I deal with 'real' persons and not with abstract anonymous persons
A08	…nothing more than that I am aware of my fellow students
A09	…it feels as if all my fellow students are 'real' physical persons
A10	…nothing more than that I feel distant from my fellow students
A11	…it feels like none of my fellow students are here
A12	…I am aware of my fellow students
A13	…my fellow students do not really live for me
A14	…I am the only one present
A15	…I feel none of my fellow students want to communicate with me
Proximity with the others	
P01	…I feel that I can see my fellow students right in the eyes
P02	…I feel my fellow students are very near to me
P03	…I constantly feel that my fellow students are around
P04	…it feels as if all my fellow students and I are in the same room
P05	…it feels as if we are a face to face group
P06	…it feels as if all my fellow students and I are in close proximity
P07	…I am sure my fellow students are here too
P08	…I can really see my fellow students as if they were in front of me
P09	…I can make a clear picture of all of my fellow students
P10	…I feel a sense of my fellow student's presence
P11	…I strongly feel the presence of my fellow students
P12	…all of my fellow students feel that I am a 'real' physical person

The Kreijns et al. (2020) social presence scale was used to measure students' perception of Social Presence (Awareness) and Social Presence (Proximity) in a videoconferencing online

learning environment. A Cronbach alpha coefficient was calculated for the Social Presence scale and each of the dimensions of the scale: awareness and proximity. The Social Presence scale consisting of items A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, and P12 had a Cronbach's alpha coefficient of 0.94, indicating excellent reliability. Table 7 presents the results of the Social Presence scale reliability analysis.

Table 7

Cronbach's Alpha Coefficient for the Social Presence Scale

Scale	No. of Items	α	Lower Bound	Upper Bound
Social Presence	27	0.94	0.93	0.96

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Social Presence (Awareness)

A Cronbach alpha coefficient was calculated for the Social Presence (Awareness) consisting of items A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, and A15 from the Social Presence scale. The items had a Cronbach's alpha coefficient of 0.85, indicating good reliability. Table 8 presents the results of the Social Presence (Awareness) reliability analysis.

Table 8

Cronbach's Alpha Coefficient for Social Presence (Awareness)

Scale	No. of Items	α	Lower Bound	Upper Bound
Social Presence (Awareness)	15	0.85	0.81	0.89

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Social Presence (Proximity)

A Cronbach alpha coefficient was calculated for Social Presence (Proximity) consisting of items P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, and P12 from the Social Space scale. The items had a Cronbach's alpha coefficient of 0.95, indicating excellent reliability. Table 9 presents the results of the Social Presence (Proximity) reliability analysis.

Table 9

Cronbach's Alpha Coefficient for Social Presence (Proximity)

Scale	No. of Items	α	Lower Bound	Upper Bound
Social Presence (Proximity)	12	0.95	0.93	0.96

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Social Space Scale

The social space scale developed by Kreijns et al. (2004a) is a self-reporting measure for assessing the perceived quality of social space in a learning group. The scale consists of two parts: feelings regarding their own behavior and feelings regarding the other group members' behavior in the group (Kreijns et al., 2004a). Previous social space scales measured varying degrees of aspects of a set of variables, which included social space, social climate, social presence, sociability, and social environment. The social space scale developed by Kreijns et al. (2004a) was designed to measure social space alone. To measure social space, data was collected from 186 students in three distance education courses. To validate the social space scale, Kreijns et al. (2004a) selected four measures that dealt with constructs related to social space or aspects of it. For validation, they used Campbell and Fiske's criterion that related constructs in a nomological network to exhibit moderate to high correlations, but not too high since correlation could be interpreted as an equivalency. As a result, 44 items were constructed that deliberately

overrepresented the social space construct. They removed redundant items in the refinement process as well as items that were psychometrically 'rejected.' To determine the dimensionality of the social space scale, Kreijns et al. (2004b) applied a factor analysis on all 174 items of the questionnaire. Of the 174 items, 44 items were associated with the social space scale and were considered to be one-dimensional. The total sample was 79 students, which was considered relatively low, considering the 174 items on the questionnaire. The factor analysis revealed 37 components possessing eigenvalues of 1.0 or greater. The criterion revealed six components, which a scree test revealed a clear break after the third component. The majority of the initial items loaded higher than .40, which meant the construct was not one-dimensional. The two components were interpreted as the *Positive Group Behavior*-dimension and *Negative Group Behavior*-dimension (Kreijns et al., 2004a).

The 44 item social space scale (Table 10) was refined in four steps (Kreijns et al., 2004a). The first step removed the item loads on component two or three, which were less than 40 (5 items), items that loaded higher on the other components (2 items). The second step was a semantic examination of the items. Items with semantically identical items were removed (11 items). The third step removed items not associated with positive or negative group behavior (4 items) or were identical to another item within the scale (1 item). The fourth step aimed to balance the items in the dimensions with no more than ten items in each dimension (1 item removed). A second-factor analysis was performed on the final 20 items, which focused on a two-factor solution. The scree plot revealed a clear break after the second component, confirming the two-dimensionality of the social space scale. Both components showed a strong loading. The two-factor solution explained 54.59% of the total variance (first component 30.14%, and second 24.45%). Cronbach's alpha was calculated for each factor. The result was

.81 for the scale, with .92 representing the positive group behavior dimension and .87 representing the negative group dimension, which showed a high internal consistency. A Pearson bi-variate correlation (two-tailed) analysis was applied to the aggregate scores. The low correlations with respect to the negative group behavior were explained by the fact that the other measures address positive experiences rather than negative ones, which meant no relationship with the negative group behavior dimension of the social space scale. Lastly, Kreijns et al. (2004b) applied factor analysis on the 20 items of the refined social space scale together with items of each of the other scales four times.

This research used the Kreijns et al. (2004b) social space scale to measure students' perceived positive and negative group behavior with the use of videoconferencing in the online learning environment. As described by Kreijns et al. (2013), "sound social space makes it possible for group members to gain a feeling of relatedness, group cohesiveness, trust, and respect for each other" (p. 239). Items Q1-12 (Table 10) on the social space scale were measured by the response to the questions in Q16 on the survey instrument (Appendix C) using a 5-point Likert-type scale with an attribute range of 5 to 1 (1= *not applicable at all*; 2 = *rarely applicable*; 3 = *moderately applicable*; 4 = *largely applicable*; 5 = *totally applicable*). Items Q13-20 (Table 10) on the social space scale were measured by the response to the questions in Q17 on the survey instrument (Appendix C) using a 5-point Likert-type scale with an attribute range of 5 to 1 (1= *very rarely or never* (on the average less than once a month); 2 = *rarely* (on average once a month); 3 = *sometimes* (on average a few times a month); 4 = *often* (on the average a few times a week); 5 = *always or very often* (on the average a few times a day). Each question began with asking respondents, "As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel." Table 10 presents the Kreijns et al. (2004b) social space scale.

Table 10

Social Space Scale

No. Item	Item
Social Space Scale: Positive Group Behavior	
Q1	Group members felt free to criticize the ideas, statements, and/or opinions of others
Q2	We reached a good understanding on how we had to function
Q3	Group members ensured that we kept in touch with each other
Q4	We worked hard on the group assignment
Q5	I maintained contact with all the other group members
Q6	Group members gave personal information on themselves
Q7	The group conducted open and lively conversations and/or discussions
Q8	Group members took the initiative to get in touch with others
Q9	Group members spontaneously started conversations with others
Q10	Group members asked others how the work was going
Social Space Scale: Negative Group Behavior	
Q11	Group members felt that they were attacked personally when their ideas, statements and/or opinion were criticized
Q12	Group members were suspicious of others
Q13	Group members grew to dislike others
Q14	I did the lion's share of the work
Q15	Group members obstructed the progress of the work
Q16	Group members were unreasonable
Q17	Group members disagreed amongst each other
Q18	The group had conflicts
Q19	Group members gossiped about each other
Q20	Group members did not take others seriously

Social Space (Positive Group Behavior)

With the response data from this survey (n = 60), a Cronbach alpha coefficient was calculated for the Social Space (Positive Group Behavior) items in this research. The items had a Cronbach's alpha coefficient of 0.91, indicating excellent reliability. Table 11 presents the results of the Social Space (Positive Group Behavior) reliability analysis.

Table 11

Cronbach's Alpha Coefficient for Social Space (Positive Group Behavior)

Scale	No. of Items	α	Lower Bound	Upper Bound
Social Space (Positive)	10	0.91	0.88	0.93

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Social Space (Negative Group Behavior)

A Cronbach alpha coefficient was calculated for the Social Space (Negative Group Behavior) items in this study. The items had a Cronbach's alpha coefficient of 0.81, indicating good reliability. Table 12 presents the results of the Social Space (Negative Group Behavior) reliability analysis.

Table 12

Cronbach's Alpha Coefficient for Social Space (Negative Group Behavior)

Scale	No. of Items	α	Lower Bound	Upper Bound
Social Space (Negative)	10	0.81	0.75	0.87

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

Sociability Scale

Kreijns et al. (2004b) produced an instrument for determining sociability, and Kreijns et al. (2007) refined the sociability scale. Sociability is a factor that influences social interaction. The greater the sociability of an environment, the more likely social interaction will occur, which will result in the emergence of a sound social space (Kreijns et al., 2007). The sociability scale is a self-reporting questionnaire for measuring the perceived sociability of the CSCL environment. The construction of the items is based upon group awareness, communication, and potential for facilitating the creation of a community of learning (Kreijns et al., 2004b). The sociability scale was refined in three steps. The first step removed 24 items from the 34 initial items because they assessed the usefulness of a CSCL environment. In the second step, a factor analysis (Principal Component Analysis, no rotations) was performed on the remaining test items. The factor analysis revealed that the sociability scale is one-dimensional (using the scree test of Catell). During the second step, other items were removed that did not load higher than 0.40 exclusively on the first factor (no items removed). The third step was used to reduce the remaining test items further to ten without losing explained total variance. The factor explained 58.52% of the total variance. To test the internal consistency and validity of the scale, Cronbach's alpha was 0.92, which revealed a high internal consistency. A Pearson bi-variate correlation (two-tailed) analysis was conducted on the test items. Lastly, a Principal Component Analysis using Varimax rotation on the 10 test items of the sociability scale was conducted (Kreijns et al., 2007).

For this research, the items from the Kreijns et al. (2007) sociability scale measured students' perceived social experiences with the use of videoconferencing in the online learning environment. In Q18 (Appendix C), respondents were asked, "As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel." Items Q1-10 on the

sociability scale was measured by the response to questions in Q18 on the survey instrument (Appendix C) using a 5-point Likert-type scale with an attribute range of 5 to 1 (1= *not applicable at all*; 2 = *rarely applicable*; 3 = *moderately applicable*; 4 = *largely applicable*; 5 = *totally applicable*). Survey items with "CSCL environment" in this study were replaced with the words "learning environment" (Appendix C). Table 13 presents the Kreijns et al. (2007) sociability scale.

Table 13

Sociability Scale

No. Item	Item
1	This CSCL environment enables me to easily contact my teammates
2	I do not feel lonely in this CSCL environment
3	This CSCL environment enables me to get a good impression of my teammates
4	This CSCL environment allows spontaneous informal conversations
5	This CSCL environment enables us to develop into a well-performing team
6	This CSCL environment enables me to develop good work relationships with my teammates
7	This CSCL environment enables me to identify myself with the team
8	I feel comfortable with this CSCL environment
9	This CSCL environment allows for non-task-related conversations
10	This CSCL environment enables me to make close friendships with my teammates

The Kreijns et al. (2007) sociability scale was used to measure students' perceived social experiences with the use of videoconferencing in the online learning environment. A Cronbach alpha coefficient was calculated for the Sociability items used in this study. The items had a Cronbach's alpha coefficient of 0.94, indicating excellent reliability. Table 14 presents the results of the reliability analysis for Sociability.

Table 14

Cronbach's Alpha Coefficient for Sociability

Scale	No. of Items	α	Lower Bound	Upper Bound
Sociability	10	0.94	0.92	0.96

Note. The lower and upper bounds of Cronbach's α were calculated using a 95% confidence interval.

For this study, using the guidelines suggested by George and Mallery (2018), the instruments' reliability analysis ranged from good to excellent. The reliability analysis for Media Richness (Multiple Channels) indicated good; Media Richness (Immediacy Feedback), acceptable; Social Presence (Awareness), good; Social Presence (Proximity), excellent; Social Space (Positive Group Behavior), excellent; Social Space (Negative Group Behavior), good; and Sociability, excellent. Comparing the reliability analysis of each of the scales used in this study to the reliability analysis of the referenced established instruments, Social Presence (Proximity) and Sociability indicated higher levels of reliability. A Comparison of Cronbach's alpha coefficient for the established instruments and for this study is summarized in Table 15.

Table 15

Cronbach's Alpha Coefficient Comparisons

Variable	Established Instrument		This Research	
Media Richness	Multiple channels	0.92	Multiple channels	0.83
	Immediacy feedback	0.90	Immediacy feedback	0.76
Social Presence	Awareness of others	0.92	Awareness of others	0.85
	Proximity with others	0.94	Proximity with others	0.95
Social Space	Positive behavior	0.92	Positive behavior	0.91
	Negative behavior	0.87	Negative behavior	0.81
Sociability		0.92		0.94

The validity and reliability of the survey used in this study was measured using Cronbach's alpha. A scale's internal consistency is quantified by Cronbach's alpha value that ranges between 0 and 1 (Creswell & Creswell, 2017). Taber (2018) suggests alpha values are described as: excellent (0.93–0.94), strong (0.91–0.93), reliable (0.84–0.90), robust (0.81), fairly high (0.76–0.95), high (0.73–0.95), good (0.71–0.91), relatively high (0.70–0.77), slightly low (0.68), reasonable (0.67–0.87), adequate (0.64–0.85), moderate (0.61–0.65), satisfactory (0.58–0.97), acceptable (0.45–0.98), sufficient (0.45–0.96), not satisfactory (0.4–0.55) and low (0.11). Optimal values range between 0.7 and 0.9 (Creswell & Creswell, 2017). For this study, Cronbach's alpha coefficient for Media Richness (Multiple Channels) was 0.83; Media Richness (Immediacy Feedback) 0.76; Social Presence (Awareness) 0.85; Social Presence (Proximity) 0.95; Social Space (Positive Group Behavior) 0.91; Social Space (Negative Group Behavior) 0.81; and Sociability 0.94. Each of the measures Cronbach's alpha values were within optimal ranges with values that range between 0.7 and 0.9 (Creswell & Creswell, 2017). A summary of the variables, descriptions, items and Cronbach's alpha for each of the scales used in this study is summarized in Table 16.

Table 16

Variables, Descriptions, Items, and Cronbach's Alpha

Variable	Description	Items	Cronbach's Alpha	
Media Richness	A communication medium's capacity to facilitate the processing of rich information.	8	Multiple channels Immediacy of feedback	0.83 0.76
Social Presence	The psychological phenomenon that the other is perceived 'real' in the communication.	27	Awareness of others Proximity with others	0.85 0.95
Social Space	The perceived network of interpersonal relationships among group members.	20	Positive group behavior Negative group behavior	0.91 0.81
Sociability	The perceived quality of the learning environment to facilitate social interaction.	10		0.94

Pilot Study

Prior to conducting the research, a pilot study was conducted with participant volunteers in order to uncover any unforeseen issues. The pilot study was conducted with a group of graduate students enrolled in a midwestern university who had been taking synchronous videoconferencing Zoom classes during the semester of Fall 2019. A link to the survey was provided to the participants via email that allowed the respondents to complete their responses by clicking on an online form where the data was directly collected by the Qualtrics survey tool. The anonymous data was then directly processed into data storage for the researcher to retrieve. Piloting a survey occurs under realistic conditions and examines all survey procedures, and can help researchers determine whether a study is feasible, worthwhile and if survey items should be edited, dropped, or retained (Colbert et al., 2019; Hassan et al., 2006). The purpose of the pilot study for this research served to test research protocols, data collection instruments, sample recruitment strategies, and other research techniques in preparation for the larger main study.

According to Chaudhary and Israel (2015), there is no prescribed sample size for a pilot test. Instead, the decision is made by the researcher based on available time and budget. However, larger sample sizes are recommended to achieve more robust results (Chaudhary & Israel, 2015). With a primary focus of estimating average values and variability for planning larger subsequent studies, Hill (1998) recommends 10 to 30 participants for a pilot study, and Julious (2005) and Moore et al. (2011) recommend at least 12 participants for a pilot study sample size. A well-organized and documented pilot study helps to improve the validity, reliability, accuracy, and efficiency of the main study (Ruel et al., 2015). However, even a well-designed and successfully executed pilot study cannot predict nor give an estimate of a response rate for the full-scale main study (Ruel et al., 2015). The pilot study for this research used a sample size of six participants. Each of the six participants of the pilot study was asked an additional five questions upon completing the survey. The additional questions pertained specifically to the survey design, flow and clarity of the questions, structure and format of the survey, instances of confusion, and survey length. With the participant volunteers' feedback on the clarity of questions, the phrase "When using Zoom" was added to the beginning of three questions in Q13 and two questions in Q14 of the main study (Appendix C).

Protection of Human Subjects

The importance of ethical behavior and how the participants should be treated was emphasized by Creswell and Creswell (2017) with regard to conducting research that includes participants. Prior to the collection of data for this study, the researcher gained human subjects' approval from the Institutional Review Board (IRB) at Kansas State University before contacting the participants (Appendix D). Data collection began after receiving IRB approval, and strict

adherence to the ethics of human research policies of the IRB as outlined by Kansas State University was followed.

The survey results were anonymous. No identifying information of individual participants was collected, nor were the individual responses in any way linked with the participants' identities. Terms of participation were explained in the informed consent form (Appendix B), which was included in the introductory message of the online survey. The informed consent form explained that this project was for research, that participation in the research was voluntary, and that all participants had the right to withdraw consent at any time without explanation, penalty, or loss of benefits or academic standing. Participants were also debriefed at the completion of the survey and were informed that the research results would be available to them upon request. The anonymous data was downloaded and secured on a password-protected local hard drive. All electronic documents will be maintained in a password-protected electronic format for five years after publication on a hard drive and stored in a locked cabinet. After five years, the information will be deleted and removed from the hard drive.

Data Collection

Data collection took place from March 17, 2021, to May 18, 2021. The recruitment process for this study relied on department chairs and instructors to distribute the survey invitation email within their departments. The email, which contained a welcome message and the link to the anonymous online survey instrument, was initially sent to three department chairs in the College of Education on March 17, 2021, and was then forwarded by the department chairs to instructors within their departments. The instructors then forwarded the email to their students. Due to a low response rate, on April 9, 2021, the researcher sent a reminder email directly to the instructors requesting their support in gaining additional student responses. After

receiving a couple of emails from students stating that they could not open the survey link in the email, the researcher sent a follow-up email on April 16, 2021, that included the corrected survey link.

Survey respondents consisted of adult students from the College of Education who were currently enrolled in a midwestern university course that used synchronous videoconferencing Zoom as a communication medium in their online learning experience. The survey utilized a Likert-type scale and was administered via Qualtrics. Four declined to participate in the survey; 74 decided to participate in the survey; 3 answered "Yes – I choose to participate," but didn't answer any additional questions; 3 did not answer any questions after answering their age; 2 stopped after question 12; 4 stopped after question 13; 1 stopped after question 15; and 1 stopped after question 17; leaving a total of 60 completed surveys. The survey closed, and the data were collected on May 23, 2021.

Data Preparation

Data preparation consists of cleaning and transforming the raw data prior to analysis (Allen, 2017; Salkind, 2010). For this study, the preliminary data preparation steps consisted of checking the data for accuracy, handling missing data, and checking for outliers. The raw data were exported from Qualtrics into an Excel spreadsheet prior to data cleaning and conducting analysis in SPSS and Intellectus Statistics. Salkind (2010) suggests that data cleaning is an important part of the data preparation process. Data cleaning refers to detecting and modifying, replacing, or deleting incomplete, incorrect, improperly formatted, duplicated, or irrelevant records (Allen, 2017). Data cleaning focuses on detecting and removing all major inconsistencies within the data, which provides a data set that allows for accurate analysis (Allen, 2017). Steps to data cleaning include analysis (detecting errors and inconsistencies), removing duplicate entries,

reviewing data for illegal values, reviewing data for missing values, and harmonizing the data (Allen, 2017). After uploading the data into SPSS and Intellectus Statistics, duplicate values and columns that were not needed were deleted. An ID variable was added, so each anonymous participant respondent was identifiable with a number, all variables were named, and partially completed responses were filtered out. Although removing 14 responses with missing data reduced the sample size available for analysis to 60, missing and erroneous data can create significant problems to the reliability and validity of a study's outcome (Salkind, 2010). The Likert-type scaled items were recoded from string format to numeric format as needed, in addition to identifying the inverted Likert-type scale items that needed to be reverse scored.

Data Analysis

The quantitative data collected from the participants was evaluated using descriptive and inferential statistics to evaluate the research question and hypotheses. There are two strategies for engaging with quantitative data: exploration and explanation (Byrne, 2017a). Exploration looks at the data to see what they are telling you. Explanation consists of having a hypothesis or set of hypotheses that are developed in advance prior to engaging with the particular dataset on which they will be tested (Byrne, 2017a; Salkind, 2010). The data analysis for this correlational cross-sectional study sought to explore students' perceptions on the social presence, social space, sociability, and media richness scales by investigating how strongly and in what direction they were related in a synchronous videoconferencing learning environment. The instrument used in this research to collect the quantitative data was an electronic self-administered cross-sectional web-based survey. A cross-sectional survey is used to collect data at a single point in time. It measures the outcome and the exposures in the study participants at the same time (Creswell & Creswell, 2017).

Descriptive statistics were obtained on survey items related to demographic data such as age, ethnicity, gender, and student status (graduate). Descriptive statistics are used to describe or summarize the data using figures and simple graphs that serve to summarize the contents of a variable (Knapp, 2017). They provide summaries of the data and are used as an exploratory method to examine the variables of interest before conducting inferential statistics on them. Descriptive statistics are useful for describing the basic features of data and may help to manage the data and present it in a summary table (Knapp, 2017). Continuous variables can be summarized using the nine descriptive statistics: number (*n*), mean, median, mode, standard deviation, variance, minimum, maximum, and range. Continuous variables can be depicted graphically using a histogram with a normal curve, and categorical variables can be graphically depicted using a simple bar chart or pie chart (Knapp, 2017).

Prior to analyzing the raw data, a value or score was added to the data, thereby assigning a numeric value to each response. The data were assessed for errors and missing data prior to entering it into SPSS. Analysis of the survey data was completed using SPSS data analysis software and Intellectus Statistics online computer software to run descriptive and parametric statistics (Intellectus Statistics, 2021). The two types of factor analysis are exploratory and confirmatory (Pett et al., 2003; Schreiber et al., 2006). Exploratory factor analysis is used when the researcher does not know how many factors are necessary to explain the interrelationships among a set of characteristics, indicators, or items. Confirmatory factor analysis is used to assess the extent to which the hypothesized organization of a set of identified factors fit the data (Pett et al., 2003; Schreiber et al., 2006). Factor analyses were previously conducted on the established instruments used in this study, as noted earlier, to assess the construct validity of each of the survey instruments. Factor analysis is used for theory and instrument development, assessing the

construct validity of an established instrument, and identifying underlying factors behind a set of data (Pett et al., 2003).

Cohen's standard was used to evaluate the strength of the relationships. According to Cohen (1988), effect sizes can be categorized into small, medium, or large. Coefficients between .10 and .29 represent a small effect size, coefficients between .30 and .49 represent a moderate effect size, and coefficients above .50 indicate a large effect size (Cohen, 1988). Cohen's *d* is one of the most common ways to measure effect size and can take on any number between 0 and infinity (Schuele & Justice, 2006). Effect size is a measure of the association or strength between two variables (Salkind, 2007). There are two types of effect size measures: measures of standardized or relative mean differences and measures of relationship or correlation (Salkind, 2007). Effect size is used to describe the degree to which the null hypothesis is false and is important for interpreting statistical tests of significance (Salkind, 2007). The larger the effect size, the stronger the relationship between the two variables.

Nonparametric tests examine the association between variables and measure the strength of association between two variables of the type using ordinal data (Byrne, 2017a; Scott & Mazhindu, 2005). Nonparametric tests can be used on: data collected using ordinal and nominal scales of measurement, data not normally distributed, small samples, and samples not randomly selected (Byrne, 2017a; Scott & Mazhindu, 2005). A parametric test was used in this study to look at the association between variables and measure the strength of association between the variables. The parametric test used in this study was the Pearson's correlation coefficient, which has four assumptions that the data must meet in order to have a valid result: the variables are continuous (interval or ratio level); there is a linear relationship between the variables; there are no significant outliers; and the variables should be approximately normally distributed (Byrne,

2017a; Scott & Mazhindu, 2005). The Pearson's correlation was used to investigate whether a relationship existed between social presence, social space, sociability, and media richness, as indicated in the Research Question.

To test the assumption of normality, Skewness and Kurtosis were applied to Media Richness, Social Presence, Social Space, and Sociability. Kurtosis, skewness, and their standard errors are common univariate descriptive statistics that measure the shape of the distribution (Lewis-Beck et al., 2004; Westfall & Henning, 2013). Skewness is a measure of the symmetry in a distribution. A symmetrical dataset will have a skewness equal to 0 (Lewis-Beck et al., 2004; Westfall & Henning, 2013). Skewness measures the relative size of the two tails. Positive skewness indicates a long right tail, while negative skewness indicates a long left tail (Lewis-Beck et al., 2004; Westfall & Henning, 2013). If skewness is less than -1 or greater than 1, the distribution is highly skewed. If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution is moderately skewed. If skewness is between -0.5 and 0.5, the distribution is approximately symmetric. Kurtosis describes the height and sharpness of the central peak by measuring the tail behavior of a distribution (DeCarlo, 1997). Positive kurtosis signifies a distribution that is more prone to outliers. Negative kurtosis implies a distribution is less prone to outliers. Kurtosis is a measure of the combined sizes of the two tails (DeCarlo, 1997). If the kurtosis is greater than 3, the dataset has heavier tails than a normal distribution (Lewis-Beck et al., 2004; Westfall & Henning, 2013). If the kurtosis is less than 3, the dataset has lighter tails than a normal distribution. If either of these values for skewness or kurtosis are less than ±1.0, the skewness or kurtosis for the distribution is not outside the range of normality; the distribution can be considered normal (Lewis-Beck et al., 2004; Westfall & Henning, 2013). If the values are greater than ±1.0, the skewness or kurtosis for the distribution is outside the range of normality;

the distribution cannot be considered normal (Lewis-Beck et al., 2004; Westfall & Henning, 2013). Acceptable values of skewness fall between -3 and +3, and kurtosis is appropriate from a range of -10 to +10 (DeCarlo, 1997).

Since the correlation coefficient does not show whether the relationship is statistically significant, a test statistic is needed to determine the degree of confidence that the relationship is truly representative of the population (Allen, 2017). A test for statistical significance examines whether the null hypothesis is confirmed or rejected (Byrne, 2017a; Salkind, 2010). Statistical significance shows that an effect exists in a study, while practical significance shows that the effect is large enough to be meaningful in the real world (Schuele & Justice, 2006). Statistical significance is denoted by *p*-values, and practical significance is represented by effect sizes (Schuele & Justice, 2006). The probability of Type I error in hypothesis testing is controlled by the chosen level of significance and is commonly represented by alpha (α) (Salkind, 2010). The most commonly used alpha values are .05 and .01. Alpha is used as the criterion for rejecting H_0. An alpha of .05 means that the probability of making a Type I error (rejecting the H_0 when it is actually true) is 5%, and an alpha of .01 means that there is a 1% probability of a Type I error (Salkind, 2010). Scores obtained from the significance testing were converted to a *p*-value. The null hypothesis is rejected if the *p*-value is less than (or equal to) the significance level threshold alpha value (α) 0.05 (Salkind, 2010). If the *p*-value is less than the significance threshold, then the null hypothesis is rejected. If the *p*-value is not less than the chosen significance threshold, then the null hypothesis is not rejected.

A correlation coefficient measures the extent to which two variables tend to change together by describing both the strength and the direction of the relationship (Allen, 2017; Chen & Popovich, 2002). The Pearson coefficient is a measure of the strength and direction of the

linear association between two variables with no assumption of causality (Allen, 2017; Chen & Popovich, 2002). The larger the magnitude of the coefficient, the stronger the relationship between the variables. The sign of the coefficient indicates the direction of the relationship as null, positive, or negative (Chen & Popovich, 2002). The Pearson correlation coefficient can be used for any of the following: (a) describing a relationship between two variables as a descriptive statistic; (b) examining a relationship between two variables in a population as an inferential statistic; (c) providing various reliability estimates such as Cronbach's alpha, test-retest reliability, and split-half reliability; (d) evaluating validity evidence; and (e) gauging the strength of the effect (Chen & Popovich, 2002). Inferential statistics allow a researcher to make inferences on the bigger population by using measurements from the sample population. The Pearson correlation coefficient works with raw data values of the variables (Allen, 2017; Chen & Popovich, 2002; Grey, 2016).

To answer the research question, a Pearson correlation analysis was conducted to investigate how strongly and in what direction social presence, social space, sociability, and media richness were related in a synchronous videoconferencing learning environment. The Pearson correlation coefficient was used in this study to describe the strength of the association between the variables. The Pearson correlation coefficient *r* is a measure to determine the relationship between two quantitative variables and the degree to which the two are linearly related (Allen, 2017; Conover & Iman, 1981). Pearson's *r* ranges between -1 and 1 (Schuele & Justice, 2006). The closer the value is to 0, the smaller the effect size. A value closer to -1 or 1 indicates a higher effect size (Schuele & Justice, 2006). A Pearson correlation requires that the relationship between each pair of variables is linear (Conover & Iman, 1981). This assumption is violated if there is curvature among the points on the scatterplots between any pair of variables.

The linear correlation coefficient measures the strength and direction of the linear relationship between two variables.

Correlation analysis is used to analyze quantitative data collected through research methods to identify the relationship, patterns, significant connections, and trends between two variables or datasets (Allen, 2017; Conover & Iman, 1981). Correlation analysis calculates the level of change in one variable due to the change in the other. A value of 0 indicates there is no association between the two variables (Allen, 2017; Conover & Iman, 1981). However, correlations are limited to linear relationships between variables, and therefore even if the correlation coefficient is 0, a non-linear relationship might exist (Allen, 2017; Conover & Iman, 1981). A value greater than 0 indicates a positive association (positive *r*-value). There is a positive correlation between two variables when an increase in one variable leads to the increase in the other (Allen, 2017; Conover & Iman, 1981). A value less than 0 indicates a negative association (negative *r*-value). A negative correlation means when one variable increases, the other decreases. A high correlation points to a strong relationship between the two variables, while a low correlation means the variables are weakly related (Allen, 2017; Conover & Iman, 1981).

Scatterplots use horizontal and vertical axes to plot data points to show how much one variable is affected by another (Vogt, 2005). If the scatterplots follow a linear pattern and not a curvilinear pattern, a linear relationship between the measured variables are indicated, and the linearity assumption is met. Scatterplots were used in this study to graphically display the relationship between the two variables. The relationship between the two variables is called their correlation. The closer the plotted data points come to making a straight line, the higher the correlation between the two variables and the stronger the relationship (Vogt, 2005). Scatterplots

use horizontal and vertical axes to plot data points to show how much one variable is affected by another (Vogt, 2005). If the data points make a straight line going from the origin out to high x- and y-values, then the variables have a positive correlation (Vogt, 2005). If the line goes from a high value on the y-axis down to a high value on the x-axis, the variables have a negative correlation (Vogt, 2005).

The results of the Pearson correlation analysis were utilized to investigate the research question. A strong, positive correlation was indicated between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness. A moderate, negative correlation was indicated between Social Space (Negative Group Behavior) and Social Presence; Social Space (Negative Group Behavior) and Sociability; and Social Space (Negative Group Behavior) and Media Richness. Therefore, the null hypothesis was rejected for all.

Chapter Summary

This chapter outlined the methodology, data collection procedures, instrument, data analysis, and population of the study. A quantitative correlational survey approach was used in this study. The research design selected for this study was a cross-sectional study that utilized an electronic self-administered survey to examine the associations of variables. The cross-sectional study was selected to test the theories of social presence and media richness as it relates to students in the online videoconferencing learning environment. Prior to conducting the research, a pilot study was conducted with six participant volunteers in order to uncover any unforeseen issues. The collection procedures for both the pilot study and the main study consisted of an online survey administered via Qualtrics. The primary purpose of this correlational survey

approach was to explore students' perceptions on the social presence, social space, sociability, and media richness scales by investigating how strongly and in what direction they were related in a synchronous videoconferencing learning environment by using a cross-sectional web-based survey. The survey item construction for this research relied on four existing instruments (media richness scale, social presence scale, social space scale, and sociability scale) and was self-administered via Qualtrics, an online survey software tool. Participant recruitment for this study specifically targeted adult students who were enrolled in a midwestern university that used synchronous videoconferencing (Zoom) as a communication medium in their online learning experience.

Chapter 4 - Findings

Students' perceived social experiences with the use of videoconferencing in the online learning environment were examined by looking through the lens of social constructivism and applying social presence theory and media richness theory. The Ferry et al. (2001) media richness scale was used to measure students' perceptions of the richness of videoconferencing as a communication medium in the online learning environment, and the Kreijns et al. (2004b, 2013) SIPS model was used as a theoretical framework for measuring computer-supported collaborative learning and social interaction. The quantitative data were collected from a nonprobability convenience sample of adult students who were enrolled in a midwestern university that used synchronous videoconferencing (Zoom) as a communication medium in their online learning experience. This chapter will include the research purpose, research question, research hypotheses, data collection and preparation, demographics and descriptive statistics, assumption testing, analysis of the research question and null hypotheses, and a chapter summary.

Research Purpose and Questions

The purpose of this survey study was to test the theories of social presence and media richness as it related to students in the online videoconferencing learning environment. The research question for this study was designed to explore students' perceptions on the social presence, social space, sociability, and media richness scales by investigating how strongly and in what direction they were related in a synchronous videoconferencing learning environment. The research question and six null hypotheses underlying this research were:

RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

$H_0$1: Social presence is not related to social space in a synchronous videoconferencing learning environment.

$H_0$2: Social presence is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$3: Social presence is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$4: Social space is not related to sociability in a synchronous videoconferencing learning environment.

$H_0$5: Social space is not related to media richness in a synchronous videoconferencing learning environment.

$H_0$6: Sociability is not related to media richness in a synchronous videoconferencing learning environment.

Demographic Characteristics

Participants' age, gender, and ethnicity were collected for demographic analysis. The demographic characteristics of the final sample consisted of sixty (*n* = 60, 100%) male and female graduate students between the ages of 25 to 65+. Participants were 21 males (35%) and 39 females (65%). The ethnicity of the participants were White (*n* = 49, 81.67%), Black or African American (*n* = 4, 6.67%), American Indian or Alaska Native (*n* = 1, 1.67%), Asian (*n* = 3, 5.00%), Native Hawaiian or Pacific Islander (*n* = 1, 1.67%), Hispanic (*n* = 1, 1.67%), and "Mixed" (*n* = 1, 1.67%). Age of the participants ranged from 25 to 65+ years old. Thirteen were between the age of 25 to 34 (21.67%); 18 were 35 to 44 (30%), 25 were 45 to 54 (41.67%), 3 were 55 to 64 (5%), and 1 was 65+ (*n* = 1, 1.67). A summary of the demographic characteristics are presented in Table 17.

Table 17

Demographic Characteristics

Variable	*n*	*%*
Student Status		
Graduate	60	100.00
Gender		
Female	39	65.00
Male	21	35.00
Ethnicity		
White	49	81.67
Black or African American	4	6.67
Asian	3	5.00
American Indian or Alaska Native	1	1.67
Native Hawaiian or Pacific Islander	1	1.67
Hispanic	1	1.67
“Mixed”	1	1.67
Age		
25 - 34	13	21.67
35 - 44	18	30.00
45 - 54	25	41.67
55 - 64	3	5.00
65+	1	1.67

Note. Due to rounding errors, percentages may not equal 100%.

Descriptive Statistics

Participants were asked to respond to a series of questions describing their involvement and use of Zoom video conferencing in their courses. These included the amount of time Zoom was used in the course, the engagement, interaction, how long their video display was on, and activities included in the use of Zoom. When asked how satisfied or dissatisfied participants were with their Zoom engagement and interaction with the instructor and other students (using a 5-point Likert-type scale from extremely satisfied to extremely dissatisfied), 67% were extremely to quite engaged (extremely engaged *n* = 8, 13%; quite engaged *n* = 32, 53%) during their course Zoom sessions, 95% were extremely to somewhat satisfied (extremely satisfied *n* = 23, 38%; somewhat satisfied *n* = 34, 57%) with interaction with the instructor, and 73% were extremely to somewhat satisfied (extremely satisfied *n* = 20, 33%; somewhat satisfied *n* = 24, 40%) with interaction with other students (Table 18).

Table 18

Zoom Engagement and Interaction with Instructor and Other Students

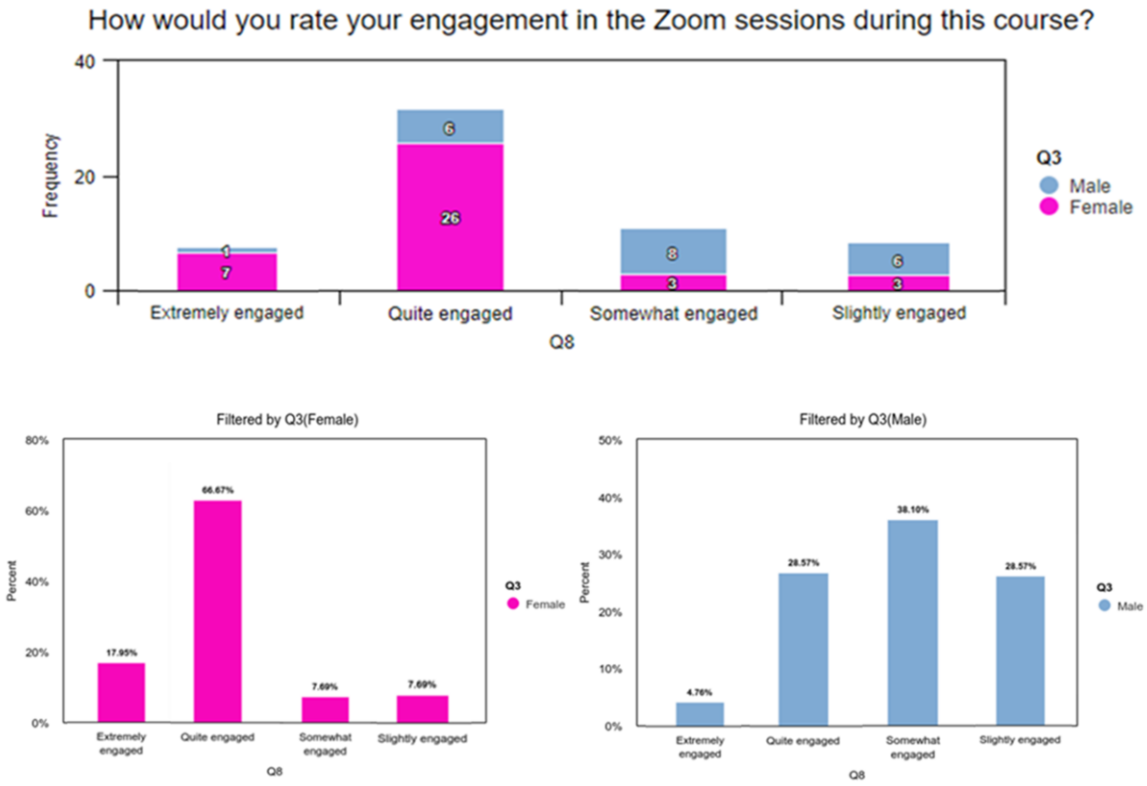
Variable	*n*	*%*
Zoom Engagement		
Slightly engaged	9	15.00
Somewhat engaged	11	18.33
Quite engaged	32	53.33
Extremely engaged	8	13.33
Interaction w/Instructor		
Neither satisfied nor dissatisfied	3	5.00
Somewhat satisfied	34	56.67
Extremely satisfied	23	38.33
Interaction w/Students		
Somewhat dissatisfied	5	8.33
Neither satisfied nor dissatisfied	11	18.33
Somewhat satisfied	24	40.00
Extremely satisfied	20	33.33

Note. Due to rounding errors, percentages may not equal 100%.

The responses to Zoom engagement and interaction were further examined by gender. Of the 67% who were extremely to quite engaged during their course Zoom sessions, 55% (n = 33) were females, and 12% (n = 7) were males. While 85% of females indicated they were extremely to quite engaged during their course Zoom sessions, only 33% of males indicated they were extremely to quite engaged (Figure 7).

Figure 7

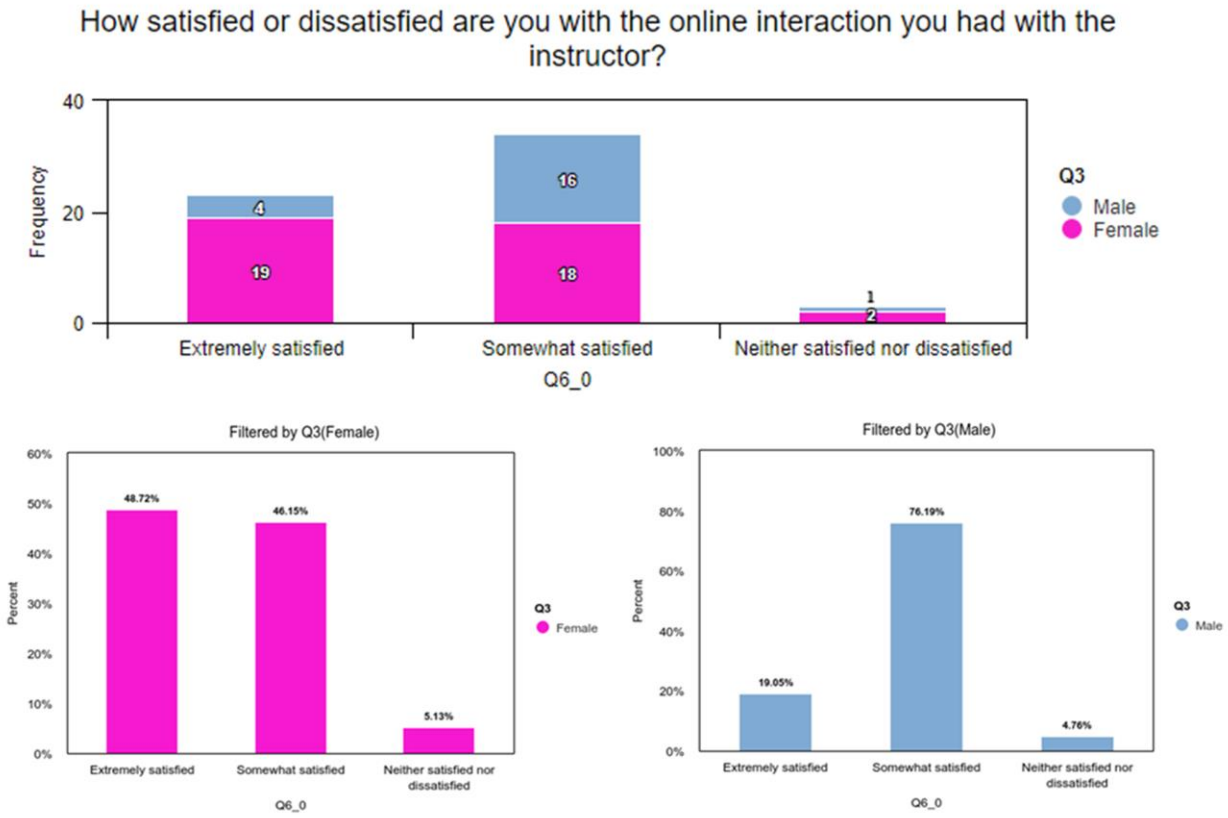
Zoom Engagement by Gender



Of the 95% who were extremely to somewhat satisfied with their interaction with instructor, 62% (*n* = 37) females, and 33% (*n* = 20) males. While 49% of females indicated they were extremely satisfied with the interaction with the instructor, only 19% of males indicated they were extremely satisfied (Figure 8).

Figure 8

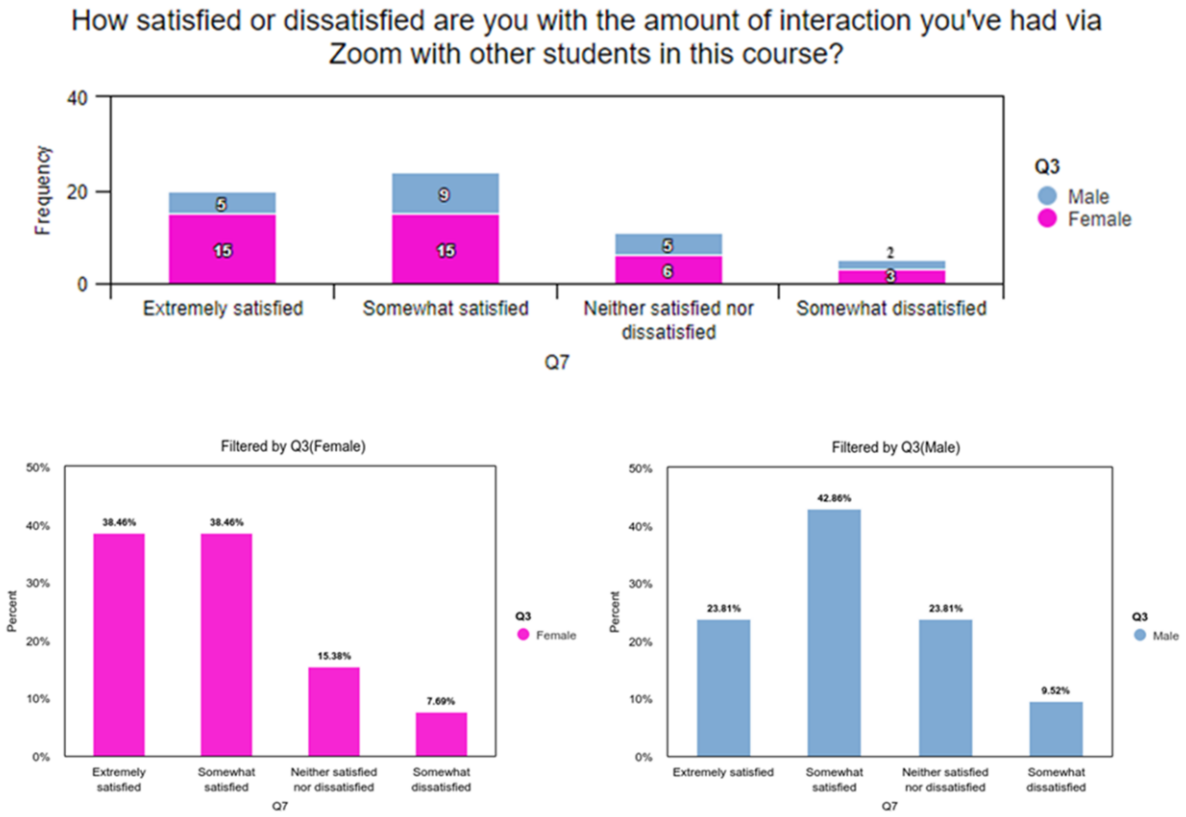
Interaction with Instructor by Gender



Of the 73% who were extremely to somewhat satisfied with their interaction with other students, 50% (*n* = 30) females, and 23% (*n* = 14) males. While 38% of females indicated they were extremely satisfied with the interaction with other students, only 24% of males indicated they were extremely satisfied (Figure 9).

Figure 9

Interaction with Other Students by Gender



When discussing frequency and duration, most participants met once a week for 1-2 hours. The frequency and duration of the Zoom class sessions consisted of 63% (*n* = 38) who met once a week. However, 35% checked other and stated they met on a different frequency; 4 met 1-2 times a month; 4 met bi-weekly; 2 met 2-3 times per semester; 1 met weekly, with some weeks being only discussion posts and no Zoom video calls; and 1 met five times for class and twice for a group project. Twenty-three percent (*n* = 14) noted meeting 3-4 hours, 27% (*n* = 16) noted meeting 2 -3 hours, and 48% (*n* = 29) that had Zoom class sessions that lasted on average 1-2 hours. Only one respondent listed meeting for less than one hour (Table 19).

Table 19

Frequency of Zoom Course Sessions

Variable	*n*	*%*
Zoom Frequency		
4-6 times a week	1	1.67
Once a week	38	63.33
Other	21	35.00
Zoom Duration		
Less than an hour	1	1.67
1-2 hours	29	48.33
2-3 hours	16	26.67
3-4 hours	14	23.33

Note. Due to rounding errors, percentages may not equal 100%.

Seeing faces and hearing the voices of others in class was extremely to very important to 75% of the respondents (extremely important 40% (*n* = 24), very important 35% (*n* = 21). Eighteen percent (*n* = 11) of the participants felt it was moderately important to see faces and hear the voices of others; 3% (*n* = 2) felt it was slightly important; and 3% (*n* = 2) felt it was not at all important (Table 20).

Table 20

Seeing the Faces and Hearing the Voices of Others

Variable	*n*	*%*
Not at all important	2	3.33
Slightly important	2	3.33
Moderately important	11	18.33
Very important	21	35.00
Extremely important	24	40.00

Note. Due to rounding errors, percentages may not equal 100%.

The responses to seeing the faces and hearing the voices of others in class were further examined by age groups and gender. Of the age groups of those who indicated it was extremely important, 8.3% (*n* = 5) aged 25-34; 12% (*n* = 7) 35-44; 18% (*n* = 11) 45-54; and 1.67% (*n* = 1) 55-64. While 44% of those between ages 45-54 felt it was extremely important to see the faces and hear the voices of others in class, only 33% aged 55-64 indicated it was extremely important (Figures 10, 11).

Figure 10

Seeing the Faces and Hearing the Voices of Others By Age Groups

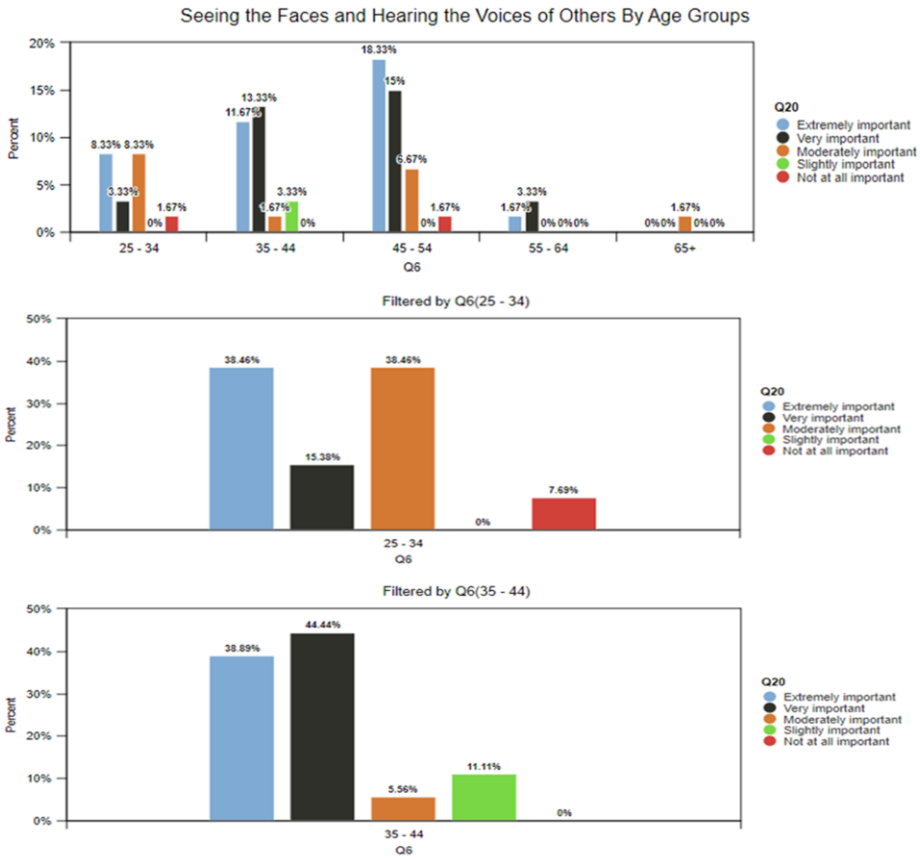
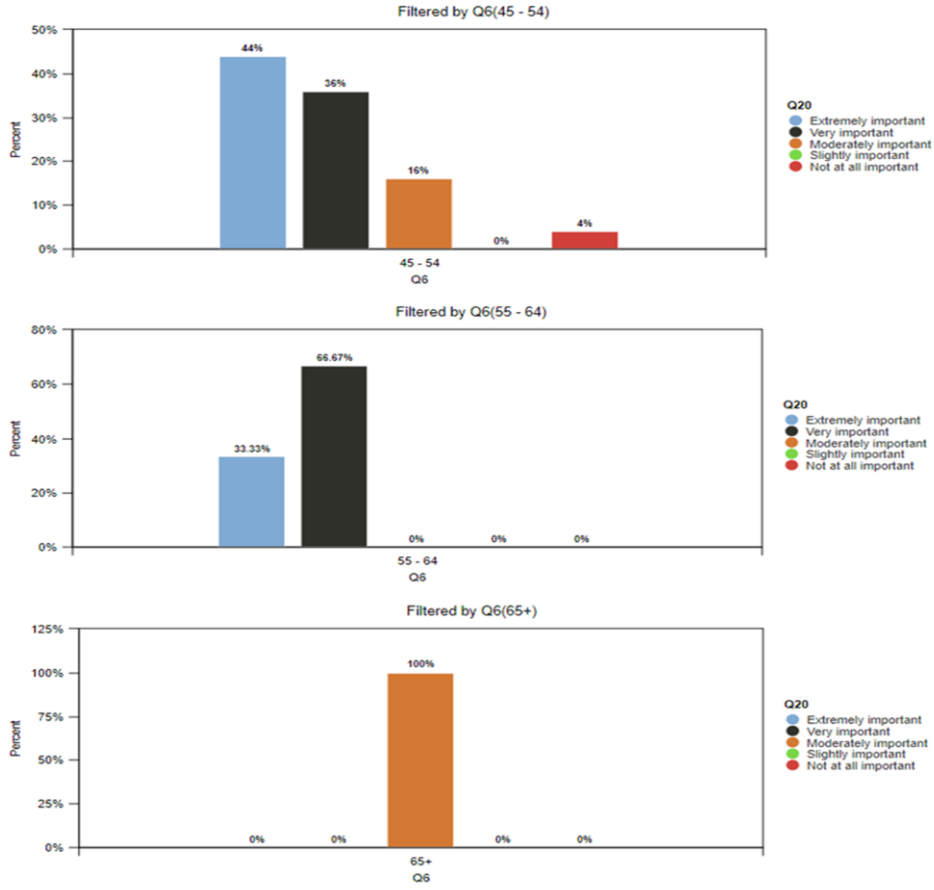


Figure 11

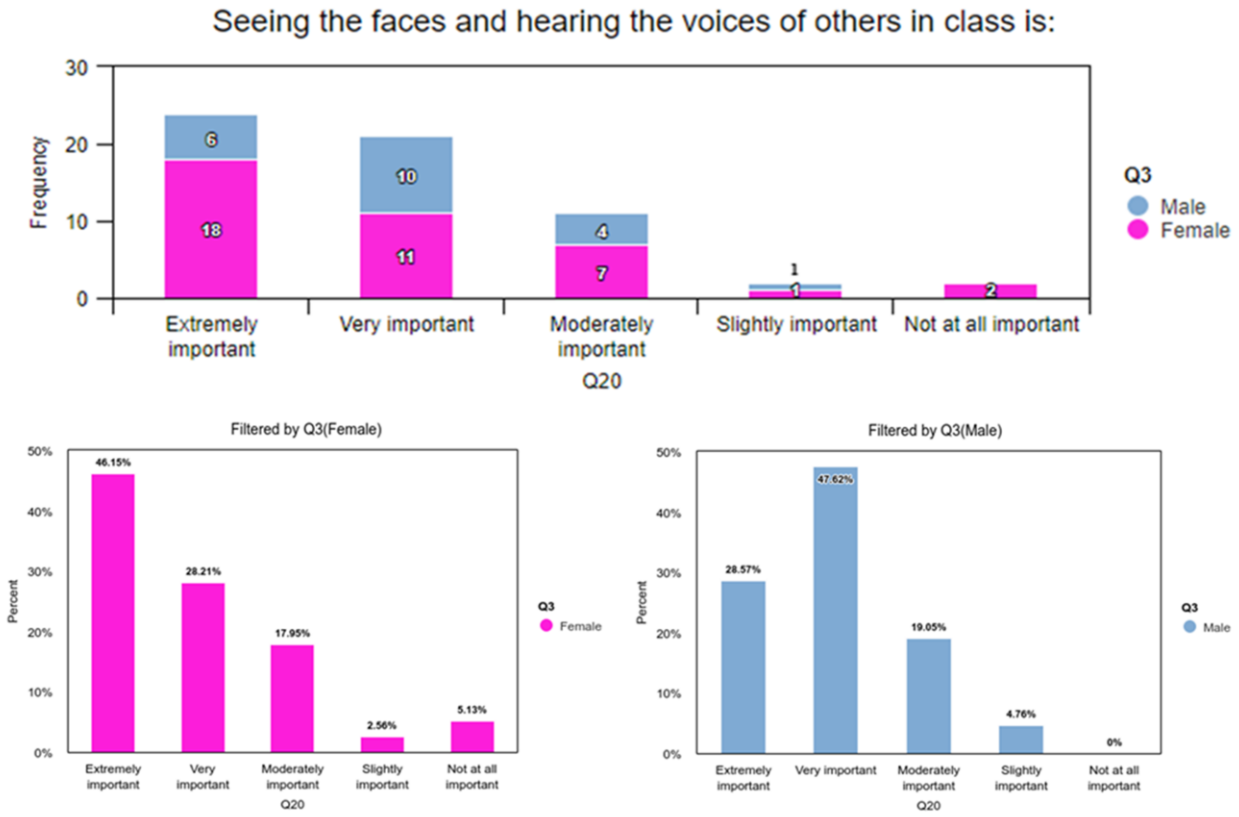
Seeing the Faces and Hearing the Voices of Others By Age Groups



Of the 75% who felt seeing the faces and hearing the voices of others in class was extremely to very important, 48% (*n* = 29) females, and 27% (*n* = 16) males. While 46% of females indicated it was extremely important to see the faces and hear the voices of others in class, only 29% of males indicated it was extremely important (Figure 12).

Figure 12

Seeing Faces and Hearing Voices of Others By Gender



When respondents were asked on average how often they displayed their video during the Zoom meetings, 83% displayed their video during the entire class time (*n* = 50); 5% displayed their video only when speaking (*n* = 3); 2% displayed their video only when in break-out rooms (*n* = 1); 5% displayed their video ½ of the time (*n* = 3), 2% never displayed their video (*n* = 1); and 8% answered *other* (*n* = 5). Of the 8% who answered *other*, 2 respondents indicated that their video is displayed most of the time and will turn it off if there is a distraction at home (kids, dogs, etc.); 1 respondent indicated 98% of the time; 1 indicated 80%+ (not displayed only when not at the computer); and 1 responded with "as needed." Table 21 summarizes the duration of video displayed during Zoom meetings.

Table 21

Video Displayed During Zoom Meetings

Variable	*n*	*%*
Entire class time	50	83.33
1/2 the time	3	5.00
Only when speaking	3	5.00
Only when in break-out rooms	1	1.67
Never	1	1.67
Other	5	8.33

Note. Due to rounding errors, percentages may not equal 100%.

Respondents noted that they participated in a variety of activities in Zoom class sessions. Those with the highest frequency of activities included during the Zoom class meetings consisted of lecture (*n* = 53, 88%), group discussion (*n* = 53, 88%), screen sharing (*n* = 44, 73%), breakout rooms for collaboration (*n* = 39, 65%) and guest speakers (*n* = 33, 55%). Those noted by fewer students included group projects (*n* = 23, 38%), instant messaging (*n* = 25, 42%), whiteboard (*n* = 5, 8%), polling (*n* = 6, 10%), debates (*n* = 1, 2%), interviews (*n* = 6, 10%), file sharing (*n* = 17, 28%), and annotation and co-annotation (*n* = 2, 3%) (Table 22).

Table 22

Frequency Table for Zoom Activities

Variable	*n*	*%*
Group Discussion	53	88.33
Lecture	53	88.33
Screen Sharing	44	73.33
Breakout Rooms for Collaboration	39	65.00
Guest Speakers	33	55.00
Instant Messaging	25	41.67
Group Projects	23	38.33
File Sharing	17	28.33
Interviews	6	10.00
Polling	6	10.00
Whiteboard	5	8.33
Annotation and Co-annotation	2	3.33
Debates	1	1.67

Note. Due to rounding errors, percentages may not equal 100%.

Findings

RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

A Pearson correlation analysis was conducted to investigate how strongly and in what direction social presence, social space, sociability, and media richness were related in a synchronous videoconferencing learning environment. The social presence scale assessed social presence across two dimensions; awareness of others and proximity to others. The social space

scale assessed positive group behavior and negative group behavior. The media richness scale assessed the ability videoconferencing conveys multiple cues through multiple channels (sight, sound, touch) and the immediacy of feedback.

Summary statistics were calculated for Media Richness, Media Richness (Multiple Channels), Media Richness (Immediacy Feedback), Social Presence, Social Presence (Awareness), Social Presence (Proximity), Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Sociability. To test the assumption of normality, Skewness and Kurtosis were applied. Skewness is a measure of the symmetry in a distribution. A symmetrical dataset will have a skewness equal to 0 (Lewis-Beck et al., 2004; Westfall & Henning, 2013). Positive kurtosis signifies a distribution is more prone to outliers. Negative kurtosis implies a distribution is less prone to outliers. If either of these values for skewness or kurtosis are less than ±1.0, the skewness or kurtosis for the distribution is not outside the range of normality; the distribution can be considered normal (Lewis-Beck et al., 2004; Westfall & Henning, 2013). If the values are greater than ±1.0, the skewness or kurtosis for the distribution is outside the range of normality; the distribution cannot be considered normal (Lewis-Beck et al., 2004; Westfall & Henning, 2013).

The observations for Media Richness had an average of 3.82 (SD = 0.58, SE_M = 0.07, Min = 2.75, Max = 5.00, Skewness = 0.33, Kurtosis = -0.58). Media Richness (Multiple Channels) had an average of 4.01 (SD = 0.62, SE_M = 0.08, Min = 2.50, Max = 5.00, Skewness = -0.28, Kurtosis = -0.31). Media Richness (Immediacy Feedback) had an average of 3.62 (SD = 0.64, SE_M = 0.08, Min = 2.25, Max = 5.00, Skewness = 0.43, Kurtosis = -0.39). Social Presence had an average of 3.55 (SD = 0.65, SE_M = 0.08, Min = 1.81, Max = 4.67, Skewness = -0.34, Kurtosis = -0.45). Social Presence (Awareness) had an average of 3.69 (SD = 0.56, SE_M = 0.07,

Min = 1.80, Max = 4.67, Skewness = -0.58, Kurtosis = 0.58). Social Presence (Proximity) had an average of 3.38 (*SD* = 0.85, SE_M = 0.11, Min = 1.42, Max = 5.00, Skewness = -0.28, Kurtosis = -0.61). Social Space (Positive Group Behavior) had an average of 3.50 (*SD* = 0.79, SE_M = 0.10, Min = 1.90, Max = 5.00, Skewness = -0.05, Kurtosis = -0.53). Social Space (Negative Group Behavior) had an average of 1.68 (*SD* = 0.51, SE_M = 0.07, Min = 1.00, Max = 3.30, Skewness = 0.83, Kurtosis = 0.59). Sociability had an average of 3.35 (*SD* = 0.92, SE_M = 0.12, Min = 1.50, Max = 5.00, Skewness = -0.00, Kurtosis = -0.84). When the skewness is greater than 2 in absolute value, the variable is considered to be asymmetrical about its mean (Lewis-Beck et al., 2004; Westfall & Henning, 2013). When the kurtosis is greater than or equal to 3, then the variable's distribution is markedly different than a normal distribution in its tendency to produce outliers (Lewis-Beck et al., 2004; Westfall & Henning, 2013). The skewness and kurtosis for each of the scales in this study are inside the range of normality (Table 23).

Table 23

Summary Statistics for Media Richness, Social Presence, Social Space, and Sociability

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
Media Richness	3.82	0.58	60	0.07	2.75	5.00	0.33	-0.58
Media Richness (Multiple Channels)	4.01	0.62	60	0.08	2.50	5.00	-0.28	-0.31
Media Richness (Immediacy Feedback)	3.62	0.64	60	0.08	2.25	5.00	0.43	-0.39
Social Presence	3.55	0.65	60	0.08	1.81	4.67	-0.34	-0.45
Social Presence (Awareness)	3.69	0.56	60	0.07	1.80	4.67	-0.58	0.58
Social Presence (Proximity)	3.38	0.85	60	0.11	1.42	5.00	-0.28	-0.61
Social Space (Positive)	3.50	0.79	60	0.10	1.90	5.00	-0.05	-0.53
Social Space (Negative)	1.68	0.51	60	0.07	1.00	3.30	0.83	0.59
Sociability	3.35	0.92	60	0.12	1.50	5.00	-0.00	-0.84

$H_0$1: Social presence is not related to social space in a synchronous videoconferencing learning environment.

The social presence scale assesses social presence across two dimensions; awareness of others and proximity to others, and the social space scale assesses positive group behavior and negative group behavior. A Pearson correlation analysis was conducted among each of the dimensions of social presence (awareness, proximity) and each social space group behavior (positive, negative). The Pearson correlation analysis was used to identify the relationship

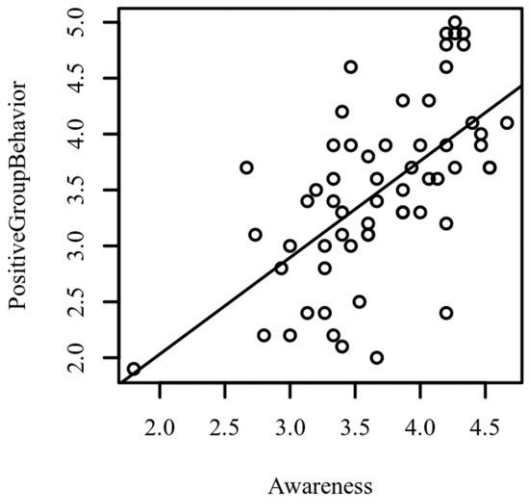
between each of the two variables. The linear correlation coefficient measured the strength and direction of the linear relationship between social presence (awareness) and social space (positive group behavior); social presence (awareness) and social space (negative group behavior); social presence (proximity), and social space (positive group behavior); and social presence (proximity) and social space (negative group behavior). Scatterplots were used to display the relationship between the measured variables graphically.

Social Presence (Awareness) and Social Space (Positive Group Behavior)

The result of the correlations was examined based on an alpha value of 0.05. A significant positive correlation was observed between Social Presence (Awareness) and Social Space (Positive Group Behavior) ($r_p = 0.61$, $p < .001$, 95% CI [0.42, 0.75]). The correlation coefficient between Social Presence (Awareness) and Social Space (Positive Group Behavior) was 0.61, indicating a large effect size (Table 24). This correlation indicates that as Social Presence (Awareness) increases, Social Space (Positive Group Behavior) tends to increase. A Pearson correlation requires that the relationship between each pair of variables is linear (Conover & Iman, 1981). This assumption is violated if there is curvature among the points on the scatterplots between any pair of variables. The scatterplots between Social Presence (Awareness) and Social Space (Positive Group Behavior) follow a positive linear pattern. The positive linear pattern shows that the linearity assumption is met. Figure 13 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Awareness) and Social Space (Positive Group Behavior).

Figure 13

Scatterplots for Social Presence (Awareness) and Social Space (Positive Group Behavior)

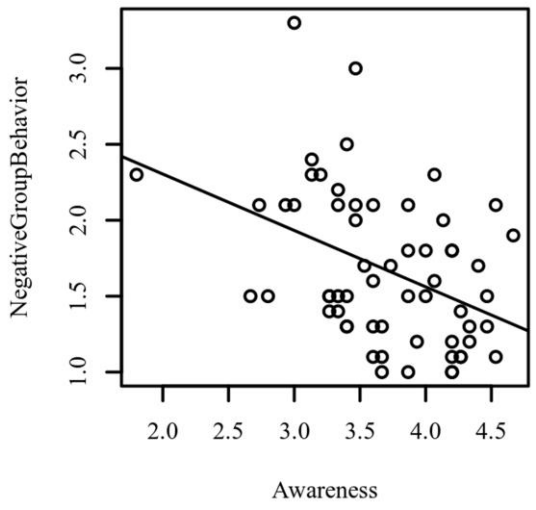


Social Presence (Awareness) and Social Space (Negative Group Behavior)

A significant negative correlation was observed between Social Presence (Awareness) and Social Space (Negative Group Behavior) (r_p = -0.41, p = .001, 95% CI [-0.60, -0.18]). The correlation coefficient between Social Presence (Awareness) and Social Space (Negative Group Behavior) was -0.41, indicating a moderate effect size (Table 24). This correlation indicates that as Social Presence (Awareness) increases, Social Space (Negative Group Behavior) tends to decrease. The scatterplots between Social Presence (Awareness) and Social Space (Negative Group Behavior) follow a negative linear pattern. The negative linear pattern shows that the linearity assumption is met. Figure 14 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Awareness) and Social Space (Negative Group Behavior).

Figure 14

Scatterplots for Social Presence (Awareness) and Social Space (Negative Group Behavior)

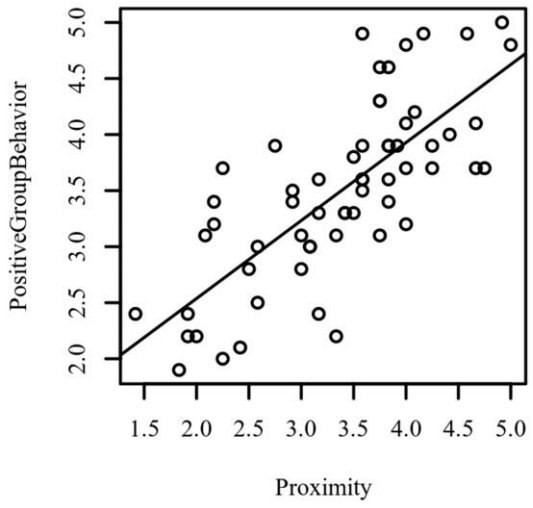


Social Presence (Proximity) and Social Space (Positive Group Behavior)

A significant positive correlation was observed between Social Presence (Proximity) and Social Space (Positive Group Behavior) ($r_p = 0.75$, $p < .001$, 95% CI [0.61, 0.84]). The correlation coefficient between Social Presence (Proximity) and Social Space (Positive Group Behavior) was 0.75, indicating a large effect size (Table 24). This correlation indicates that as Social Presence (Proximity) increases, Social Space (Positive Group Behavior) tends to increase. The scatterplots between Social Presence (Proximity) and Social Space (Positive Group Behavior) follow a positive linear pattern which shows that the linearity assumption is met. Figure 15 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Proximity) and Social Space (Positive Group Behavior).

Figure 15

Scatterplots for Social Presence (Proximity) and Social Space (Positive Group Behavior)

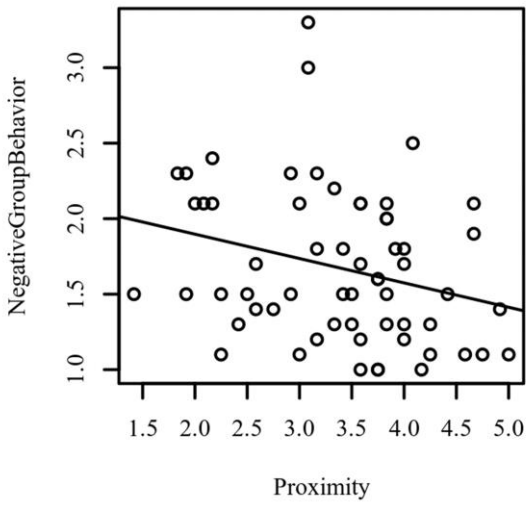


Social Presence (Proximity) and Social Space (Negative Group Behavior)

A significant negative correlation was observed between Social Presence (Proximity) and Social Space (Negative Group Behavior) (r_p = -0.27, p = .035, 95% CI [-0.49, -0.02]). The correlation coefficient between Social Presence (Proximity) and Social Space (Negative Group Behavior) was -0.27, indicating a small effect size (Table 24). This correlation indicates that as Social Presence (Proximity) increases, Social Space (Negative Group Behavior) tends to decrease. The scatterplots between Social Presence (Proximity) and Social Space (Negative Group Behavior) follow a negative linear pattern which shows that the linearity assumption is met. Figure 16 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Proximity) and Social Space (Negative Group Behavior).

Figure 16

Scatterplots for Social Presence (Proximity) and Social Space (Negative Group Behavior)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence (Awareness) - Social Space (Positive Group Behavior) had a large effect size of 0.61 and a $p < .001$; and Social Presence (Proximity) - Social Space (Positive Group Behavior) had a large effect size of 0.75 and a $p < .001$, which indicated there was a strong, positive correlation between the variables. Social Presence (Awareness) and Social Space (Negative Group Behavior) had a moderate effect size of -0.41 and a $p = .001$, which indicated a moderate, negative correlation. Social Presence (Proximity) and Social Space (Negative Group Behavior) had a small effect size of -0.27 and a $p = .035$, which indicated a weak, negative correlation. Table 24 presents the results of the correlations between Social Presence (Awareness), Social Presence (Proximity), Social Space (Positive Group Behavior), and Social Space (Negative Group Behavior).

Table 24

Pearson Correlation Results Between Social Presence (Awareness), Social Presence (Proximity), Social Space (Positive Group Behavior), and Social Space (Negative Group Behavior)

Combination	r_p	95% CI	p
Social Presence (Awareness) - Social Space (Positive)	0.61	[0.42, 0.75]	< .001
Social Presence (Awareness) - Social Space (Negative)	-0.41	[-0.60, -0.18]	.001
Social Presence (Proximity) - Social Space (Positive)	0.75	[0.61, 0.84]	< .001
Social Presence (Proximity) - Social Space (Negative)	-0.27	[-0.49, -0.02]	.035

Note. $n = 60$.

Social Presence and Social Space

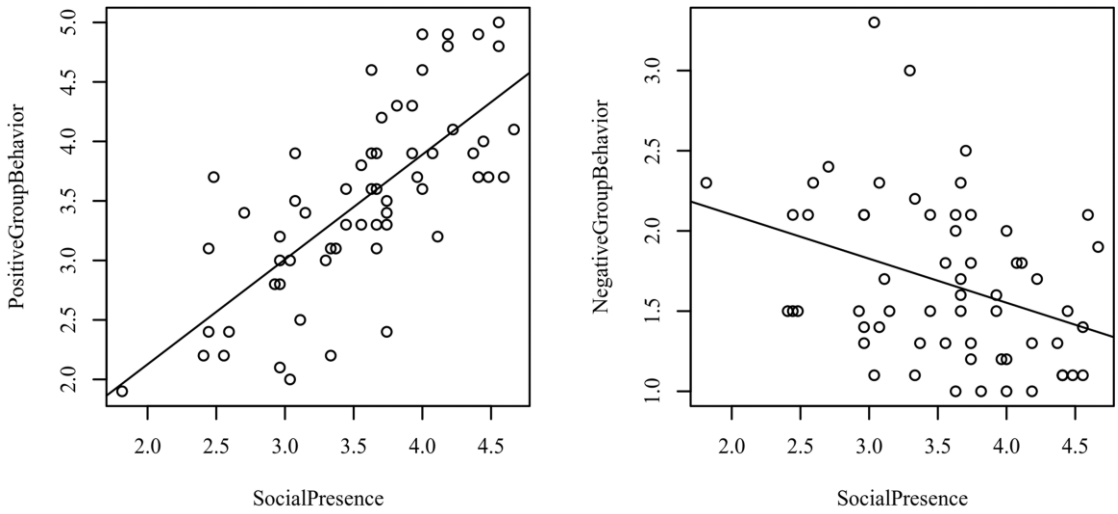
Lastly, a Pearson correlation analysis was conducted among the combined Social Presence dimensions and Social Space group behaviors. A significant positive correlation was observed between Social Presence and Social Space (Positive Group Behavior) ($r_p = 0.73$, $p <$ .001, 95% CI [0.58, 0.83]). The correlation coefficient between Social Presence and Social Space (Positive Group Behavior) was 0.73, indicating a large effect size (Table 25). This correlation indicates that as Social Presence increases, Social Space (Positive Group Behavior) tends to increase.

A significant negative correlation was observed between Social Presence and Social Space (Negative Group Behavior) ($r_p = -0.36$, $p = .005$, 95% CI [-0.56, -0.11]). The correlation coefficient between Social Presence and Social Space (Negative Group Behavior) was -0.36, indicating a moderate effect size (Table 25). This correlation indicates that as Social Presence increases, Social Space (Negative Group Behavior) tends to decrease. The scatterplots between Social Presence and Social Space (Positive Group Behavior) follow a positive linear pattern

which shows that the linearity assumption is met, and Social Presence and Social Space (Negative Group Behavior) follows a negative linear pattern which also shows that the linearity assumption is met. Figure 17 presents scatterplots of the correlations for Social Presence, Social Space (Positive Group Behavior), and Social Space (Negative Group Behavior). A regression line has been added to assist the interpretation.

Figure 17

Scatterplots for Social Presence and Social Space (Positive Group Behavior) (left), Social Presence and Social Space (Negative Group Behavior) (right)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence - Social Space (Positive Group Behavior) had a large effect size of 0.73 and a $p < .001$, which indicated a strong, positive correlation. Social Presence - Social Space (Negative Group Behavior) had a moderate effect size of -0.36 and a $p = .005$, which indicated a moderate, negative correlation. Due to the strong, positive correlation between Social Presence and Social Space (Positive Group Behavior) and the moderate, negative correlation between Social Presence and Social Space (Negative Group

Behavior), the null hypothesis ($H_0$1) was rejected. Table 25 presents the results of the correlations between Social Presence and Social Space.

Table 25

Pearson Correlation Results Between Social Presence, Social Space (Positive Group Behavior), and Social Space (Negative Group Behavior)

Combination	rp	95% CI	p
Social Presence - Social Space (Positive)	0.73	[0.58, 0.83]	< .001
Social Presence - Social Space (Negative)	-0.36	[-0.56, -0.11]	.005

Note. n = 60.

$H_0$2: Social presence is not related to sociability in a synchronous videoconferencing learning environment.

A Pearson correlation analysis was conducted among each of the dimensions of social presence (awareness, proximity) and sociability. Cohen's standard was used to evaluate the strength of the relationships. The linear correlation coefficient measured the strength and direction of the linear relationship between social presence (awareness) and sociability; and social presence (proximity) and sociability. Scatterplots graphically display the relationship between each of the two measured variables.

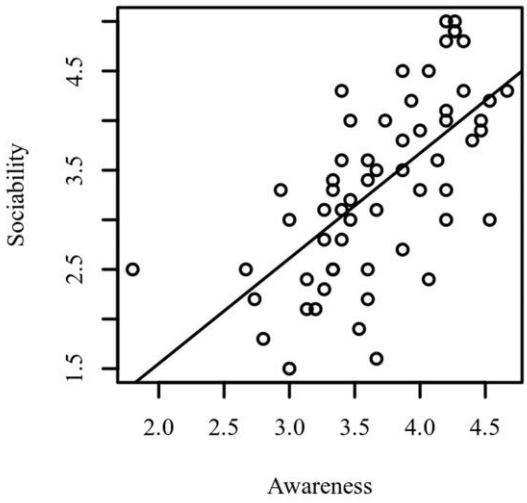
Social Presence (Awareness) and Sociability

A significant positive correlation was observed between Social Presence (Awareness) and Sociability (r_p = 0.65, p < .001, 95% CI [0.47, 0.78]). The correlation coefficient between Social Presence (Awareness) and Sociability was 0.65, indicating a large effect size (Table 26). This correlation indicates that as Social Presence (Awareness) increases, Sociability tends to increase. The scatterplots between Social Presence (Awareness) and Sociability follow a positive linear pattern. The positive linear pattern shows that the linearity assumption is met. Figure 18 presents

the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Awareness) and Sociability.

Figure 18

Scatterplots for Social Presence (Awareness) and Sociability

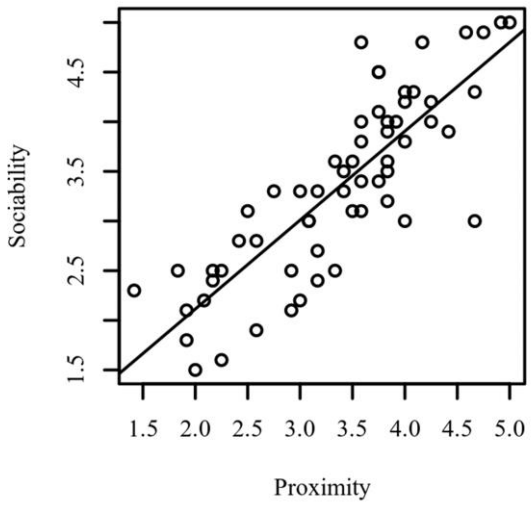


Social Presence (Proximity) and Sociability

A significant positive correlation was observed between Social Presence (Proximity) and Sociability (r_p = 0.83, p < .001, 95% CI [0.73, 0.90]). The correlation coefficient between Social Presence (Proximity) and Sociability was 0.83, indicating a large effect size (Table 26). This correlation indicates that as Social Presence (Proximity) increases, Sociability tends to increase. The scatterplots between Social Presence (Proximity) and Sociability follow a positive linear pattern. The positive linear pattern shows that the linearity assumption is met. Figure 19 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Proximity) and Sociability.

Figure 19

Scatterplots for Social Presence (Proximity) and Sociability



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence (Awareness) - Sociability had a large effect size of 0.65 and a $p < .001$, and Social Presence (Proximity) - Sociability had a large effect size of 0.83 and a $p < .001$. The large effect size between Social Presence (Awareness) and Sociability; and Social Presence (Proximity) and Sociability indicated a strong, positive relationship between the variables. Table 26 presents the summation of the results of the correlations between Social Presence (Awareness), Social Presence (Proximity), and Sociability.

Table 26

Pearson Correlation Results Between Social Presence (Awareness), Social Presence (Proximity), and Sociability

Combination	r_p	95% CI	*p*
Social Presence (Awareness) - Sociability	0.65	[0.47, 0.78]	< .001
Social Presence (Proximity) - Sociability	0.83	[0.73, 0.90]	< .001

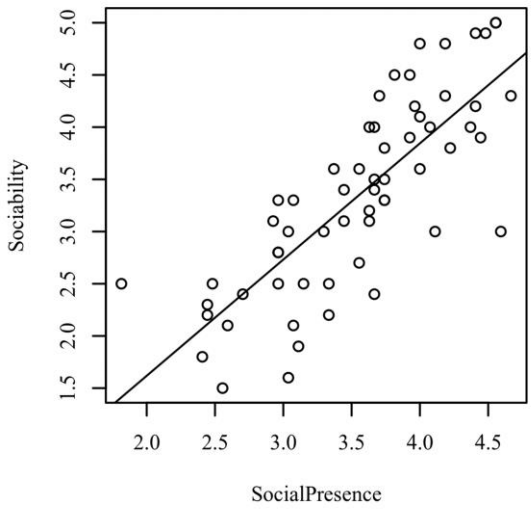
Note. $n = 60$.

Social Presence and Sociability

Lastly, a Pearson correlation analysis was conducted among the combined Social Presence dimensions and Sociability. A significant positive correlation was observed between Social Presence and Sociability ($r_p = 0.79$, $p < .001$, 95% CI [0.67, 0.87]). The correlation coefficient between Social Presence and Sociability was 0.79, indicating a large effect size (Table 27). This correlation indicates that as Social Presence increases, Sociability tends to increase. The scatterplots for Social Presence and Sociability follow a positive linear pattern which shows that the linearity assumption is met. Figure 20 presents the scatterplots of the correlation for Social Presence and Sociability. A regression line has been added to assist the interpretation.

Figure 20

Scatterplots for Social Presence and Sociability



Results. The result of the correlation was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence - Sociability had a large effect size of 0.79 and a $p < .001$, which indicated a strong, positive relationship between the two variables. The

null hypothesis ($H_0$2) was rejected because of the strong, positive relationship between Social Presence and Sociability, as presented in Table 27.

Table 27

Pearson Correlation Results Between Social Presence and Sociability

Combination	r_p	95% CI	p
Social Presence - Sociability	0.79	[0.67, 0.87]	< .001

Note. n = 60.

$H_0$3: Social presence is not related to media richness in a synchronous videoconferencing learning environment.

Similar to social presence, the media richness scale has two constructs: multiple channels and immediacy feedback. A Pearson correlation analysis was conducted among the dimensions of social presence (awareness, proximity) and the constructs of media richness (multiple channels, immediacy feedback). Cohen's standard was used to evaluate the strength of the relationships. The linear correlation coefficient measured the strength and direction of the linear relationship between social presence (awareness) and media richness (multiple channels); social presence (awareness) and media richness (immediacy feedback); social presence (proximity), and media richness (multiple channels); social presence (proximity) and media richness (immediacy feedback). Scatterplots graphically display the relationship between each of the two measured variables.

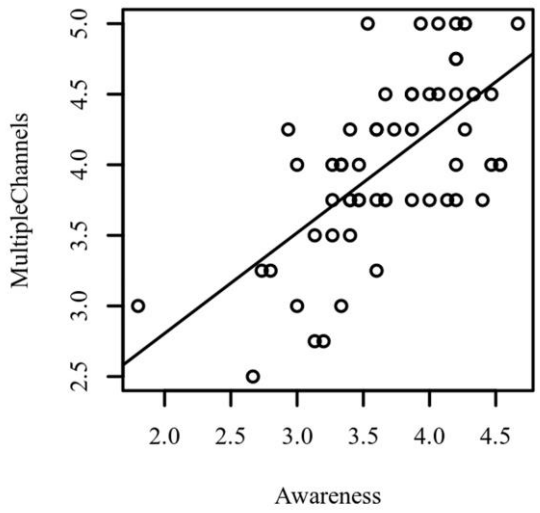
Social Presence (Awareness) and Media Richness (Multiple Channels)

A significant positive correlation was observed between Social Presence (Awareness) and Media Richness (Multiple Channels) (r_p = 0.65, p < .001, 95% CI [0.47, 0.78]). The correlation coefficient between Social Presence (Awareness) and Media Richness (Multiple Channels) was 0.65, indicating a large effect size. This correlation indicates that as Social Presence (Awareness)

increases, Media Richness (Multiple Channels) tends to increase. The scatterplots between Social Presence (Awareness) and Media Richness (Multiple Channels) follow a positive linear pattern which shows that the linearity assumption is met. Figure 21 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Awareness) and Media Richness (Multiple Channels).

Figure 21

Scatterplots for Social Presence (Awareness) and Media Richness (Multiple Channels)



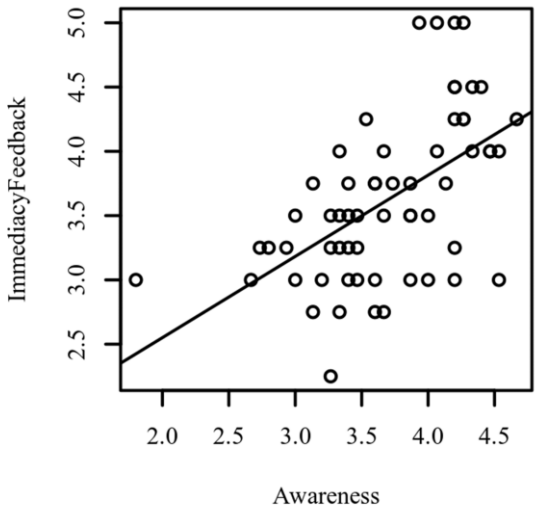
Social Presence (Awareness) and Media Richness (Immediacy Feedback)

A significant positive correlation was observed between Social Presence (Awareness) and Media Richness (Immediacy Feedback) ($r_p = 0.55$, $p < .001$, 95% CI [0.35, 0.71]). The correlation coefficient between Social Presence (Awareness) and Media Richness (Immediacy Feedback) was 0.55, indicating a large effect size. This correlation indicates that as Social Presence (Awareness) increases, Media Richness (Immediacy Feedback) tends to increase. The scatterplots between Social Presence (Awareness) and Media Richness (Immediacy Feedback) follow a positive linear pattern which shows that the linearity assumption is met. Figure 22

presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Awareness) and Media Richness (Immediacy Feedback).

Figure 22

Scatterplots for Social Presence (Awareness) and Media Richness (Immediacy Feedback)

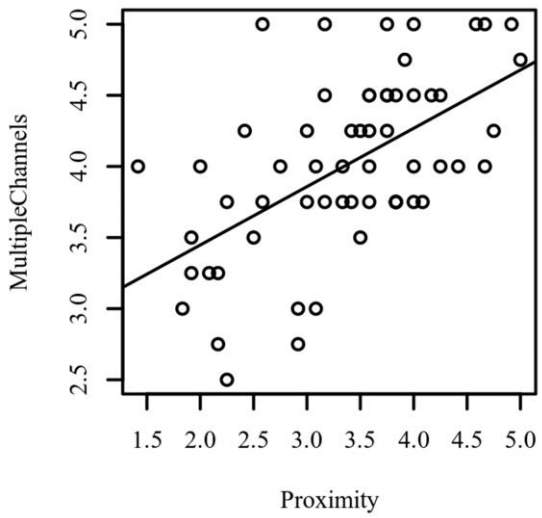


Social Presence (Proximity) and Media Richness (Multiple Channels)

A significant positive correlation was observed between Social Presence (Proximity) and Media Richness (Multiple Channels) ($r_p = 0.57$, $p < .001$, 95% CI [0.37, 0.72]). The correlation coefficient between Social Presence (Proximity) and Media Richness (Multiple Channels) was 0.57, indicating a large effect size. This correlation indicates that as Social Presence (Proximity) increases, Media Richness (Multiple Channels) tends to increase. The scatterplots between Social Presence (Proximity) and Media Richness (Multiple Channels) follow a positive linear pattern which shows that the linearity assumption is met. Figure 23 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Proximity) and Media Richness (Multiple Channels).

Figure 23

Scatterplots for Social Presence (Proximity) and Media Richness (Multiple Channels)

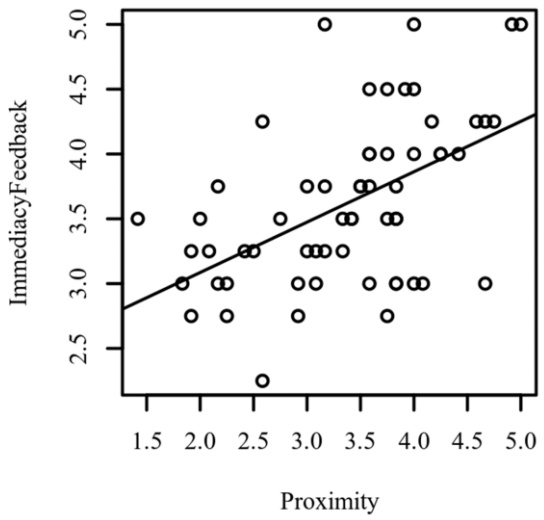


Social Presence (Proximity) and Media Richness (Immediacy Feedback)

A significant positive correlation was observed between Social Presence (Proximity) and Media Richness (Immediacy Feedback) (r_p = 0.52, p < .001, 95% CI [0.30, 0.68]). The correlation coefficient between Social Presence (Proximity) and Media Richness (Immediacy Feedback) was 0.52, indicating a large effect size. This correlation indicates that as Social Presence (Proximity) increases, Media Richness (Immediacy Feedback) tends to increase. The scatterplots between Social Presence (Proximity) and Media Richness (Immediacy Feedback) follow a positive linear pattern which shows that the linearity assumption is met. Figure 24 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Presence (Proximity), Media Richness (Immediacy Feedback).

Figure 24

Scatterplots for Social Presence (Proximity) and Media Richness (Immediacy Feedback)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence (Awareness) - Media Richness (Multiple Channels) had a large effect size of 0.65 and a $p < .001$; Social Presence (Awareness) - Media Richness (Immediacy Feedback) had a large effect size of 0.55 and a $p < .001$; Social Presence (Proximity) - Media Richness (Multiple Channels) had a large effect size of 0.57, and a $p < .001$; and Social Presence (Proximity) - Media Richness (Immediacy Feedback) had a large effect size of 0.52 and a $p < .001$, which indicated a strong, positive correlation between the variables. Therefore, the null hypothesis ($H_0$3) was rejected. Table 28 presents the results of the correlations between Social Presence (Awareness), Social Presence (Proximity), Media Richness (Multiple Channels), and Media Richness (Immediacy Feedback).

Table 28

Pearson Correlation Results Between Social Presence (Awareness), Social Presence (Proximity), Media Richness (Multiple Channels), and Media Richness (Immediacy Feedback)

Combination	r_p	95% CI	*p*
Social Presence (Awareness) - Media Richness (Multiple Channels)	0.65	[0.47, 0.78]	< .001
Social Presence (Awareness) - Media Richness (Immediacy Feedback)	0.55	[0.35, 0.71]	< .001
Social Presence (Proximity) - Media Richness (Multiple Channels)	0.57	[0.37, 0.72]	< .001
Social Presence (Proximity) - Media Richness (Immediacy Feedback)	0.52	[0.30, 0.68]	< .001

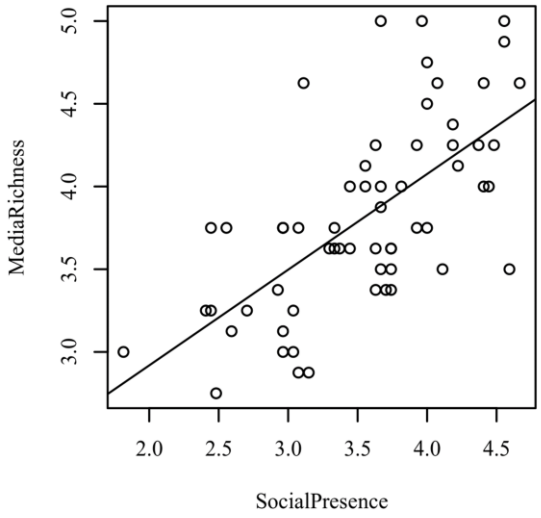
Note. $n = 60$.

Social Presence and Media Richness

Lastly, a Pearson correlation analysis was conducted among the combined Social Presence dimensions and the combined Media Richness constructs. A significant positive correlation was observed between Social Presence and Media Richness ($r_p = 0.66$, $p < .001$, 95% CI [0.48, 0.78]). The correlation coefficient between Social Presence and Media Richness was 0.66, indicating a large effect size. This correlation indicates that as Social Presence increases, Media Richness tends to increase. The scatterplots between Social Presence and Media Richness follow a positive linear pattern which shows that the linearity assumption is met. Figure 25 presents the scatterplots of the correlation for Social Presence and Media Richness. A regression line has been added to assist the interpretation.

Figure 25

Scatterplots for Social Presence and Media Richness



Results. The result of the correlation was examined based on an alpha value of 0.05. The Pearson correlation results among Social Presence - Media Richness had a large effect size of 0.66 and a $p < .001$, which indicated a strong, positive relationship between the two variables. The null hypothesis ($H_0$3) was rejected because of the strong, positive relationship between Social Presence and Media Richness, as presented in Table 29.

Table 29

Pearson Correlation Results Between Social Presence and Media Richness

Combination	r_p	95% CI	p
Social Presence - Media Richness	0.66	[0.48, 0.78]	< .001

Note. $n = 60$.

$H_0$4: Social space is not related to sociability in a synchronous videoconferencing learning environment.

A Pearson correlation analysis was conducted among the social space group behaviors and sociability. Cohen's standard was used to evaluate the strength of the relationships. The

linear correlation coefficient measured the strength and direction of the linear relationship between social space (positive group) and sociability; and social space (negative group behavior) and sociability. Scatterplots graphically display the relationship between each of the two measured variables.

Social Space (Positive Group Behavior) and Sociability

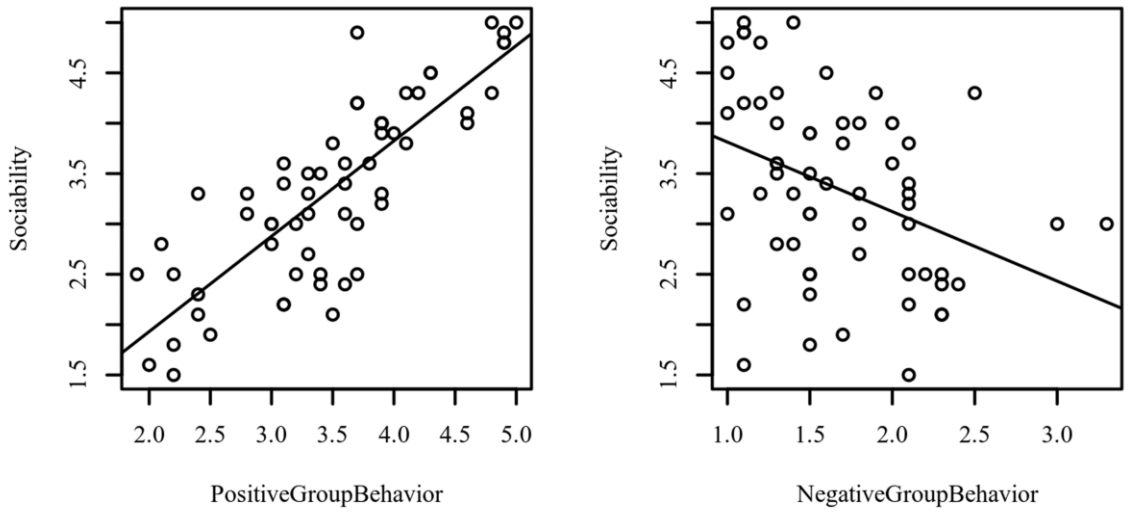
A significant positive correlation was observed between Social Space (Positive Group Behavior) and Sociability (r_p = 0.82, p < .001, 95% CI [0.71, 0.89]). The correlation coefficient between Social Space (Positive Group Behavior) and Sociability was 0.82, indicating a large effect size. This correlation indicates that as Social Space (Positive Group Behavior) increases, Sociability tends to increase. The scatterplots between Social Space (Positive Group Behavior) and Sociability follow a positive linear pattern which shows that the linearity assumption is met (Figure 26).

Social Space (Negative Group Behavior) and Sociability

A significant negative correlation was observed between Social Space (Negative Group Behavior) and Sociability (r_p = -0.38, p = .003, 95% CI [-0.58, -0.14]). The correlation coefficient between Social Space (Negative Group Behavior) and Sociability was -0.38, indicating a moderate effect size. This correlation indicates that as Social Space (Negative Group Behavior) increases, Sociability tends to decrease. The scatterplots between Social Space (Negative Group Behavior) and Sociability follow a negative linear pattern which shows that the linearity assumption is met. Figure 26 presents the scatterplots of the correlations for Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Sociability. A regression line has been added to assist the interpretation.

Figure 26

Scatterplots for Social Space (Positive Group Behavior) and Sociability (left) and Social Space (Negative Group Behavior) and Sociability (right)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Space (Positive Group Behavior) - Sociability had a large effect size of 0.82 and a $p < .001$, which indicated a strong, positive correlation. Social Space (Negative Group Behavior) - Sociability had a moderate effect size of -0.38 and a $p = .003$, which indicated a moderate, negative correlation. Due to the strong, positive correlation between Social Space (Positive Group Behavior) and Sociability; and the moderate, negative correlation between Social Space (Negative Group Behavior) and Sociability, the null hypothesis ($H_0 4$) was rejected. Table 30 presents the results of the correlations between Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Sociability.

Table 30

Pearson Correlation Results Between Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Sociability

Combination	r_p	95% CI	*p*
Social Space (Positive) - Sociability	0.82	[0.71, 0.89]	< .001
Social Space (Negative) - Sociability	-0.38	[-0.58, -0.14]	.003

Note. $n = 60$.

$H_0$5: Social space is not related to media richness in a synchronous videoconferencing learning environment.

A Pearson correlation analysis was conducted among the social space group behaviors and media richness constructs. Cohen's standard was used to evaluate the strength of the relationships. The linear correlation coefficient measured the strength and direction of the linear relationship between social space (positive group behavior) and media richness (multiple channels); social space (positive group behavior) and media richness (immediacy feedback); social space (negative group behavior) and media richness (multiple channels); and social space (negative group behavior) and media richness (immediacy feedback). Scatterplots graphically display the relationship between each of the two measured variables.

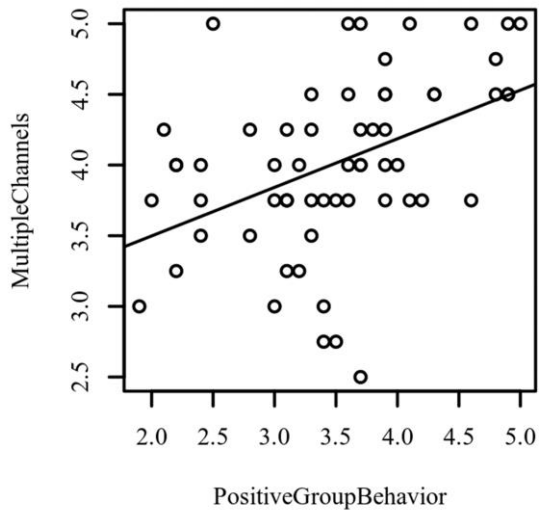
Social Space (Positive Group Behavior) and Media Richness (Multiple Channels)

A significant positive correlation was observed between Social Space (Positive Group Behavior) and Media Richness (Multiple Channels) ($r_p = 0.44$, $p < .001$, 95% CI [0.21, 0.63]). The correlation coefficient between Social Space (Positive Group Behavior) and Media Richness (Multiple Channels) was 0.44, indicating a moderate effect size. This correlation indicates that as Social Space (Positive Group Behavior) increases, Media Richness (Multiple Channels) tends to increase. The scatterplots between Social Space (Positive Group Behavior) and Media Richness

(Multiple Channels) follow a positive linear pattern which shows that the linearity assumption is met. Figure 27 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Space (Positive Group Behavior) and Media Richness (Multiple Channels).

Figure 27

Scatterplots for Social Space (Positive Group Behavior) and Media Richness (Multiple Channels)



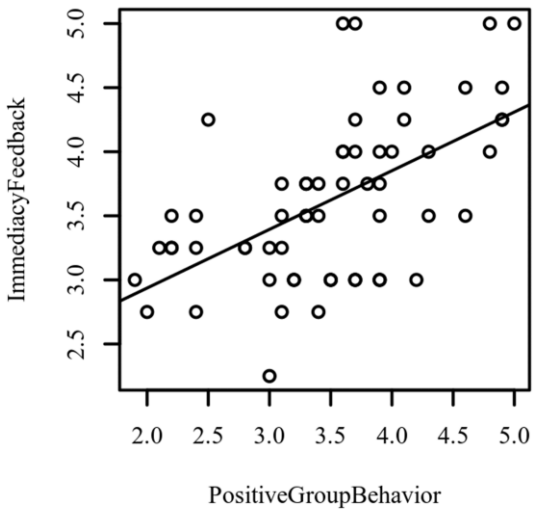
Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback)

A significant positive correlation was observed between Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback) ($r_p = 0.57$, $p < .001$, 95% CI [0.37, 0.72]). The correlation coefficient between Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback) was 0.57, indicating a large effect size. This correlation indicates that as Social Space (Positive Group Behavior) increases, Media Richness (Immediacy Feedback) tends to increase. The scatterplots between Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback) follow a positive linear pattern which shows that the linearity

assumption is met. Figure 28 presents the scatterplots with a regression line added to assist the interpretation of the correlation between Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback).

Figure 28

Scatterplots for Social Space (Positive Group Behavior) and Media Richness (Immediacy Feedback)



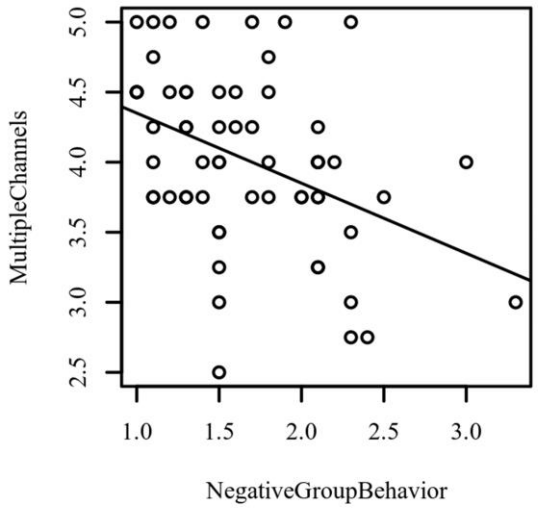
Social Space (Negative Group Behavior) and Media Richness (Multiple Channels)

A significant negative correlation was observed between Social Space (Negative Group Behavior) and Media Richness (Multiple Channels) (r_p = -0.41, p = .001, 95% CI [-0.60, -0.17]). The correlation coefficient between Social Space (Negative Group Behavior) and Media Richness (Multiple Channels) was -0.41, indicating a moderate effect size. This correlation indicates that as Social Space (Negative Group Behavior) increases, Media Richness (Multiple Channels) tends to decrease. The scatterplots between Social Space (Negative Group Behavior) and Media Richness (Multiple Channels) follow a negative linear pattern which shows that the linearity assumption is met. Figure 29 presents the scatterplots with a regression line added to

assist the interpretation of the correlation between Social Space (Negative Group Behavior) and Media Richness (Multiple Channels).

Figure 29

Scatterplots for Social Space (Negative Group Behavior) and Media Richness (Multiple Channels)



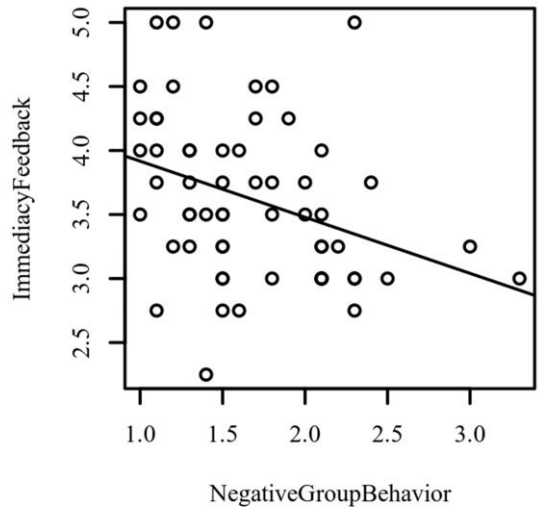
Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback)

A significant negative correlation was observed between Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback) (r_p = -0.35, p = .007, 95% CI [-0.55, -0.10]). The correlation coefficient between Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback) was -0.35, indicating a moderate effect size. This correlation indicates that as Social Space (Negative Group Behavior) increases, Media Richness (Immediacy Feedback) tends to decrease. The scatterplots between Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback) follow a negative linear pattern which shows that the linearity assumption is met. Figure 30 presents the scatterplots with a regression line

added to assist the interpretation of the correlation between Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback).

Figure 30

Scatterplots for Social Space (Negative Group Behavior) and Media Richness (Immediacy Feedback)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Space (Positive) - Media Richness (Multiple Channels) had a moderate effect size of 0.44 and a $p < .001$, which indicated a moderate, positive correlation. Social Space (Positive) - Media Richness (Immediacy Feedback) had a large effect size of 0.57 and a $p < .001$, which indicated a strong, positive correlation. Social Space (Negative Group Behavior) - Media Richness (Multiple Channels) had a moderate effect size of -0.41 and a $p = .001$, which indicated a moderate, negative correlation. Social Space (Negative Group Behavior) - Media Richness (Immediacy Feedback) had a moderate effect size of -0.35 and a $p = .007$, which indicated a moderate, negative correlation. Table 31 presents the results of the

correlations between Social Space (Positive), Social Space (Negative), Media Richness (Multiple Channels), and Media Richness (Immediacy Feedback).

Table 31

Pearson Correlation Results Between Social Space (Positive), Social Space (Negative), Media Richness (Multiple Channels), and Media Richness (Immediacy Feedback)

Combination	r_p	95% CI	*p*
Social Space (Positive) - Media Richness (Multiple Channels)	0.44	[0.21, 0.63]	< .001
Social Space (Positive) - Media Richness (Immediacy Feedback)	0.57	[0.37, 0.72]	< .001
Social Space (Negative) - Media Richness (Multiple Channels)	-0.41	[-0.60, -0.17]	.001
Social Space (Negative) - Media Richness (Immediacy Feedback)	-0.35	[-0.55, -0.10]	.007

Note. $n = 60$.

Social Space and Media Richness

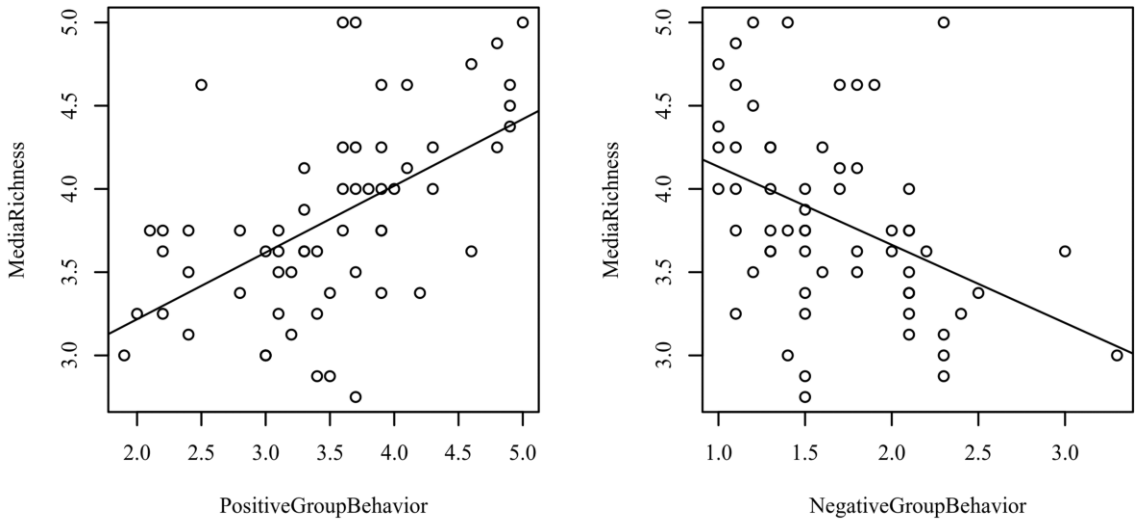
Lastly, a Pearson correlation analysis was then conducted among the Social Space group behaviors and the combined Media Richness constructs. A significant positive correlation was observed between Social Space (Positive Group Behavior) and Media Richness ($r_p = 0.55$, $p < .001$, 95% CI [0.35, 0.71]). The correlation coefficient between Social Space (Positive Group Behavior) and Media Richness was 0.55, indicating a large effect size. This correlation indicates that as Social Space (Positive Group Behavior) increases, Media Richness tends to increase.

A significant negative correlation was observed between Social Space (Negative Group Behavior) and Media Richness ($r_p = -0.41$, $p = .001$, 95% CI [-0.60, -0.18]). The correlation coefficient between Social Space (Negative Group Behavior) and Media Richness was -0.41,

indicating a moderate effect size. This correlation indicates that as Social Space (Negative Group Behavior) increases, Media Richness tends to decrease. The scatterplots between Social Space (Positive Group Behavior) and Media Richness follows a positive linear pattern which shows that the linearity assumption is met, and the scatterplots between Social Space (Negative Group Behavior) and Media Richness follows a negative linear pattern which also shows that the linearity assumption is met. Figure 31 presents the scatterplots of the correlations for Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Media Richness. A regression line has been added to assist the interpretation.

Figure 31

Scatterplots for Social Space (Positive Group Behavior) and Media Richness (left), and Social Space (Negative Group Behavior) and Media Richness (right)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Social Space (Positive Group Behavior) - Media Richness had a large effect size of 0.55 and a $p < .001$, which indicated a strong, positive correlation. Social Space (Negative Group Behavior) - Media Richness had a moderate effect size of -0.41

and a $p = .001$, which indicated a moderate, negative correlation. Due to the strong, positive correlation between Social Space (Positive Group Behavior) and Media Richness and the moderate, negative correlation between Social Space (Negative Group Behavior) and Media Richness, the null hypothesis ($H_0 5$) was rejected. Table 32 presents the results of the correlations between Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Media Richness.

Table 32

Pearson Correlation Results Between Social Space (Positive Group Behavior), Social Space (Negative Group Behavior), and Media Richness

Combination	r_p	95% CI	p
Social Space (Positive) – Media Richness	0.55	[0.35, 0.71]	< .001
Social Space (Negative) – Media Richness	-0.41	[-0.60, -0.18]	.001

Note. $n = 60$.

$H_0 6$: Sociability is not related to media richness in a synchronous videoconferencing learning environment.

A Pearson correlation analysis was conducted among sociability and the media richness constructs. Cohen's standard was used to evaluate the strength of the relationships. The linear correlation coefficient measured the strength and direction of the linear relationship between sociability and media richness (multiple channels); and sociability and media richness (immediacy feedback). Scatterplots graphically display the relationship between each of the two measured variables.

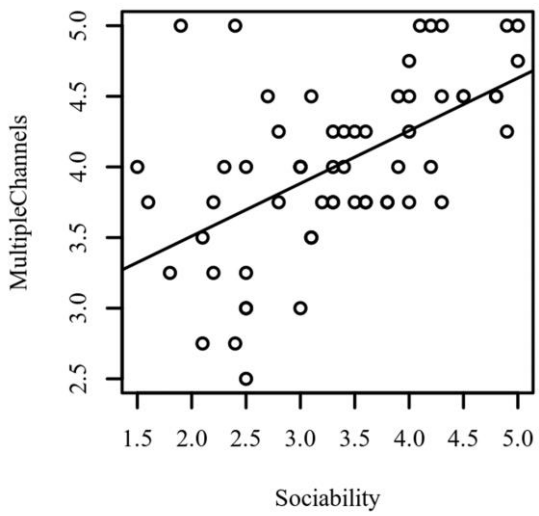
Sociability and Media Richness (Multiple Channels)

The result of the correlations was examined based on an alpha value of 0.05. A significant positive correlation was observed between Sociability and Media Richness (Multiple

Channels) (r_p = 0.56, p < .001, 95% CI [0.35, 0.71]). The correlation coefficient between Sociability and Media Richness (Multiple Channels) was 0.56, indicating a large effect size. This correlation indicates that as Sociability increases, Media Richness (Multiple Channels) tends to increase. The scatterplots between Sociability and Media Richness (Multiple Channels) follow a positive linear pattern. The positive linear pattern shows that the linearity assumption is met. Figure 32 presents the scatterplots with a regression line added to assist the interpretation of the correlation for Sociability and Media Richness (Multiple Channels).

Figure 32

Scatterplots for Sociability and Media Richness (Multiple Channels)



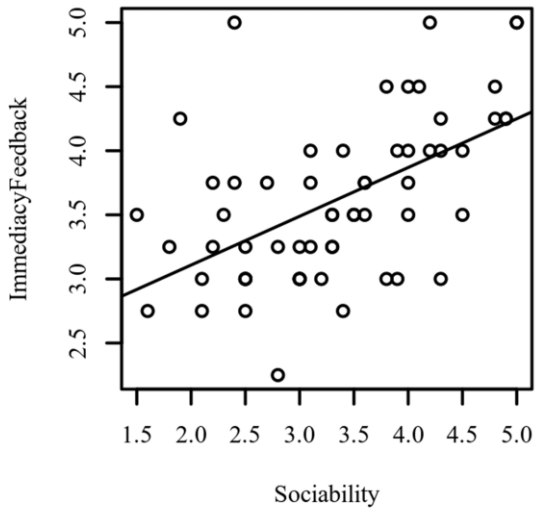
Sociability and Media Richness (Immediacy Feedback)

A significant positive correlation was observed between Sociability and Media Richness (Immediacy Feedback) (r_p = 0.55, p < .001, 95% CI [0.34, 0.70]). The correlation coefficient between Sociability and Media Richness (Immediacy Feedback) was 0.55, indicating a large effect size. This correlation indicates that as Sociability increases, Media Richness (Immediacy Feedback) tends to increase. The scatterplots between Sociability and Media Richness

(Immediacy Feedback) follow a positive linear pattern which shows that the linearity assumption is met. Figure 33 presents the scatterplots with a regression line added to assist the interpretation of the correlation for Sociability and Media Richness (Immediacy Feedback).

Figure 33

Scatterplots for Sociability and Media Richness (Immediacy Feedback)



Results. The result of the correlations was examined based on an alpha value of 0.05. The Pearson correlation results among Sociability – Media Richness (Multiple Channels) had a large effect size of 0.56 and a $p < .001$; and Sociability – Media Richness (Immediacy Feedback) had a large effect size of 0.55 and a $p < .001$, which indicated a strong, positive correlation between the variables. Table 33 presents the results of the correlations between Sociability, Media Richness (Multiple Channels), and Media Richness (Immediacy Feedback).

Table 33

Pearson Correlation Results Between Sociability and Media Richness

Combination	r_p	95% CI	*p*
Sociability - Media Richness (Multiple Channels)	0.56	[0.35, 0.71]	< .001
Sociability - Media Richness (Immediacy Feedback)	0.55	[0.34, 0.70]	< .001

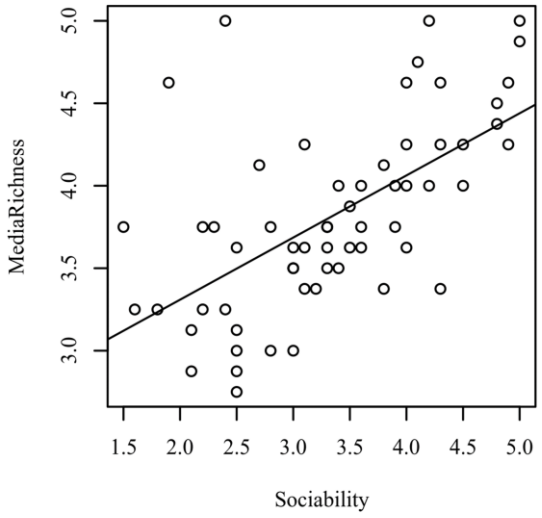
Note. $n = 60$.

Sociability and Media Richness

A Pearson correlation analysis was then conducted among Sociability and the Media Richness constructs. A significant positive correlation was observed between Sociability and Media Richness ($r_p = 0.60$, $p < .001$, 95% CI [0.41, 0.74]). The correlation coefficient between Sociability and Media Richness was 0.60, indicating a large effect size. This correlation indicates that as Sociability increases, Media Richness tends to increase. The scatterplots between Sociability and Media Richness follow a positive linear pattern which shows that the linearity assumption is met. Figure 34 presents the scatterplots of the correlation for Sociability and Media Richness. A regression line has been added to assist the interpretation.

Figure 34

Scatterplots for Sociability and Media Richness



Results. The result of the correlation was examined based on an alpha value of 0.05. The Pearson correlation results among Sociability - Media Richness had a large effect size of 0.60 and a $p < .001$, which indicated a strong, positive correlation. The null hypothesis ($H_0$6) was rejected because of the strong, positive correlation between Sociability and Media Richness, as presented in Table 34.

Table 34

Pearson Correlation Results Between Sociability and Media Richness

Combination	r_p	95% CI	*p*
Sociability - Media Richness	0.60	[0.41, 0.74]	< .001

Note. $n = 60$.

Null Hypotheses

Due to the strong, positive correlation between Social Presence and Social Space (Positive Group Behavior) and the moderate, negative correlation between Social Presence and

Social Space (Negative Group Behavior), the null hypothesis ($H_0$1) was rejected. The null hypothesis ($H_0$2) was rejected because of the strong, positive relationship between Social Presence and Sociability. The null hypothesis ($H_0$3) was rejected because of the strong, positive relationship between Social Presence and Media Richness. Due to the strong, positive correlation between Social Space (Positive Group Behavior) and Sociability and the moderate, negative correlation between Social Space (Negative Group Behavior) and Sociability, the null hypothesis ($H_0$4) was rejected. Due to the strong, positive correlation between Social Space (Positive Group Behavior) and Media Richness and the moderate, negative correlation between Social Space (Negative Group Behavior) and Media Richness, the null hypothesis ($H_0$5) was rejected. The null hypothesis ($H_0$6) was rejected because of the strong, positive correlation between Sociability and Media Richness.

Summary

The total sample size for this research consisted of sixty (n = 60) male and female graduate students between the ages of 25 to 65+. When asked how satisfied or dissatisfied participants were with their Zoom engagement and interaction with the instructor and other students, 67% were extremely to quite engaged during their course Zoom sessions, 95% were extremely to somewhat satisfied with interaction with the instructor, and 73% were extremely to somewhat satisfied with interaction with other students. Seeing faces and hearing the voices of others in class was extremely to very important to 75% of the respondents. Of the 75% who felt seeing the faces and hearing the voices of others in class was extremely to very important, 48% were females, and 27% were males. While 46% of females indicated it was extremely important to see the faces and hear the voices of others in class, only 29% of males indicated it was extremely important. Of the age groups of those who thought seeing the faces and hearing the

voices of others in class was extremely important, 8.3% were aged 25-34; 12% were 35-44; 18% were 45-54; and 1.67% were 55-64. While 44% of those between ages 45-54 felt it was extremely important to see the faces and hear the voices of others in class, only 33% aged 55-64 indicated it was extremely important. To answer the research question, a Pearson correlation analysis was conducted to investigate how strongly and in what direction social presence, social space, sociability, and media richness were related in a synchronous videoconferencing learning environment. The Pearson correlation analysis indicated a strong, positive correlation between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness. A moderate, negative correlation was indicated between Social Space (Negative Group Behavior) and Social Presence; Social Space (Negative Group Behavior) and Sociability; and Social Space (Negative Group Behavior) and Media Richness. Therefore, the null hypothesis was rejected for all. The following chapter will present a discussion of these findings and recommendations for future research.

Chapter 5 - Discussion

Looking through the lens of social constructivism, this correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related. The previous chapter presented the findings for the six null hypotheses. This chapter will present a study summary, a discussion of the findings, implications for practice, recommendations for future research, and a conclusion.

Study Summary

The purpose of this study was to test the theories of social presence and media richness as it related to students in the online synchronous videoconferencing learning environment. The conceptual framework that situated this study provided an understanding of the interlinked concepts within social constructivism, social presence theory, and media richness theory. Looking through the lens of social constructivism, this correlational cross-sectional study explored graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment by investigating how strongly and in what direction social presence, social space, sociability, and media richness were related. The sample population for this research consisted of 60 adult students between the ages of 25 to 65+ years old who were currently using synchronous videoconferencing in their online learning experience. The communication theories of social presence and media richness were applied to better understand the relationship between the communication medium (videoconferencing) and the interactions within the mediated environments (e.g., Zoom) from a student's perspective. The data collected from the participants was evaluated using descriptive and inferential statistics to

evaluate the research question and hypotheses. The findings from this study indicated that 67% of the respondents were extremely to quite engaged during their course Zoom sessions; 95% were extremely to somewhat satisfied with interaction with the instructor; and 73% were extremely to somewhat satisfied with interaction with other students. Of the 75% of the respondents who felt seeing the faces and hearing the voices of others in class was extremely to very important, 48% were females, 29% were males, and 44% were between the ages of 45-54. The Pearson correlation analysis indicated a strong, positive correlation between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness. A moderate, negative correlation was indicated between Social Space (Negative Group Behavior) and Social Presence; Social Space (Negative Group Behavior) and Sociability; and Social Space (Negative Group Behavior) and Media Richness. The null hypothesis was rejected for all.

Synchronous videoconferencing in online courses allows for immediate real-time social interaction, thereby enabling increased media richness and social presence in the learning environment. The sociability of a learning environment is expected to be a predictor of how much social interaction will take place. Synchronous videoconferencing supports immediate communication that creates a sense of having a face-to-face conversation while promoting feelings that the other person is ‘real’ in the interaction. As social interaction occurs, the communicators will form an impression of one another. The process of impression formation determines the emergence of social presence. The synchronous videoconferencing learning environment is a rich communication medium that provides the ability for real-time social

interaction among students that fosters impression formation and the emergence of social presence.

A literature review establishes the importance of the current study in relationship to previous studies (Rocco & Plakhotnik, 2009). The literature review for this study revealed that although online course enrollments have increased over the past two decades (Berry, 2017), low retention rates persist (Muilenburg & Berge, 2005; Ng, 2019). Online students often feel isolated and lack a social connection with their instructor and classmates (Baxter, 2012; Pinsk et al., 2014). Feelings of isolation, lack of social connection, and high dropout rates indicate that the learners' learning needs are not being sufficiently addressed in the online learning environment (Baxter, 2012; Borup et al., 2013; McInnerney & Roberts, 2004; Shelton et al., 2017). A lack of social interaction is a barrier to students' learning. A communication medium's ability to provide a sense that the communication partner is immediately available has been found to affect communication content, satisfaction, and the ability to communicate complex information (Kuyath & Winter, 2006). Synchronous videoconferencing is a communication medium that allows users to share audio and visual facilities in real-time, without delay (Al-Samarraie et al., 2019), which adds a real-life experience to the online learning environment (Guo et al., 2010; Martin et al., 2017; McInnerney & Roberts, 2004). Synchronous videoconferencing provides the visual of non-verbal, facial, and physical cues that are present in face-to-face courses but lacking in text-based only discussion posts. The synchronous videoconferencing learning environment provides the necessary tools for online education that support social interaction, communication, sharing, and collaboration.

Research on student engagement in synchronous videoconferencing learning environments is limited. Previous research conducted on synchronous videoconferencing

examined how it related to engagement and communication (Basko & Hartman, 2017); combating feelings of isolation (McInnerney & Roberts, 2004); creating a sense of community (Berry, 2019; McInnerney & Roberts, 2004); and learner characteristics and online technology self-efficacy (Kobayashi, 2017). Communication platforms such as Remind (Basko & Hartman, 2017), VoIP, Social Bookmark, Social Networks, Facebook, and YouTube (Hitrec et al., 2011) were also examined. The participants in the research studies consisted of high school (Rehn et al., 2016) and undergraduate level students (Basko & Hartman, 2017; Clark et al., 2015; Wagner et al., 2016), and faculty members. Student perspectives of social presence (Clark et al., 2015) and teaching presence (Clark et al., 2015; Rehn et al., 2016) were also investigated. The systematic review conducted by Martin et al. (2017) of 157 articles from thirty-four countries identified a number of meta-analyses and systematic reviews conducted on distance education and online learning, but none specifically examined synchronous online learning. Previous studies that measured both media richness and social presence examined instant messaging (Guo et al., 2010; Kuyath & Winter, 2006; Oregon et al., 2018; Tseng et al., 2019), recorded videos (Oregon et al., 2018), SMS text messaging (Oregon et al., 2018), traditional email and with avatars (Guo et al., 2010; Kuyath & Winter, 2006; Lee et al., 2009), telephone (Kuyath & Winter, 2006), Social Networking Services (Guo et al., 2010), and learning management systems as communication mediums (Thien et al., 2013). Campbell (2006) explored videoconferencing in an office setting, and Dennis and Kinney (1998) studied the effects of media richness on decision making with two-person teams using computer-mediated and video communication with 132 undergrad students. None of the previous research, however, explored how social presence, social space, sociability, and media richness were related in a synchronous videoconferencing learning environment from a student's perspective.

Discussion of the Findings

This study tested variables that have been developed in the fields of communication and adult education literature for their association with student satisfaction with online learning. Consisting of one research question and six null hypotheses, this research conducted an exploration of graduate students' perceived social presence and media richness of a synchronous videoconferencing learning environment. The research question for this study was designed to explore students' perceptions on the social presence, social space, sociability, and media richness students' by asking *how strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?* All null hypotheses for this research were rejected based on the hypotheses tests.

$H_0$1 was rejected because the strong, positive correlation between Social Presence and Social Space (Positive Group Behavior) indicates that as Social Presence increases, Social Space (Positive Group Behavior) tends to increase in a synchronous videoconferencing environment. The moderate, negative correlation between Social Presence and Social Space (Negative Group Behavior) indicates that as Social Presence increases, Social Space (Negative Group Behavior) tends to decrease in a synchronous videoconferencing environment. This result was consistent with previous literature. Kreijns et al. (2013) state, "simply enabling social interaction, therefore is not enough; it must be stimulated," and that sociability, social space, and social presence influence the social interaction that is needed for both learning and the emergence of a sound social space (p. 230). According to Kreijns et al. (2004a), social presence leads to a social space, and social space supports social interaction. In a collaborative online learning environment, social presence is a variable that affects the degree to which a social space will emerge (Kreijns et al., 2013). Kuyath and Winter (2006) suggest, "The immediacy of a communication medium

plays a role in its social presence such that greater delays in the communication media can contribute to a lower social presence" (p. 70). A lack of social presence is a barrier to students engaging in and completing online courses. Students find delays in responses from their peers and instructors to be the most frustrating characteristic of online classes. Synchronous videoconferencing provides a medium for immediate communication that makes the online students' experience comparable to that of the traditional face-to-face on-campus student. In the context of synchronous videoconferencing learning, the ability for students to immediately engage with their peers and instructors with no delays results in lowered communication frustration, thereby increasing social presence, social space, and student satisfaction. A sound social space in the online classroom enables social interaction (Kreijns & Kirschner, 2001).

$H_0$2 was rejected because the strong, positive relationship between Social Presence and Sociability indicates that as Social Presence increases, Sociability tends to increase in a synchronous videoconferencing environment. This result was consistent with previous literature. Kreijns et al. (2004b, 2013) suggest that sociability will influence social presence directly, as well as through social interaction. The sociability of a learning environment is expected to be a predictor of how much social interaction will take place. Social interaction is the process in which task-oriented or socio-emotional-oriented messages are exchanged between members of the group (Kreijns et al., 2013). The reduction of social interaction was found by Arbaugh (2000) to be a factor that negatively impacted student satisfaction in distance education. Synchronous videoconferencing provides the capability for immediate social interaction, which allows students to experience each other as actual *real* humans instead of text on a screen. In a synchronous videoconferencing learning environment, the capability for immediate social interaction helps students create feelings of group affiliation by increasing participation and

engagement, resulting in increased sociability and social presence. When feelings of group affiliation and cohesion occur, collaboration and learning communities are formed (Pinsk et al., 2014).

$H_0$3 was rejected because the strong, positive relationship between Social Presence and Media Richness indicates that as Social Presence increases, Media Richness tends to increase in a synchronous videoconferencing environment. This result was consistent with previous literature. Robert and Dennis (2005) suggest that media richness and social presence are linked and can be measured in two dimensions: time and space. They proposed that media providing same-time and same-place interaction are perceived to be higher in social presence and media richness than media providing different-time and different-place interaction. Oregon et al. (2018) found a distinct correlation between using rich media technologies and enhancing social presence due to the positive impact it had on retention rates in the program. Campbell (2006) explored the impact of communication apprehension and participation in a videoconferencing context. Their findings indicated that the media richness and social presence aspects of media choice theory are important considerations for videoconferencing users (Campbell, 2006). A lack of social presence has been associated with student engagement, course completions, and high dropout rates. Synchronous videoconferencing is a rich media technology that provides a sense that the communication partner is *real* and immediately available. The synchronous videoconferencing learning environment provides same-time and same-place interaction for students, which results in higher perceived social presence and media richness, thereby positively impacting course completions and retention rates.

$H_0$4 was rejected because the strong, positive correlation between Social Space (Positive Group Behavior) and Sociability indicates that as Social Space (Positive Group Behavior)

increases, Sociability tends to increase in a synchronous videoconferencing environment. The moderate, negative correlation between Social Space (Negative Group Behavior) and Sociability indicates that as Social Space (Negative Group Behavior) increases, Sociability tends to decrease in a synchronous videoconferencing environment. This result was consistent with previous literature. As noted previously, sociability facilitates social presence and social interaction, which are important processes necessary for socioemotional interaction that can result in the emergence of a social space (Kreijns et al., 2013). Social interaction, therefore, is the precursor to the emergence of a social space. Social space is the perceived network of interpersonal relationships among group members (Kreijns et al., 2004a, 2004b; Weidlich & Bastiaens, 2019), and a "sound social space makes it possible for group members to gain a feeling of relatedness, group cohesiveness, trust, and respect for each other" (Kreijns et al., 2013, p. 239). The synchronous videoconferencing learning environment increases sociability and social space (positive group behavior) by providing students the ability to socially interact, gain feelings of relatedness, build group cohesiveness, trust, and respect for each other. When meaningful positive social interactions occur, feelings of isolation and anonymity are reduced.

$H_0$5 was rejected because the strong, positive correlation between Social Space (Positive Group Behavior) and Media Richness indicates that as Social Space (Positive Group Behavior) increases, Media Richness tends to increase in a synchronous videoconferencing environment. The moderate, negative correlation between Social Space (Negative Group Behavior) and Media Richness indicates that as Social Space (Negative Group Behavior) increases, Media Richness tends to decrease in a synchronous videoconferencing environment. This result was consistent with previous literature. As noted by Baehr (2012), synchronous learning offers high-to-moderate levels of richness, and asynchronous learning offers moderate-to-low levels of

richness. Kuyath and Winter (2006) proposed that a communication medium's ability to provide a sense that the communication partner is real and immediately available has been found to affect communication content, satisfaction, and the ability to communicate complex information. Synchronous videoconferencing creates the sense of having a face-to-face conversation by providing the feeling and psychological sensation that the others in the communication appear to be *real*, which can lead to feelings of relatedness, group cohesiveness, interpersonal relationships, and the development of a sound social space (Kreijns et al., 2013). The synchronous videoconferencing learning environment provides increased social space (positive group behavior) and media richness by enabling students the ability to clearly communicate complex information and develop group cohesiveness and interpersonal relationships.

$H_0$6 was rejected because the strong, positive correlation between Sociability and Media Richness indicates that as Sociability increases, Media Richness tends to increase in a synchronous videoconferencing environment. This result was consistent with previous literature. Sociability is the perceived quality of the learning environment to facilitate social interaction (Kreijns et al., 2007; Weidlich & Bastiaens, 2019), and media richness is a communication medium's capacity to facilitate the processing of rich information (Daft et al., 1987). Sun and Cheng (2007) found that a course with high uncertainty and equivocality in content needs high richness media representation. Conradie et al. (2014) found a significant correlation between media richness, immediate feedback, capacity to transmit multiple perspectives, and language variety, with student satisfaction. Arbaugh (2000) found that the flexibility of the communication medium and the ability to develop an interactive course environment plays a larger role in determining student satisfaction than the ease or frequency with which the medium could be used. The synchronous videoconferencing environment provides an interactive course

environment for students that enables immediate feedback, the capacity to transmit multiple perspectives, and language variety, therefore, increasing student sociability and perceived media richness.

Social constructivism emphasizes the role of social relationships in the individual construction of knowledge (Adams, 2006; Young & Collin, 2004). Synchronous videoconferencing strengthens social presence and is a beneficial learning environment for students' learning. It provides students the ability to immediately engage with their peers and instructors with no delays resulting in lowered communication frustration, thereby increasing sociability, social presence, and social space. This research indicated that 67% of the participants were extremely to quite engaged during their course Zoom sessions, 95% were extremely to somewhat satisfied with interaction with the instructor, and 73% were extremely to somewhat satisfied with interaction with other students. This result was consistent with previous literature findings but in contrast with the Charbonneau-Gowdy (2018) findings. Clark et al. (2015) found perceptions of social and teaching presence were significantly higher when using video-enabled discussion in both asynchronous and synchronous contexts. Oregon et al. (2018) found a distinct correlation between using rich media technologies and enhancing social presence and retention rates. Conradie et al. (2014) found a significant correlation between media richness and student satisfaction. Arbaugh (2000) found that social interaction impacted student satisfaction. Kuyath and Winter (2006) found the immediacy of a communication medium plays a role in student satisfaction and social presence. The Charbonneau-Gowdy (2018) findings, however, were attributed to instructors being unable to encourage social learning practices in the face-to-face Zoom classes. Although the instructors had the technological capability to incorporate social interaction, they instead reverted back to traditional teaching practices that used PowerPoint

slides. The lack of social interaction resulted in the students missing out on opportunities for peer-to-peer learning that would have assisted them in gaining confidence with practicing their new language skills. As previously noted, creating a sociable learning environment benefits the quality of the learning experience (Weidlich & Bastiaens, 2017). The Charbonneau-Gowdy (2018) findings reaffirm that appropriate uses of technology combined with effective teaching approaches offer opportunities for quality and sustained learning.

Most of the studies that explored the relationship between users' demographic variables and social presence included them as covariates or control variables in their analyses without specifically focusing on gender and age. Based upon this research, females appear to be more engaged than males in the synchronous videoconferencing online learning environment. Of the 75% of the respondents who felt seeing the faces and hearing the voices of others in class was extremely to very important, 48% were females, and only 29% were males; 85% of females were extremely to quite engaged during their course Zoom sessions, and only 33% of males; 49% of females indicated they were extremely satisfied with the interaction with the instructor, and only 19% of males; 38% of females indicated they were extremely satisfied with the interaction with other students, and only 24% of males. This result was consistent with the Richardson and Swan (2003) findings but in contrast with the Kim (2011) findings. Richardson and Swan (2003) found that females experienced higher levels of social presence compared to males, while Kim (2011) found male students to have significantly higher social presence than female students. The contrast in findings may be attributed to social and cultural differences in Korean society, where men are more likely to actively participate in social engagement than females. The results from this research also found students between ages 45-54 felt seeing the faces and hearing the voices of others in class was more important than other age groups. Only 33% aged 55-64 indicated it

was extremely important, while 44% of those between ages 45-54 felt it was extremely important to see the faces and hear the voices of others in class. This result was consistent with the findings of Siriaraya and Ang (2012) but not consistent with the Felnhofer et al. (2014), Kim (2011), and Richardson and Swan (2003) findings. The Siriaraya and Ang (2012) findings indicated that participants aged 55+ tended to experience lower levels of social presence, whereas Felnhofer et al. (2014), Kim (2011), and Richardson and Swan (2003) found no significant relationship between social presence and age. Siriaraya and Ang (2012) also noted that the lower levels of social presence by participants aged 55+ correlated with their significantly greater difficulty in navigation of the virtual technology (familiarity of the technology).

Implications for Practice

The findings from this research have conceptual and practical implications for educators and curriculum designers in the design and development of future online courses. This research provides conceptual and practical teaching strategies that will help make online students' experiences as comparable and rich to that of their traditional on-campus face-to-face student counterparts. With new and emerging technologies, the ways students communicate, interact, and learn are continuously changing, which means instructional approaches to online delivery need to also continue to adapt to fulfill the students' digital learning needs. When educators and curriculum designers understand how students interact and engage with the use of various media in learning contexts, they will be better able to accommodate the students' needs within their instructional strategies (Guo et al., 2010).

Due to COVID-19, lockdown and social distancing measures impacted higher education by forcing the vast majority of institutions to immediately replace classroom teaching with distance teaching and learning. Replacing face-to-face instruction with distance education meant

educators had to immediately change their course delivery. Educators worldwide were forced to find ways to maximize interpersonal communication while maintaining social distancing requirements. With only a week or two to convert courses, the most challenging issues institutions faced were faculty preparedness and underprepared students (Garrett et al., 2020b). Prior to COVID-19, many instructors did not have experience teaching online (Johnson et al., 2021). Although many instructors chose to teach with a hybrid style that incorporated synchronous videoconferencing into their course delivery, those who lacked online teaching experience struggled to transition their face-to-face courses within a matter of days. The swift shift to online learning left many students without technology, internet connections, and the guidance and skills they needed to succeed (Garrett et al., 2020b; Garrett et al., 2021). Many institutions distributed laptops, tablets, wireless hotspots, expanded on-campus internet access and provided free software (Garrett et al., 2021).

Although COVID-19 significantly accelerated the digitalization of teaching and learning across the world, overall postsecondary enrollments continued to decline. Undergraduate students accounted for all of the decline; graduate student enrollment continued to increase (Causey et al., 2021; National Student Clearinghouse, 2021, 2022). From Fall 2019 to Fall 2021, the two-year enrollment losses represented a decline of 5.1 percent resulting in over 900,000 students (National Student Clearinghouse, 2021, 2022). At community colleges, traditional college-aged students between the ages of 18 to 24 declined the most, while adult students aged 25 or older decreased less than half the rate of the younger age group. In Fall 2021, the nation's freshman class was 9.2 percent smaller compared to the pre-pandemic levels in Fall 2019 (National Student Clearinghouse, 2021, 2022). The huge shift from in-person learning to going fully online is believed to have contributed to the undergraduate decline, whereas the increase at

the graduate level was credited to pre-pandemic online learning having already been common practice for many graduate students (Garrett et al., 2021).

The decline in postsecondary enrollments may be attributed to students feeling unprepared and isolated due to a lack of positive social interactions with their instructor and classmates, as well as other COVID-19 related barriers. Findings from Klebs et al.'s (2021) online survey of over 1,000 college students and 200 high school seniors indicated that students' negative perspectives and concerns for online classes persisted. Over half of the students surveyed expressed concern that their degree was less valuable because it was online and felt that higher education was not good quality since it moved online (Klebs et al., 2021). Most of the students stated that they found it challenging to have a fulfilling online learning experience, with approximately two-thirds indicating that higher education is no longer worth the cost (Klebs et al., 2021). The top challenges for college students included: staying motivated to learn, having access to labs, specialized equipment, clinicals, internships, and getting proper instruction from their professors (Klebs et al., 2021). Additional challenges for students also included: caregiver students taking care of children while pursuing their education; learning from peers; interacting with instructors; and access to student support services (Klebs et al., 2021).

The pandemic not only forced educators to rapidly shift their teaching roles from the classroom to online but they were also faced with having to provide each of their students feedback remotely. Providing feedback to students remotely can incorporate the use of asynchronous and synchronous technologies. Feedback from the perspective of media richness theory is identified as having three elements: content and utility, timing and efficiency, and delivery and affective support (Istenič, 2021). Educators should consider utilizing various communication modalities and formats when providing specific and detailed feedback to

students (Istenič, 2021; Wisniewski et al., 2020). Providing detailed, specific written, audio, and video comments are more effective than just providing grades (Wisniewski et al., 2020). Synchronous videoconferencing can be used in both group and individual one-on-one sessions to provide timely feedback, listen to concerns, and guide students. When providing feedback, educators should include the use of positive comments, gentle language, and redirection of student work and discussions (Richardson et al., 2016). Instructor feedback that addresses students' personal needs and integrates multiple dimensions profoundly influences learning (Istenič, 2021).

Implications for practice include integrating and using mediated technologies in the online learning environment that incorporate a capability for stimulating meaningful social interactions. When meaningful positive social interactions occur, feelings of isolation and anonymity are reduced (McInnerney & Roberts, 2004). Social interaction is necessary for group members to learn from each other and for the occurrence of socioemotional processes, which helps to create a social space where trust, interpersonal relationships, and a sense of community exist. Information technology has enabled the capability for peer learning in numerous ways: by creating learning groups, structuring learning activities, and facilitating group interactions (Topping, 2005). Group interactions and collaborative peer-learning occur when students work together in groups to discuss ideas and solve problems by working alongside one another while also providing opportunities for self-reflection and learning within the learning environment (Boud et al., 1999; Topping, 2005). Incorporating the use of synchronous videoconferencing technologies into the online learning environment provides educators the capability for stimulating meaningful social interactions.

Transitioning to new technologies and communication mediums during the pandemic crises created a need for new pedagogical approaches in the online learning environment. Due to COVID-19, faculty gained a new appreciation of online education and are now familiar with incorporating video, digital materials, and online educational resources into their course delivery (Johnson et al., 2021). The use of videoconferencing was estimated to have increased from 51% usage in 2019 to an estimated 87% by the end of 2021 (Garrett et al., 2021). When introducing new and emerging technologies into the learning environment, the helpfulness of different media for satisfying students' psychological and communication needs may also change (Guo et al., 2010). For some students, increased social presence may not always be better. Students who have high social anxiety and communication apprehension are often uncomfortable in the presence of people and may prefer to withdraw from social interaction and avoid engaging in conversation (Oh et al., 2018). When designing courses, it is therefore important to consider the context, specific communication goal, communication preferences, and the different characteristics of the learner. Depending on the specific communication goal, certain media are superior to others in achieving the goal and increasing social presence. Increased social presence of a likable communication partner may lead to an increase in positive social outcomes. Conversely, increased social presence of a disliked communication partner may lead to negative communication outcomes (Oh et al., 2018). Negative communication outcomes may also occur if the communicator feels discomfort during social interactions (Oh et al., 2018). Since communication media can differ in their ability to facilitate understanding, educators and curriculum designers should consider offering varying levels of communication preferences and social presence within their online learning environment to accommodate students' varying communication needs.

Curriculum designers who understand how to best optimize technology, the pairing of content with delivery mode, and media type, help create a more effective educational communication exchange between instructor, content, and student. Incorporating synchronous videoconferencing with constructivist teaching approaches into course development shifts the focus from the teacher to the learner, thereby enabling the development of multiple perspectives and shared ideas through collaborative peer learning activities (Bonk & Khoo, 2014). Curriculum designers should consider including multiple opportunities and modalities for social interaction and collaborative learning activities within courses. Synchronous videoconferencing provides a medium for communication that enables meaningful positive social interactions, which makes the online students' experience comparable to that of the traditional face-to-face on-campus student. It allows students to experience each other as actual *real* humans instead of text on a screen. Incorporating synchronous videoconferencing opportunities for students to socially interact outside of scheduled class time, such as in breakout rooms, meeting rooms, and coffee break areas, are ways to foster social interaction, increase learner engagement, and build a sense of community that would otherwise have naturally occurred in an in-person class. Designing virtual learning spaces is especially important in reducing feelings of isolation, the loss of sense of community, and the anxiety caused by the pandemic crisis (Oliveira et al., 2021). Synchronous videoconferencing enables increased sociability, social presence, and social space (positive group behavior), which helps to create a more effective educational communication exchange between instructor, content, and student.

Many educators expect that teaching will continue to be different following the pandemic and anticipate the continued use of video-based technologies post-pandemic (Johnson et al., 2021). Synchronous videoconferencing provides a beneficial learning environment for student

learning; a greater sense of community among the learners (McInnerney & Roberts, 2004); a space for instructors to be present with students in a face-to-face manner; and strengthens social presence. Wagner et al. (2016) suggest that videoconferencing also creates opportunities for instructors to build relationships, address academic integrity issues, and assess student progress at regular intervals. Students experience a heightened sense of psychological need satisfaction that can be fostered through social interactions and relationships (Deci & Ryan, 2008; Jang et al., 2009; Ryan & Deci, 2017; Ryan et al., 2006). If students are dissatisfied with their online courses, they are likely to stop taking them and drop out. High drop-out rates have serious implications for the continued viability of online courses as an educational medium. Synchronous videoconferencing enables high-quality learning to occur through real-time social interaction, which is necessary to support social connectedness, build relationships, and satisfy the psychological needs of students (Cocquyt et al., 2017).

A student-centered teaching and learning approach supports facilitating learners in negotiating multiple perspectives, reconciling conflicting ideas, and constructing new knowledge (Jo et al., 2017). Student-centered instructional methods include problem-based learning, computer-supported collaborative learning, project-based learning, and discussion-based learning (Jo et al., 2017). With the integration of information technologies and diverse online learning environments, student-centered teaching and learning support positive effects on knowledge acquisition, increased communication, social engagement, and collaboration skills (Jo et al., 2017). Just assigning students learning tasks and placing them within groups does not in itself promote cooperation and collaboration among the students (Kreijns et al., 2002). Positive learning outcomes occur with active student engagement and instructor facilitation. With a

student-centered approach, it is essential that instructor facilitation and intervention occur during class discussions (Jo et al., 2017).

Educators should also consider incorporating synchronous videoconferencing into their course delivery as a method to facilitate continual communication, connect students with one another, provide feedback, and increase sociability, social presence, and social space (positive group behavior). When incorporating synchronous videoconferencing, instructors will need to create a friendly, warm, and welcoming tone in the learning environment while applying structured instructional approaches within the groups to reinforce and enhance collaborative learning and social interaction amongst the group members. Setting the tone within the learning environment is done by instructors making themselves approachable and modeling the expected behaviors in classroom discussions (Richardson et al., 2016). When instructors create a warm and welcoming tone in the synchronous videoconferencing learning environment, it increases student engagement, cohesion, collaboration and helps develop a sense of community. Creating a learning environment where cohesion, collaboration, and a sense of community occurs, reduces barriers to student learning, feelings of isolation, and dropout rates.

Technology alone is not effective in the online learning environment without educators who are knowledgeable in ways of using it to facilitate meaningful social interactions. The way in which technology is used plays an important role in shaping social interaction and student collaboration. If an instructor selects an unsuitable choice of media for course delivery, then the information conveyed will not be beneficial to the learners. The effectiveness of learning is heavily influenced by the ways educators design tasks, support groupwork, and guide the overall learning experience (Bower, 2019). When learning is being mediated through the use of technology, a sense of presence and community must be established through the way those

technologies are used. Institutions that offer continual faculty development and online training for educators assist them with learning new technologies and ways to implement and facilitate social interaction within their technology-enhanced educational settings.

Institutions moving more toward a hybrid course design that incorporates multiple delivery modalities should consider incorporating the use of synchronous videoconferencing into the design of appropriate courses. By designing courses with the capability for multiple synchronous delivery modalities, the potential for unforeseen emergency course transitions would be alleviated, avoiding future disruptions or potential impacts on student learning and higher education. Incorporating the capability for synchronous videoconferencing into courses gives instructors an instructional approach that combines face-to-face with synchronous online delivery. Combining face-to-face with synchronous videoconferencing offers flexibility for students and educators. The instructional approach could be implemented simultaneously with the face-to-face in-person delivery, as an online-only delivery, or a combination of both delivery methods. Incorporating the capability for synchronous videoconferencing into courses gives instructors and students the flexibility to choose whether they want to deliver or attend in-person, online or a combination of both. A hybrid course design would enable educators the ability to integrate face-to-face meetings while offering the option to communicate with larger groups via synchronous videoconferencing means. Creating courses with a hybrid design that can be modified to incorporate face-to-face classes and small group meetings offers flexibility for students and educators during the ongoing COVID-19 pandemic and beyond (Skulmowski & Rey, 2020).

Instructors facilitating online courses from a social constructivist approach should consider using a hybrid course design that offers flexibility for both the student and instructor.

The hybrid instructional approach can be implemented using synchronous videoconferencing in multiple ways: simultaneously with the face-to-face in-person delivery, as an online-only delivery, or a combination of both delivery methods. Using synchronous videoconferencing technologies in the hybrid course design should also include digital learning materials, online educational resources, and opportunities for students to socially interact outside of scheduled class time. Creating convenient spaces for students to use as breakout rooms, meeting rooms, and coffee break areas are ways to foster social interaction, increase learner engagement, peer-to-peer learning, and build a sense of community that would otherwise have naturally occurred in an in-person class. To reinforce and enhance collaborative learning and social interaction, instructors should apply structured approaches within the groups and intervene during class discussions to synthesize and conclude the discussions. Instructors can create a warm and welcoming environment by utilizing the synchronous video capability during class discussions, providing positive comments, using gentle language, encouraging students to use their cameras, and enabling the chat functionality to increase sociability, social interaction, social presence, and social space. The greater the sociability of an environment, the more likely social interaction will occur, which will result in the emergence of a sound social space. A sound social space makes it possible for group members to gain a feeling of relatedness, group cohesiveness, trust, and respect for each other.

Recommendations for Future Research

To increase the effective use of synchronous videoconferencing in higher education, further research is needed on why and how it can be used to increase student engagement and interaction in online learning environments. While this quantitative research explored the survey responses of 60 graduate students, recommendations for future research include collecting data

from a larger sample population, from more than one unit, and from more than one institution. Although 67% of the participants in this study indicated they were extremely to quite engaged during their course Zoom sessions, the response rate for this research was very limited. Eighty-two percent of the respondents in this study were White. This research needs to be furthered with a larger and more diverse sample population from multiple departments and institutions. A larger and more diverse sample population would enable the researcher to conduct comparisons between the institutions, departments, ethnicities, asynchronous to synchronous courses, undergraduate to graduate students, female to male students, and younger to older students. A more diverse and representative sample of participants facilitates greater generalizability of results and inclusivity of more populations (Asmal et al., 2022).

This research did not have students indicate if they were seeing or hearing impaired. It is recommended that future research provide a 'Prefer not to say' or 'Do not want to answer' option for Q10 "Seeing the faces and hearing the voices of others in class is," so participants with sensory impairments have an option for opting-out. It is important to ensure diversity, equity, and inclusion for all research participants in the research design, implementation, and data collection methods (Asmal et al., 2022). While this research indicated that students between ages 45-54 felt seeing the faces and hearing the voices of others in class was more important than other age groups, perhaps having additional questions separating seeing from hearing would render different results. Having separate questions would enable the researcher the ability to distinguish whether an age group valued seeing others over hearing them or if they valued hearing others over seeing them as more important. Further research needs to be done by age groups on students' perceived social presence and media richness of a synchronous videoconferencing learning environment in order to determine the reasons behind this finding. If

older participants tend to experience lower levels of social presence and media richness, it may be worth exploring if factors such as familiarity with a given technology or openness to learning new technologies influence their perceptions of social presence and media richness. Examining the different age groups for any generational differences in their social engagement and social experiences, including how they handle and use technology, is also recommended.

This research showed that females were more engaged than males. Further cross-referencing the analysis between the descriptive and correlational statistics is also recommended. A mixed-methods or qualitative research design would also enable the researcher to further explore why the level of engagement between females and males is different. Adding a question regarding employment status may also help explain engagement level since adult learners often have full-time jobs and have already worked an entire day before attending class, which may affect their classroom engagement levels. Through interviews and focus groups, the researcher could explore how and why participants felt engaged during their course Zoom sessions. In a qualitative design, participants have the ability to answer questions using their own words instead of being limited to selecting answers from Likert-type scales in a survey. Using open-ended questions, the researcher could gain a deeper understanding of why participants were satisfied with their instructor and student interactions; and why they felt seeing the faces and hearing the voices of others in class was important.

This research did not ask participants if their Zoom course was simultaneously connected to a face-to-face classroom. Considering the findings from Rehn et al. (2016) and Charbonneau-Gowdy (2018) indicated that teaching synchronous videoconferencing and face-to-face classes simultaneously led to challenges with developing presence, adding additional clarifying questions is recommended. Incorporating additional questions regarding the delivery method of

the participant's Zoom course would enable the researcher the ability to compare social presence of an online-only Zoom course to one that was simultaneously connected with a face-to-face classroom. Adding additional questions regarding the gender of the instructor would enable the researcher to compare instructor gender to students' perceived social presence and media richness of a synchronous videoconferencing learning environment.

Conclusion

This research significantly contributes to the field of social presence, social space, sociability, and media richness because it looks at the synchronous videoconferencing environment. Previous research on student engagement in synchronous videoconferencing learning environments is limited. This research, however, is unique because it applied the communication theories of social presence and media richness to better understand the relationship between the communication medium (videoconferencing) and the interactions within the mediated environments (e.g., Zoom) from a student's perspective by measuring their perceived social experiences on the social presence, social space, sociability, and media richness scales. This research showed that females were more engaged than males, and students between ages 45-54 felt seeing the faces and hearing the voices of others in class was more important than other age groups. Based on the results of the hypothesis tests in this study, it appears that a synchronous videoconferencing learning environment enables increased social presence, social space (positive group behavior), sociability, and media richness. The results of the hypothesis tests indicated a strong, positive correlation between Social Presence and Social Space (Positive Group Behavior); Social Presence and Sociability; Social Presence and Media Richness; Social Space (Positive Group Behavior) and Sociability; Social Space (Positive Group Behavior) and Media Richness; and Sociability and Media Richness in a synchronous videoconferencing

learning environment. Based on these findings, the uniqueness of this research environment positively promotes social presence and media richness.

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Appendix A - Relationship of Research Question, Null Hypotheses, Instrument Questions, and Statistical Techniques

Table A1

Relationship of Research Question, Null Hypotheses, Instrument Questions, and Statistical Techniques

Research Question	Null Hypothesis	Instrument Questions	Statistical Analysis Technique
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$1 - $H_0$6	Media richness 13 Social presence 14-15 Social space 16-17 Sociability 18	Inferential statistical analysis → Hypothesis testing → Parametric statistical test → Correlation test → Association between variables (interval/ratio) → Pearson correlation coefficient → Scatterplots interpretation
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$1: Social presence is not related to social space in a synchronous videoconferencing learning environment.	Social presence 14-15 Social space 16-17	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$2: Social presence is not related to sociability in a synchronous videoconferencing learning environment.	Social presence 14-15 Sociability 18	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous	$H_0$3: Social presence is not related to media richness in a synchronous videoconferencing learning environment.	Social presence 14-15 Media richness 13	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation

videoconferencing learning environment?			
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$4: Social space is not related to sociability in a synchronous videoconferencing learning environment.	Social space 16-17 Sociability 18	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$5: Social space is not related to media richness in a synchronous videoconferencing learning environment.	Social space 16-17 Media richness 13	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation
RQ: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?	$H_0$6: Sociability is not related to media richness in a synchronous videoconferencing learning environment.	Sociability 18 Media richness 13	Hypothesis testing; Pearson correlation coefficient; Scatterplots interpretation

Appendix B - Informed Consent – Survey

KANSAS STATE UNIVERSITY
University Research Compliance Office

Students' perceived social experiences with the use of videoconferencing in the online learning environment.

PROJECT APPROVAL DATE: 01/08/21 **PROJECT EXPIRATION DATE:** 01/08/22

LENGTH OF STUDY: Approximately six months.

PRINCIPAL INVESTIGATOR: Royce Ann Collins, Ph.D., Associate Professor, Adult Learning and Leadership, Educational Leadership Department

CO-INVESTIGATOR: Brandie C. Wempe, Doctoral Candidate

CONTACT NAME AND PHONE FOR ANY PROBLEMS/QUESTIONS: Dr. Royce Ann Collins, (913) 307-7353

IRB CHAIR CONTACT INFORMATION: If you have any questions regarding consent to participate in this research, feel free to contact one of the following Kansas State University Institutional Review Board Members:

Rick Scheidt, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224; Cheryl Doerr, Associate Vice President for Research Compliance, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224

PURPOSE OF THE RESEARCH: The purpose of the study is to examine students' perceived social experiences using video conferencing in the online learning environment. The goal of the research is to investigate how social presence, social space, sociability, and media richness are related in a synchronous videoconferencing learning environment and if there is a statistically significant difference between undergraduate and graduate students' perceptions of social presence, social space, sociability, and media richness in a synchronous videoconferencing learning environment.

PROCEDURES OR METHODS TO BE USED: You will be asked to respond to a few demographic questions and then several Likert-like scale questions concerning your perception of social presence, sociability, social space, and media richness in a synchronous videoconferencing learning environment (e.g., Zoom). You must be currently enrolled in a course using synchronous videoconferencing (e.g., Zoom). The survey is administered via Qualtrics, an online survey software tool. You will be asked to respond to questions and statements regarding your learning experience

with synchronous videoconferencing (e.g., Zoom) in your courses. This survey will take about 15 to 20 minutes to complete. No identifying information to include IP addresses will be collected. Nor does the survey ask questions that would allow the researcher to identify you.

RISKS OR DISCOMFORTS ANTICIPATED: There are no expected discomfort or risks related to this study. You may voluntarily withdraw from the survey at any time.

BENEFITS ANTICIPATED: A potential benefit to this study includes understanding how the richness of a discussion medium influences students' perception of social presence in the online learning environment. This study's findings will potentially have practical implications for educators and curriculum designers in designing and developing future online courses.

EXTENT OF CONFIDENTIALITY: The survey results are anonymous. No identifying information of individual participants will be collected, nor will the individual responses be in any way linked with your identity. Data downloaded by the researcher will be anonymous and secured on a password-protected local hard drive. All electronic documents will be maintained in a password-protected electronic format for five years on a hard drive and stored in a locked cabinet. After five years, the data will be deleted from all electronic storage and all hard copies shredded.

The information or biospecimens collected as part of this research <u>will not</u> be shared with any other investigators.

At the conclusion of the study, research results will be available to you upon request. You may contact the doctoral student at bcwempe@ksu.edu.

Terms of participation: I understand this project is research and that my participation is voluntary. I also understand that if I decide to participate in this study, I may withdraw my consent and stop participating at any time without explanation, penalty, or loss of benefits, or academic standing to which I may otherwise be entitled.

I verify that by clicking "Yes" (below) that I indicate I have read and understand this consent form and willingly agree to participate in this study under the terms described.

If you choose <u>not</u> to participate, please click "No" and you will exit the survey.

○ Yes – I choose to participate in this research, and I am currently enrolled in a course using synchronous videoconferencing in the learning environment.

○ No – I decline participation in this survey.

Appendix C - Survey Questions

Q1 What is your current student status?

- ○ Undergraduate
- ○ Graduate

Q2 Which gender do you identify as?

- ○ Male
- ○ Female
- ○ Prefer not to say

Q3 Please specify your ethnicity (choose 1).

- ○ White
- ○ Black or African American
- ○ American Indian or Alaska Native
- ○ Asian
- ○ Native Hawaiian or Pacific Islander
- ○ Other _____

Q4 What is your age?

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65+

Q5 In a learning environment using Zoom, how satisfied or dissatisfied are you with the online interaction you had with the instructor?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Extremely dissatisfied

Q6 How satisfied or dissatisfied are you with the amount of interaction you've had via Zoom with other students in this course?

- ○ Extremely satisfied
- ○ Somewhat satisfied
- ○ Neither satisfied nor dissatisfied
- ○ Somewhat dissatisfied
- ○ Extremely dissatisfied

Q7 How would you rate your engagement in the Zoom sessions during this course?

- ○ Not at all engaged
- ○ Slightly engaged
- ○ Somewhat engaged
- ○ Quite engaged
- ○ Extremely engaged

Q8 How often does your class meet via Zoom?

- ○ Daily
- ○ 4-6 times a week
- ○ 2-3 times a week
- ○ Once a week
- ○ Other (please describe) _____

Q9 On average, how long are your Zoom class meetings?

- ○ Less than an hour
- ○ 1-2 hours
- ○ 2-3 hours
- ○ 3-4 hours
- ○ 5 hours or longer

Q10 Seeing the faces and hearing the voices of others in class is:

- ○ Extremely important
- ○ Very important
- ○ Moderately important
- ○ Slightly important
- ○ Not at all important

Q11 On average, how often is your video displayed during the Zoom meetings?

- ☐ Entire class time
- ☐ Only when speaking
- ☐ Only when in break-out rooms
- ☐ 1/2 the time
- ☐ Never
- ☐ Other (please describe) _____

Q12 What activities have been included in your Zoom class meetings? (please select all that apply)

- [ ] Lecture
- [ ] Group discussion
- [ ] Group projects
- [ ] Breakout rooms for collaboration
- [ ] Whiteboard
- [ ] Polling
- [ ] Screen sharing
- [ ] Instant messaging
- [ ] Guest speakers
- [ ] Debates
- [ ] Interviews
- [ ] File sharing
- [ ] Annotation and co-annotation
- [ ] Other (please describe) _____

Q13 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

	Always	Often	Sometimes	Rarely	Never
To what extent can you send/receive information through spoken word?	○	○	○	○	○
To what extent can you understand others through voice inflection and intonations?	○	○	○	○	○
To what extent can you communicate (send/receive) through body language?	○	○	○	○	○
To what extent can you understand others by noticing their facial expressions or other nonverbal expressions?	○	○	○	○	○
To what extent can you know immediately what others in your group think about your ideas?	○	○	○	○	○
When using Zoom, you can send/receive information immediately.	○	○	○	○	○
When using Zoom, you can immediately learn what others think about your ideas.	○	○	○	○	○
When using Zoom, you can immediately express your reactions to others.	○	○	○	○	○

Q14 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

In this learning environment…	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
…I only can get a glimpse of my fellow students.	○	○	○	○	○
…I can form distinct impressions of some of my fellow students.	○	○	○	○	○
…I know my fellow students are here too, but I do not 'see' them.	○	○	○	○	○
…my fellow students are not abstract at all, which was what I first expected.	○	○	○	○	○
…I feel my fellow students are far away.	○	○	○	○	○
…I do not know who my fellow students are.	○	○	○	○	○
…it feels as if I deal with 'real' persons and not with abstract anonymous persons.	○	○	○	○	○
…when using Zoom (and nothing more than that) I am aware of my fellow students.	○	○	○	○	○
…it feels as if all my fellow students are 'real' physical persons.	○	○	○	○	○

…when using Zoom (and nothing more than that) I feel distant from my fellow students.	○	○	○	○	○
…it feels like none of my fellow students are here.	○	○	○	○	○
…I am aware of my fellow students.	○	○	○	○	○
…my fellow students do not really seem alive.	○	○	○	○	○
…I am the only one present.	○	○	○	○	○
…I feel none of my fellow students want to communicate with me.	○	○	○	○	○

Q15 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

In this learning environment…	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
…I feel that I can see my fellow students right in the eyes.	○	○	○	○	○
…I feel my fellow students are very near to me.	○	○	○	○	○
…I constantly feel that my fellow students are around.	○	○	○	○	○
…it feels as if all my fellow students and I are in the same room.	○	○	○	○	○
…it feels as if we are a face-to-face group.	○	○	○	○	○
…it feels as if all my fellow students and I are in close proximity.	○	○	○	○	○
…I am sure my fellow students are here too.	○	○	○	○	○
…I can really see my fellow students as if they were in front of me.	○	○	○	○	○
…I can make a clear picture of all of my fellow students.	○	○	○	○	○

…I feel a sense of my fellow student's presence.	○	○	○	○	○
…I strongly feel the presence of my fellow students.	○	○	○	○	○
…all of my fellow students feel that I am a 'real' physical person.	○	○	○	○	○

Q16 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

	Totally applicable	Largely applicable	Moderately applicable	Rarely applicable	Not applicable at all
Class members felt free to criticize the ideas, statements, and/or opinions of others.	○	○	○	○	○
We reached a good understanding of how we had to function in a Zoom class.	○	○	○	○	○
Class members ensured that we kept in touch with each other.	○	○	○	○	○
In the Zoom class sessions, we are collaborative and very engaged in discussions.	○	○	○	○	○

I maintained contact with all the other class members.	○	○	○	○	○
Class members gave personal information on themselves.	○	○	○	○	○
The class conducted open and lively conversations and/or discussions.	○	○	○	○	○
Class members took the initiative to get in touch with others.	○	○	○	○	○
Class members spontaneously started conversations with others.	○	○	○	○	○
Class members asked others how the work was going.	○	○	○	○	○
Class members felt that they were attacked personally when their ideas, statements and/or opinion were criticized.	○	○	○	○	○
Class members were suspicious of others.	○	○	○	○	○

Q17 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

	Always or very often (on average a few times a Zoom session)	Often (on average a few times a week)	Sometimes (on average a few times a month)	Rarely (on average once a month)	Very rarely or never
Class members grew to dislike others.	○	○	○	○	○
I felt like I was more prepared and more engaged in the Zoom class discussions than my classmates.	○	○	○	○	○
Classmates were not as prepared and engaged in Zoom class discussions.	○	○	○	○	○
Class members were unreasonable.	○	○	○	○	○
Class members disagreed amongst each other.	○	○	○	○	○
The class members had conflicts.	○	○	○	○	○
Class members gossiped about each other.	○	○	○	○	○
Class members did not take others seriously.	○	○	○	○	○

Q18 As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel (complete the stems below):

	Totally applicable	Largely applicable	Moderately applicable	Rarely applicable	Not applicable at all
This learning environment enables me to contact my classmates easily.	○	○	○	○	○
I do not feel lonely in this learning environment.	○	○	○	○	○
This learning environment enables me to get a good impression of my classmates.	○	○	○	○	○
This learning environment allows spontaneous informal conversations.	○	○	○	○	○
This learning environment enables us to develop into a well-performing team.	○	○	○	○	○
This learning environment enables me to develop a good work relationship with my classmates.	○	○	○	○	○
This learning environment enables me to identify myself with the class.	○	○	○	○	○
I feel comfortable with this learning environment.	○	○	○	○	○
This learning environment allows for non-task-related conversations.	○	○	○	○	○
This learning environment enables me to make close friendships with my classmates.	○	○	○	○	○

Q19 Thank you for participating in the study! Your participation is much appreciated.

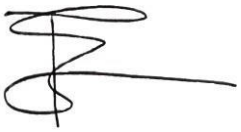
As previously noted, the purpose of the study is to examine students' perceived social experiences using video conferencing in the online learning environment. The goal of the research is to investigate how social presence, social space, sociability, and media richness are related in a synchronous videoconferencing learning environment and if there is a statistically significant difference between undergraduate and graduate students' perceptions of social presence, social space, sociability, and media richness in a synchronous videoconferencing learning environment. If you would like to receive a copy of this study's final report, please feel free to contact the doctoral student at bcwempe@ksu.edu.

Appendix D - Kansas State University IRB Approval

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Dr. Royce Ann Collins
10359Educational Leadership
K-State Olathe

Proposal Number:



FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 01/08/2021

RE: Proposal Entitled, "An examination of students' perceived social experiences with the use of videoconferencing in the online environment"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas StateUniversity has reviewed the proposal identified above and has determined that it is EXEMPT from furtherIRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation andmay disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §104(d), category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that researchis exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, andif the subjects are KSU students, to the Director of the Student Health Center.