

Students' perceived social presence and media richness of a synchronous videoconferencing learning environment

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Abstract

This correlational cross-sectional study was conducted with 60 graduate students to explore their perceived social experiences with the use of synchronous videoconferencing in the online learning environment. By applying the theories of social presence and media richness, this study investigated the perceived relationship between social presence, social space, sociability, and media richness. 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). 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. 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 results 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.

Keywords: synchronous videoconferencing, media richness, social presence, social interaction

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Introduction

In April 2020, lockdown and social distancing measures immediately affected higher education, requiring instructors to switch from teaching face-to-face to an online hybrid style that incorporated synchronous videoconferencing into the course delivery (Skulmowski & Rey, 2020). Although using technology to deliver online classroom instruction and online course enrollments have continued to increase over the past two decades (Allen & Seaman, 2017; Berry, 2017; Weidlich & Bastiaens, 2017), low retention rates have persisted (Muilenburg & Berge, 2005; Ng, 2019) due to feelings of isolation and a lack of social connection (Baxter, 2012; Lowenthal, 2009; Pinski et al., 2014). Feelings of isolation, a lack of social connection, and high dropout rates indicate that the learners' online learning needs are not being met (Ali et al., 2018; McInnerney & Roberts, 2004; Ng, 2019; Shelton et al., 2017).

Educators have identified social interaction in the learning environment as a vital element in the learning process (Bandura, 1979; Kreijns & Kirschner, 2001; Vygotsky, 1978) and that social interaction is necessary for group cohesion and collaboration to occur (Kreijns & Kirschner, 2001; Weidlich & Bastiaens, 2017). If cohesion and collaboration fail to occur, it can create a barrier to student learning. Low retention rates, feelings of isolation, and a lack of social connection are attributed to a perceived lack of social presence. Face-to-face communication is described as the richest communication medium in both media richness theory and social presence theory. 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. It 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, therefore creating higher perceived social presence.

Emerging technologies and media in online educational environments are continuously changing (Cocquyt et al., 2017), resulting in technology-mediated learning as the technological means by which information is conveyed and people are linked together (Bower, 2019). In the online environment, 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. While face-to-face learning naturally creates an environment with rich social interaction opportunities, the online learning environment relies solely on technology to mediate all social interactions (Kreijns et al., 2004a, 2004b; Weidlich & Bastiaens, 2017). Unfortunately, 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).

Synchronous videoconferencing is a communication medium that provides students a human feel or real-life experience in the online learning environment by incorporating real-time communication software tools such as Skype, Zoom, Adobe Connect, or Microsoft Teams (Guo et al., 2010; Martin et al., 2017; Mulder, 2019). Using synchronous videoconferencing in online classes allows users to share audio and visual facilities in real-time, without delay (Al-Samarraie et al., 2019). It enables education, instruction, and learning to occur at the same time without requiring students to be in the same geographical location. Unlike asynchronous communication, 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.

While we know that face-to-face communication is important for social presence, little is known about the impact of synchronous videoconferencing in college courses. In 2020, higher education institutions had to quickly move to distance learning, and some instructors incorporated synchronous videoconferencing in a variety of ways. This research was completed during this timeframe and looked specifically at the effects synchronous videoconferencing had on media richness and social presence. Therefore, the underlying research questions for this study were designed to explore students' perceptions on the social presence, social space, sociability, and media richness scales.

How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment? On average, how often was the student's camera turned on during the class sessions? How important was it to the students to see the faces and hear voices of others? From a list of potential activities in the synchronous videoconferencing environment of Zoom, what did students use in their courses?

Literature Review

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; Pinski 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).

Research that specifically examined synchronous videoconferencing investigated how it related to engagement and communication (Basko & Hartman, 2017); combating feelings of isolation (McInnerney & Roberts, 2004); creating a sense of community (Berry, 2019; Lowenthal & Trespalacios, 2022; McInnerney & Roberts, 2004); learner characteristics and online technology self-efficacy (Kobayashi, 2017); communication platforms such as Remind (Basko & Hartman, 2017), VoIP, social bookmarking, social networks, Facebook, and YouTube (Hitrec et al., 2011); audio communication problems (Earnshaw, 2017); videoconferencing in an office setting (Campbell, 2006), and the effects of media richness on decision-making with two-person teams (Dennis & Kinney, 1998). Martin et al. (2017) conducted a systematic review of 157 articles from 34 countries and identified a number of meta-analyses and systematic reviews conducted on distance education and online learning, but none specifically examined synchronous online learning. Though previous studies 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; Ladyshevsky, 2013), and media richness (Campbell, 2006; Daft et al., 1987; Oregon et al.,

2018), much of the research focused on asynchronous communication platforms.

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.

Social Presence Theory

Social presence is described as the psychological phenomenon that the other is perceived *real* in the communication (Kreijns et al., 2020; Weidlich et al., 2018). Social presence theory originated from computer-mediated communication (CMC), which grew out of the telecommunication era of the late 1960s and 1970s. 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). Kreijns et al. (2011) state, “Social presence theory has often been used to rank telecommunication media according to the degree of social presence (i.e., face-to-face > videoconferencing > audio). 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 and Zittle (1997) 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). Social presence theory indicates that the *realness* of the perceived other is also increased when the richness of the communication medium is increased. Therefore, social presence is not about experiencing the environment; instead, it is the perception of another in the environment (Felnhofer et al., 2014). Kreijns et al. (2013) separated social presence into three core elements: social presence, social space, and sociability.

Social Presence, Social Space, and Sociability

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 because it affects participation and social interaction, which are both necessary for effective collaboration and knowledge construction (Garrison, 2007; Kreijns et al., 2011). 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 sociability of a learning environment is expected to be a predictor of how much social interaction will take place. Sociability is described as the perceived quality of the learning environment to facilitate social interaction (Kreijns et al., 2007; Weidlich & Bastiaens, 2019) and social space is the perceived network of interpersonal relationships among group members (Kreijns et al., 2004a, 2004b; Weidlich & Bastiaens, 2019).

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. Sociability, therefore, facilitates socioemotional interaction and the emergence of a social space (Kreijns et al., 2013). 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).

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 is described as a communication medium’s capacity to facilitate the processing of rich information (Daft et al., 1987). 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 for task completion. Media richness theory proposes that 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.

A study conducted by Oregon et al. (2018) found a distinct correlation between using rich media technologies and enhancing social presence in course design and instruction on attrition in an online graduate program. Additionally, Campbell (2006) explored the impact of communication apprehension and participation on user perceptions of task and media characteristics in a videoconferencing context. The Campbell (2006) findings indicated that the media richness and social presence aspects of media choice theory are important considerations for videoconferencing users. 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).

Method

This research employed a survey approach to make inferences about the relationship between media richness, social presence, social space, and sociability. This cross-sectional study used 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. The quantitative data collected from the participants was evaluated using descriptive and inferential statistics to evaluate the research questions and hypotheses.

Applying the communication theories of social presence and media richness, 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. The communication theories of social presence and media richness were applied in this study 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.

Research Questions

The research questions and six null hypotheses underlying this research were:

RQ1: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

H01: Social presence is not related to social space in a synchronous videoconferencing learning environment.

H02: Social presence is not related to sociability in a synchronous videoconferencing learning environment.

H03: Social presence is not related to media richness in a synchronous videoconferencing learning environment.

H04: Social space is not related to sociability in a synchronous videoconferencing learning environment.

H05: Social space is not related to media richness in a synchronous videoconferencing learning environment.

H06: Sociability is not related to media richness in a synchronous videoconferencing learning environment.

RQ2: On average, how often was the student's camera turned on during the class sessions?

RQ3: How important was it to the students to see the faces and hear voices of others?

RQ4: From a list of potential activities in the synchronous videoconferencing environment of Zoom, what did students use in their courses?

Survey Item Construction

This research used four established instruments: the media richness scale, the social presence scale, the social space scale, and the sociability scale. The cross-sectional survey was used to collect demographic data and questions related to perceived media richness, social presence, social space, and sociability. The four existing instruments were combined into one survey that contained 77 questions using a 5-point Likert-type scale. 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 distribution of the survey was administered using Qualtrics survey software. After completing the demographic questions participants were asked eight additional questions that pertained to their use of Zoom in their class meetings. 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 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. 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 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 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. 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. All of the scales used in this research are published and permission was granted for use by the authors.

The authors of the scales further approved modifications to address the context of the research. For the social presence scale, 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." For the social space scale, 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." For the sociability scale, respondents were asked, "As you're thinking of yourself in class using Zoom, please select a response that best describes how you feel." The survey items with "CSCL environment" in the original scale were replaced with the words "learning environment."

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). Therefore, instead of asking "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?" the wording was modified to "When using Zoom, you can send/receive information immediately." "When using Zoom, you can immediately learn what others think about your ideas" was asked in place of "On average, how long does it seem to take for you to learn what others think of your ideas?" And "When using Zoom, you can immediately express your reactions to others" replaced "On average, how long do you feel you have to wait to express your reactions to others?" Additionally, the third construct (personalness) was removed from the Ferry et al. (2001) media richness scale since the Kreijns et al. (2020) social presence scale measured items that were similar in scope.

The reliability of the survey used in this study was measured using Cronbach's alpha. 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 1.

Table 1
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 0.81
Sociability	The perceived quality of the learning environment to facilitate social interaction.	10	0.94

Participants

After obtaining IRB approval to conduct the research from the university, participant recruitment for this study began and specifically targeted adult students (ages 25+) who were enrolled in the college of education at a midwestern university that used synchronous videoconferencing in their online learning experience. The survey was only distributed in online courses where the instructor was using Zoom. Descriptive statistics were obtained on survey items related to demographic data such as age, ethnicity, gender, student status (graduate), as well as background information about the frequency of use of cameras in Zoom sessions, variety of interactive tools used within Zoom, and the importance of seeing a person's face and hearing a voice. The sample population for this research consisted of 60 graduate students between the ages of 25 to 65+ years old who were currently using Zoom as a communication medium in their online classes from March 17, 2021, to May 18, 2021. The majority of the participants noted their race/ethnicity as White (82%). Table 2 outlines age and gender demographics for this study.

Table 2
Age and Gender Demographics

Age	n	%
25–34	13	21.67
35–44	18	30.00
45–54	25	41.67
55–64	3	5.00
65+	1	1.67
Gender		
Female	39	65.00
Male	21	35.00

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

Data Analysis

A correlational research design was chosen for this study to describe and measure the nature of the relationship among social presence, social space, sociability, and media richness with synchronous videoconferencing. 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. 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.

Prior to analyzing the raw data, a value or score was added to the data, thereby assigning a numeric value to each response. Any incomplete responses were not included, which led to the 60 completed surveys. 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). 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. Cohen's standard was used to evaluate the strength of the relationships. The larger the effect size, the stronger the relationship between the two variables. The Pearson correlation coefficient was used in this study to describe the strength of the association between the variables. To test the assumption of normality, Skewness and Kurtosis were applied to Media Richness, Social Presence, Social Space, and Sociability. Scatterplots were used in this study to graphically display the relationship between the two variables.

Results

The results of the Pearson correlation analysis were used to investigate the research questions. The result of the correlations was examined based on an alpha value of 0.05. 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. All null hypotheses for this research were rejected based on the hypotheses tests.

Table 3

Pearson Correlation Results

Combination	<i>r_p</i>	95% CI	<i>p</i>
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

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Social Presence—Social Space (Positive)	0.73	[0.58, 0.83]	< .001
Social Presence—Social Space (Negative)	-0.36	[-0.56, -0.11]	.005
Social Presence (Awareness)—Sociability	0.65	[0.47, 0.78]	< .001
Social Presence (Proximity)—Sociability	0.83	[0.73, 0.90]	< .001
Social Presence—Sociability	0.79	[0.67, 0.87]	< .001
Social Presence (Awareness)—Media Richness (Multiple)	0.65	[0.47, 0.78]	< .001
Social Presence (Awareness)—Media Richness (Immediacy)	0.55	[0.35, 0.71]	< .001
Social Presence (Proximity)—Media Richness (Multiple)	0.57	[0.37, 0.72]	< .001
Social Presence (Proximity)—Media Richness (Immediacy)	0.52	[0.30, 0.68]	< .001
Social Presence—Media Richness	0.66	[0.48, 0.78]	< .001
Social Space (Positive)—Sociability	0.82	[0.71, 0.89]	< .001
Social Space (Negative)—Sociability	-0.38	[-0.58, -0.14]	.003
Social Space (Positive)—Media Richness (Multiple)	0.44	[0.21, 0.63]	< .001
Social Space (Positive)—Media Richness (Immediacy)	0.57	[0.37, 0.72]	< .001
Social Space (Negative)—Media Richness (Multiple)	-0.41	[-0.60, -0.17]	.001
Social Space (Negative)—Media Richness (Immediacy)	-0.35	[-0.55, -0.10]	.007
Social Space (Positive)—Media Richness	0.55	[0.35, 0.71]	< .001
Social Space (Negative)—Media Richness	-0.41	[-0.60, -0.18]	.001
Sociability—Media Richness (Multiple)	0.56	[0.35, 0.71]	< .001
Sociability—Media Richness (Immediacy)	0.55	[0.34, 0.70]	< .001
Sociability—Media Richness	0.60	[0.41, 0.74]	< .001

Note. $n = 60$.

RQ1: How strongly and in what direction are social presence, social space, sociability, and media richness related in a synchronous videoconferencing learning environment?

H01: Social presence is not related to social space in a synchronous videoconferencing learning environment. 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. The null hypothesis was rejected.

H02: Social presence is not related to sociability in a synchronous videoconferencing learning environment. The correlation coefficient between Social Presence (Awareness) and Sociability was 0.65, indicating a large effect size. The correlation coefficient between Social Presence (Proximity) and Sociability was 0.83, indicating a large effect size. This indicated a strong, positive relationship between the Social Presence and Sociability. The null hypothesis was rejected.

H03: Social presence is not related to media richness in a synchronous videoconferencing learning environment. 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. This correlation indicates that as Social Presence increases, Media Richness tends to increase. The null hypothesis was rejected.

H04: Social space is not related to sociability in a synchronous videoconferencing learning environment. 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. This correlation indicates that as Social Space (Positive Group Behavior) increases, Sociability tends to increase. Social Space (Negative Group Behavior)—Sociability had a moderate effect size of -0.38 and a $p = .003$, which indicated a moderate, negative correlation. This correlation indicates that as Social Space (Negative Group Behavior) increases, Sociability tends to decrease. The null hypothesis was rejected.

H05: Social space is not related to media richness in a synchronous videoconferencing learning environment. 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. This correlation indicates that as Social Space (Negative Group Behavior) increases, Media Richness tends to decrease. The null hypothesis was rejected.

H06: Sociability is not related to media richness in a synchronous videoconferencing learning environment. 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. This correlation indicates that as Sociability increases, Media Richness tends to increase. The null hypothesis was rejected.

RQ2: On an average, how often was the student’s camera turned on during the class sessions?

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 4).

When 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 5 summarizes the duration of video displayed during Zoom meetings.

Table 4
Frequency of Zoom Course Sessions

Variable	<i>n</i>	%
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%.

Table 5
Video Displayed During Zoom Meetings

Variable	<i>n</i>	%
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%.

RQ3: How important was it to the students to see the faces and hear voices of others?

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 6). Of the age groups of those who indicated it was extremely important, 8.320.8% ($n = 5$) aged 25–34; 29% ($n = 7$) 35–44; 46% ($n = 11$) 45–54; and 0.04% ($n = 1$) 55–64. Of the 75% who felt seeing the faces and hearing the voices of others in class was extremely to very important, the majority were female ($n = 29$).

Table 6
Seeing the Faces and Hearing the Voices of Others

Variable	<i>n</i>	%
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%.

RQ4: From a list of potential activities in the synchronous videoconferencing environment of Zoom, what did students use in their courses?

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 ($n = 53$), group discussion ($n = 53$), screen sharing ($n = 44$), breakout rooms for collaboration ($n = 39$) and guest speakers ($n = 33$). 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%). See Table 7.

Table 7
Frequency Table for Zoom Activities

Variable	<i>n</i>	%
Group Discussion	53	88.33
Lecture	53	88.33
Screen Sharing	44	73.33
Breakout Rooms for Collaboration	39	65.00
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%.

Discussion

This study tested variables that have been developed in the fields of communication and computer assisted collaborative learning for their association with student social presence and media richness experiences during the COVID-19 switch to distance learning environments. Consisting of four research questions 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 questions for this study were designed to explore students' perceptions on the social presence, social space, sociability, and media richness scales and how synchronous videoconferencing was used in the class sessions.

Social presence has been studied for decades in the online asynchronous environment, but the addition of synchronous learning is new to students and instructors. Social interaction, engagement, and collaborative learning have long been hallmarks in education. 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). Due to COVID-19, lockdown and social distancing measures, 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).

Using the refined social presence core elements developed by Kreijns et al. (2013), the results from this study demonstrated that in the synchronous learning environment graduate students linked social awareness of others and sensing the proximity of others to positive group behavior which leads to higher satisfaction with the media and as social awareness of others and proximity of others increases, negative group behavior tended to decrease. Negative group behavior can be an indicator of low social cohesiveness, which occurs when trust is violated by group members (Kreijns et al., 2004a). With the incorporation of synchronous videoconferencing into courses, instructors can potentially decrease the negative group behavior in the computer assisted learning environments and create a more positive learning experience for students, which increases student satisfaction and engagement (Arbaugh, 2000). Further the majority students expressed that it was extremely important to see faces and hear voices. Low social cohesiveness is an indicator that a sense of community is failing, and affective relationships were not established (Kreijns et al., 2004a). 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, social cohesiveness is increased, and as the results of this study supports negative group behavior is decreased (McInnerney & Roberts, 2004). Arbaugh (2000) found that social interaction impacted student satisfaction. The synchronous videoconferencing learning environment provides a media in which instructors can

stimulate meaningful social interactions and increase student satisfaction and engagement in the course content.

This study further supported the research that as social awareness of others and the sensing of the proximity of others increases so does media richness with the immediacy of feedback and the sense of multiple channels. Media richness “is a measure of a medium’s ability to transmit information that will change the receptor’s understanding within a given time” (Dunaetz et al., 2015, p. 2). As we can see a person’s face, read facial cues, and body language, it enhances the receiver’s ability to accurately interpret the spoken message. When just a discussion board is used, these multiple channels in which a person receives information is decreased. Further 75% of participants in this research noted that it was very important to extremely important to see faces and hear voices. Over 80% of the respondents stated that their camera was on the entire course session. From this we note that instructors should encourage students to use their cameras to increase multiple channels in media richness. 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. This is one of the reasons students are drawn to face-to-face courses in addition to the immediate feedback received in real time, versus the delay from a discussion board. With the use of synchronous videoconferencing, instructors can create the social interaction with students to better receive the message and interpret the information. Conradie et al. (2014) found a significant correlation between media richness and student satisfaction. Kuyath and Winter (2006) found the immediacy of a communication medium plays a role in student satisfaction and social presence.

Instructors have long had to deal with negative behavior in a classroom. This research supports the idea that when negative group behavior in the social space arises in the synchronous videoconferencing environment, social presence, and sociability also decreased. Therefore, as negative group behavior increased, the students were less engaged and decreased their immediate feedback and social interactions. Increased social presence of a likable communication partner oftentimes leads 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). Just as the classroom dynamics must be managed by the instructor, the synchronous videoconferencing environment must be monitored for positive group behavior and collaboration among students. Creating an environment where learners feel welcome and included is important to a successful learning experience in a synchronous videoconferencing class.

This research supports the use of synchronous videoconferencing with distance delivered courses with graduate students. The incorporation of synchronous videoconferencing can assist with the reception of messages through multiple channels (e.g., tone, body language, facial cues) and increase the immediacy of feedback. There are tools within synchronous videoconferencing media program that assist instructors in creating collaborative learning experiences to allow for large group discussions and breakout rooms for small group discussions. Further, by the instructor creating a welcoming atmosphere in the social space, this creates a sense of belonging and increases social interaction between students. With structured instructional approaches, instructors can create collaborative learning activities within small groups further extending the

students interaction in the space. Creating a learning environment of engagement, collaboration and sense of community reduces the feelings of isolation and dissatisfaction with the learning experience. With the incorporation of synchronous videoconferencing into online courses, encouraging students to use their cameras, instructors can increase social presence and media richness. The greater the sociability of an environment, the more social interaction, and the more positive social space created, increases the possibility for students to gain a feeling of relatedness, group cohesiveness, trust, and collaboration with others.

Research Limitations and Future Research Recommendations

This study used a Likert-type scale to gather data. A limitation to using Likert-type scales is that the data will not allow for rich descriptive details that could otherwise be found in qualitative data (Creswell & Creswell, 2017). Recommendations for future studies include examining age and gender differences in their social engagement and social experiences, including how they handle and use technology. Furthermore, 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 age and gender differences. 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.

This research did not ask participants if their Zoom course was simultaneously connected to a face-to-face classroom, because during the lockdown and social distancing enforcements during the time period of the research, most courses were not meeting face-to-face. 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.

Conclusion

Synchronous videoconferencing learning provides students the ability to immediately engage with their peers and instructors with no delays resulting in lowered communication frustration, thereby increasing social presence, social space, and student satisfaction. 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. 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 student interaction and potential for retention. 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.

When introducing new technologies into the learning environment, the helpfulness of different media for satisfying students' psychological and communication needs may also change (Guo et al., 2010). When designing online courses, it is important to consider the different

characteristics of the learner. Creating varied levels of communication and social presence within the online learning environment can help accommodate students' different communication needs. Synchronous videoconferencing provides an interactive course environment for students that enables immediate feedback and the capacity to transmit multiple perspectives and language variety; therefore, increasing student sociability and perceived media richness. Integrating synchronous videoconferencing in the online learning environment not only provides real-time interaction, but it also can reduce feelings of isolation and anonymity and decrease negative group behavior.

Declarations

The authors declare no conflicts of interest in this research.

The authors assert that approval was obtained from an ethics review board (IRB) at Kansas State University.

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Author's Note

To request permission for use of the social presence, social space, and sociability scales, email Dr. Karel Kreijns at karel.kreijns@ou.nl.

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