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Facilitating Effective Online Discourse: Investigating Factors Influencing Students' Cognitive Presence in Online Learning

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Facilitating Effective Online Discourse: Investigating Factors Influencing Students' Cognitive Presence in Online Learning

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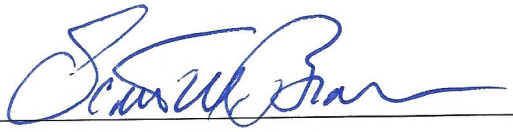
Major Advisor 

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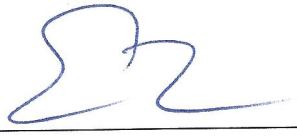
Associate Advisor 

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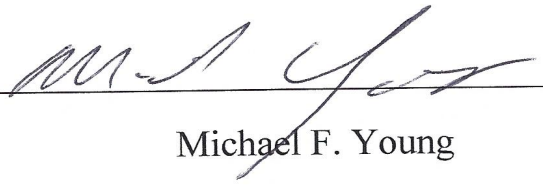
Associate Advisor 

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Facilitating Effective Online Discourse: Investigating Factors Influencing Students' Cognitive Presence in Online Learning

Abstract

The purpose of this study was to examine the relationship among social presence, cognitive presence and teaching presence in online learning within a Community of Inquiry (CoI) Framework (Garrison, Anderson, & Archer, 2000). In addition, the study investigated the impact of individual's motivational factors on the relationship among the presences. An online survey testing learner's perceived social presence, teaching presence, cognitive presence, situational interest and online technology self-efficacy was distributed to students who were taking online courses. A follow-up interview process was conducted in order to further interpret the quantitative data. The findings show that within the CoI framework, social presence and teaching presence are both significant predictors of cognitive presence. When motivational factors were added, social presence became no longer significant. In addition, qualitative data revealed that students were satisfied with online courses in general, but expecting more natural social connection and instructor involvement.

Keywords: Online Learning, social presence, teaching presence, cognitive presence, online technology self-efficacy, situational interest, mixed method

Chapter 1

Introduction

Online education and its use of computer-mediated communication (CMC) have been popularized and developed rapidly in higher education. With its abundant resources, convenience, and highly interactive characteristic, research has been done indicating that classes online on average produced stronger student learning outcomes than classes with solely face-to-face instruction do (Means et al., 2010). Facilitating efficient online discourse for higher-order learning has been an important issue in the research of online learning (Curtis & Lawson, 2001; Rovai & Jordan, 2004). Also, to equip individuals with life-readiness skills, the focus has transferred from content knowledge acquisition to critical thinking abilities (Garrison, Anderson, & Archer, 2010; Şendağ & Odabaşı, 2009). These soft skills, including creativity, problem solving ability, intuition, and insights etc., are essential for students from cradle to career, to succeed in a globally and digitally interconnected world in 21st Century (Garrison, Anderson & Archer, 2001; Partnership for 21st Century Learning, 2007).

In this regard, cognitive presence, as a function to construct meaning through sustained communication focusing on higher-order thinking processes has gained much attention (Garrison et al., 2001). However, research shows that it is generally hard for learners to achieve a higher level of cognitive presence. Studies have noted that most of learners' posts online only reflected surface exploration (Rourke & Kanuka, 2009). In a transcript analysis of online learner's cognitive presence, most of the learners stayed at the exploration and integration stages, meaning they actively searched for resources and integrating their knowledge, but only a few arrived at the next step, which is to solve a problem or apply/transfer the knowledge (Akyol & Garrison, 2011).

To study the nature of a successful online course, a number of promising models and theoretical frameworks emerged. One approach is the Community of Inquiry (CoI) framework proposed by Garrison, Anderson, and Archer (2000). The CoI framework sees the online learning experience as "a function of the relationship among three elements: social presence, teaching presence and cognitive presence" (Richardson et al., 2012, p.2). It is consistent with the premise that an educational learning experience is both collaborative and reflective (Dewey, 1933; Garrison et al., 2010). Generated in the social constructivism literature, CoI believes that learning is constructed between sharing, discussion, and negotiating meaning, with some degrees of support from content experts and peers (Redmon & Lock, 2006; Swan, 2005).

The present study mainly utilized CoI framework to identify the elements that are prerequisites for a successful online learning experience. Social presence represents learners' "perceived ability to be socially and emotionally connected and purposeful communicated within the community" (Richardson et al., 2012, p.2). It has a demonstrated impact on learning, including engagement, strategy utilizing and also learning outcomes. Successful social presence provides learners space to feel free to share and exchange their information and knowledge. (Cleveland-Innes & Emes, 2005; Garrison & Cleveland-Innes, 2005). Teaching presence refers to learners' perception of the course design, instructors' facilitation and teaching of the online community provided by the instructors. Examples of successful teaching presences include well-designed lectures, timely feedback, professional support, etc. It is essential to promote the other two presences (Anderson, Rourke, Garrison, & Archer, 2001; Richardson et al., 2012; Shea, Vickers, & Hayes, 2010). Cognitive presence describes "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (Richardson et al., 2012, p.2). It can be understood as knowledge building and knowledge application (Redmond & Lock, 2006). Garrison and colleagues (2001) explained the cognitive presence into four phases:

(1) triggering event, meaning a dilemma or question which could engage learning; (2) exploration, including searching for relevant information; (3) integrating, indicating the connection between knowledge/information and problems; and the (4) resolution, where learners apply and transfer what they have learned into practice and solve problems.

Engagement is essential to all successful learning. E-learning has the capacity to offer various of opportunities for engagement, including online peer-teaching activities or games (Clark & Mayer, 2016). However, it is also possible that the effect of the engagement- the motivational commitment, could be varied by and associated with learners' background and personality, which have already been generated by the individual before entering the class. Therefore, these individual factors may influence the interrelationship among the three presences in the CoI framework. In other words, the framework may need to take these individual differences into account.

One of the hypotheses in this research was, that the individual differences which were associated with motivation may influence the interrelationships among the three presences within the CoI framework. Online course instructors and researchers may need consider the learners' diverse needs when referencing the framework. In this regard, this study investigated the relationship among the three presences, and also how motivational factors, including online technology self-efficacy and situational interest, potentially impact their relationships.

Interest has been recognized as a motivation and engagement factor and plays an important role in the learning process (Hidi, 1990). John Dewey (1913) described interest as ‘‘being engaged, engrossed, or entirely taken up with some activity because of its recognized worth" (Dewey, 1913, p. 17). He believed that interest mediated the relationship between effort and learning.

In contrast to individual interest, which is activated internally and persists over time, situational interest is environmentally activated and context-specific. (Hidi, 1990; Renninger, 1992; Schraw & Lehman, 2001). Given the study context of online discourse activities, situational interest was examined as a motivational factor influencing the learning within the CoI framework.

Online technology self-efficacy, as another motivational factors investigated in this research, refers to a judgment of one's capability to use an online technology (Miltiadou & Yu, 2000). Research shows that the online technical difficulty has become one of the most important factors in the success of online learning, which may take up some of the learner's focus and effect their cognitive achievement (Song, Singleton, Hill, & Koh, 2004). In this study, the technology specifically represents to the HuskyCT system, which is an online learning management system by Blackboard Learning. All the participants in this study were taking courses through this platform at the University of Connecticut.

The two research questions were proposed as:

1. What is the relationship among social presence, teaching presence, and cognitive presence among online learners?
2. How do individual's motivational factors, including situational interest and online technology self-efficacy impact the relationship?

By utilizing a sequential explanatory mixed method, this study investigated the relationship among cognitive presence, social presence and teaching presence within the CoI, with specific interest in the impacts of teaching and social presences on cognitive presence. Additionally, the study investigated the impact of motivational individual differences on their relationship. This mixed method design consists of two distinct phases: quantitative followed by

qualitative. This method provides straightforwardness and opportunities for the exploration of the quantitative results in more detail (Ivankova, Creswell, & Stick, 2006).

Each participant was taking at least one online course at the time when the study was conducted. Total of 127 participants completed a same online anonymous survey investigating their online technology self-efficacy by using the discussion board in HuskyCT, cognitive presence, social presence, teaching presence and situated interest after the middle of each semester. Multiple Regression Analyses were used to analyze data from the Situated Interest (SI) Questionnaire, Community of Inquiry (CoI) Survey, and Online Technologies Self-Efficacy Scale (OTSES) (See Appendix 1, 2 & 3). Interview protocols was used to further examine and interpret the findings from the quantitative phase.

The survey in this study contains 54 items which are from The CoI Survey, SI Questionnaire, and the OTSES. CoI survey, developed and validated by Arbaugh et al. (2008), has been found useful for studying online learning and the relationship among the cognitive, teaching and social presence. It consists of 34 five-point Likert type items (5 = strongly agree, 1 = strongly disagree). SI Questionnaire was developed by Chen, Darst and Pangrazi in 1999 and consists of 24 five-point Likert type items (5 = strongly agree, 1 = strongly disagree) to measure levels of students' feelings about each item in terms of the activity they are experiencing. OTSES has been created and validated by Miltiadou and Yu in 2000, which measured students' self-efficacy with online computer-mediated communication tools. The instrument consisted of 29 four-point Likert type items (4= very confident, 1=not confident at all).

To address the research questions, multiple regression analyses were adopted to test data from the survey, and to investigate the relationship among social, teaching and cognitive presence, and the impact on their relationships by motivational factors. Qualitative data was

transcribed and analyzed into categories. It was hypothesized that social presence and teaching presence were all significant predictors of cognitive presence. In addition, motivational factors, specifically, situational interest and online technology self-efficacy significantly impacted the relationship among three presences. For example, when adding motivational factors into account, social presence would not be significant in predicting cognitive presence. Therefore, online educators should pay more attention on the individual difference in learning when design and develop the online learning environment.

Chapter 2

Literature Review

Research in online learning has been divided into three main objectives: learning, teaching, and media. Educators' challenge is therefore to integrate the technology into the pedagogy with the consideration of the three elements.

How do people learn in an online environment? Research in answering this question primarily focuses on the learner's cognitive process. Akyol and Garrison (2011) stressed the importance of metacognition in online higher learning, and assessed learners' metacognitive knowledge, metacognitive monitor and metacognitive regulation based on a transcript analysis of students' discussion posts. Their results revealed that learner's metacognitive skills increase during online collaborative learning. For example, group feedback is beneficial to provide learners opportunity to explore different perspectives, question, clarify and prove or solve problems (Akyol & Garrison, 2011; Kramarski & Dudai, 2009).

Research focused on the instruction in e-learning indicated that the design and facilitation of an online course "is hypothesized to be an indicator of online instructional quality" (Shea et al., 2010a, p.129). According to the multimedia learning theory, Clark and Mayer suggested that in e-learning, in order to promote a deeper learning, instructors need to use graphics than words along, align words to corresponding graphics, present works as audio narration rather than on-screen text, not add extra material which may hurt learning, etc. (Clark & Mayer, 2016).

Research focusing on the media, or platform for online learning is interested in how different features of the media influence the quality of learning. Media comparison research suggested that the success of an online course is depend on the instructional methods, instead of the function of media. For example, Tallent-Runnels et al. (2006) conducted a review of online

learning research and revealed that there are online learning environments which were proved to be less efficient than traditional classrooms. However, a meta-analysis conducted in 2010 revealed that students in online learning programs performed better than face-to-face classrooms (Means, Toyama, Murphy, Bakia, & Jones, 2010). These conflicting results were discussed in Mayer's book, indicating that the results could vary in terms of different curriculum and instructional methods (Mayer, 2015, p.848;). Some research has also focused on the added-value of specific media, for example, Sung and Mayer (2012) examined the role of different kinds of graphics in the same online learning environment and their influence on learning.

Community of Inquiry Framework

There are many conceptual frameworks or models addressing the components of successful online learning. Garrison and his colleges (2000) created the Community of Inquiry (CoI) framework that investigated the complexities of online learning. A CoI in educational settings is "a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (Garrison, 2011, p.2). As shown in Fig.1, CoI is based on the assumption that learning occurs through the interaction of all three core elements: teaching presence, social presence, and cognitive presence (Garrison et al., 2000).

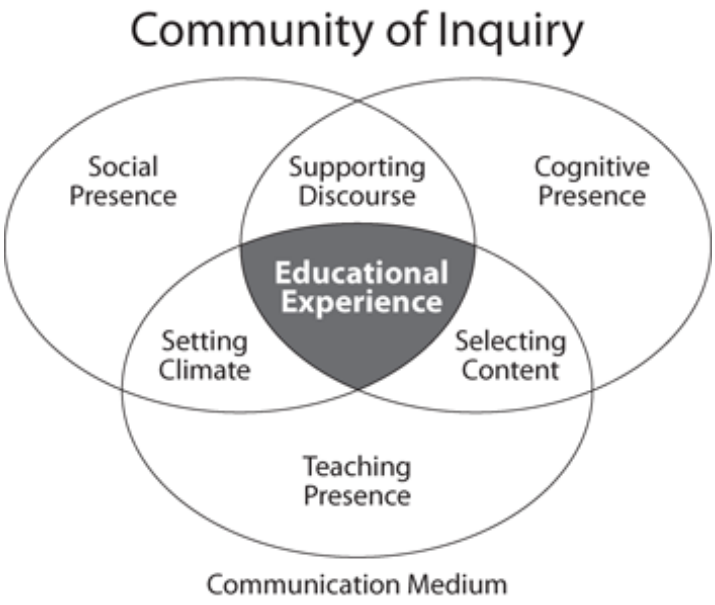


Figure 1. Community of Inquiry (CoI) Framework (Garrison et al., 2000).

Social Presence

Social presence (SP) represents "learners' perceived ability to be socially and emotionally connected and purposeful communicate within the community" (Richardson et al., 2012, p.2). It has a demonstrated impact on learning processes (motivation and strategy utilizing) and learning outcomes. (Cleveland-Innes & Emes, 2005; Garrison & Cleveland-Innes, 2005). As defined, to support higher-order learning, social presence is the foundation of the critical discourse required in the community of inquiry, created by both the learner and the teacher. It is not only to purely engage social relationships, since students may still feel isolated when they are responding to classmates' posts, but it is imperative to create an environment of trust, where learners can express their ideas, emotions, concerns, to probe questions, collaborate and learn (Garrison & Akyol 2010; Picciano, 2002; Redmond & Lock, 2006).

Teaching Presence

Teaching presence (TP) refers to the learners' perceptions of the instructional design and organization (DE), facilitating of productive discourse (FD), and direct instruction (DI) of the online community provided by the instructors (Anderson et al., 2001; Richardson et al., 2012; Shea et al., 2010a). DE "is normally carried out by educators prior to learners entering the learnscape" with consideration of learners' needs and the educational objectives (Redmond & Lock, 2006, p.272). This phase requires building curriculum materials, such as integrating lectures and readings in a Learning Management System, designing and administering group/individual activities, establishing time parameters (deadlines for activities), and providing organizational guide (guidelines and tips about effectively using the technology) (Anderson et al., 2001). In order to achieve a successful teaching presence, research suggests "defining clear expectations, selecting manageable content, structuring appropriate activities, conducting assessment congruent with intended goals" (Garrison & Cleveland-Innes, 2005, p.145) and it is important to refine timelines if needed based on learners' schedule (Harris, 2000).

The FD process is critical to maintaining learners' interest, motivation and engagement. In the facilitation of teaching presence, instructor's participation in the discourse should be stressed. According to Anderson and his colleague (Anderson et al, 2001), the instructor needs to "regularly read and comment on student postings, constantly search for ways to support the development of the learning community" (p.7). For example, instructors need to identify the agreement/disagreement, therefore to direct the discussion to a higher learning experience; instructors may also reinforce students' contributions, set climate for learning, prompt discussion, and assess the efficacy of the process.

At the final stage of the teaching presence, DI means that the instructor as an expert needs to provide "intellectual and scholarly leadership" in their content area (Anderson et al., 2001). According to Collins, Brown and Holum's Cognitive Apprenticeship Model (1991), natural and active learning happens when teachers provide instructional support and encourage students' reflection and exploration. Collins, et al. (1991) also stressed the need for efficient assistant by teachers to help students achieve their learning goals.

Cognitive Presence and the Practical Inquiry Model

Cognitive presence (CP) describes "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (Richardson et al., 2012, p.2). The importance of cognitive presence to generate higher-level learning in asynchronous discussion-based online environments has been widely reported in the literature (Garrison et al., 2001; Rourke & Kanuka, 2007). Generated on Dewey (1933)'s construction of practical inquiry and the critical thinking literature, cognitive presence focuses on higher-order thinking processes as opposed to specific individual learning outcomes, including creativity, problem-solving, intuition, and insight. These thinking skills are essential for students from cradle to career, to succeed in a globally and digitally interconnected world in the 21st Century. Cognitive presence contributes to the assessment of the systematic process of thinking, therefore can potentially represent the quality of the students' critical thinking processes in the online environment (Garrison et al., 2001; Partnership for 21st Century Learning, 2007).

Garrison and colleagues (2001) then developed the Practical Inquiry (PI) Model (see Figure 2) to explain the cognitive presence in the online environment. The phases of PI are defined as: triggering event, exploration, integration and resolution. The first phase is identified as triggering event. It starts from of a problem or dilemma that needs further investigation. As a result of phase one, there is a transformation to the second phase-exploration to search for

relevant information. This phase provides insights into the challenge (from the triggering event) and students start to search for possible explanations. In phase three-integration, connections are made and individuals tend to generate their own explanations. Meanings are constructed and decisions are made about integration of ideas. Finally, through application and testing of ideas, the cognitive presence achieves to the resolution phase. After this phase, another triggering event may be initiated (Richardson et al., 2012).

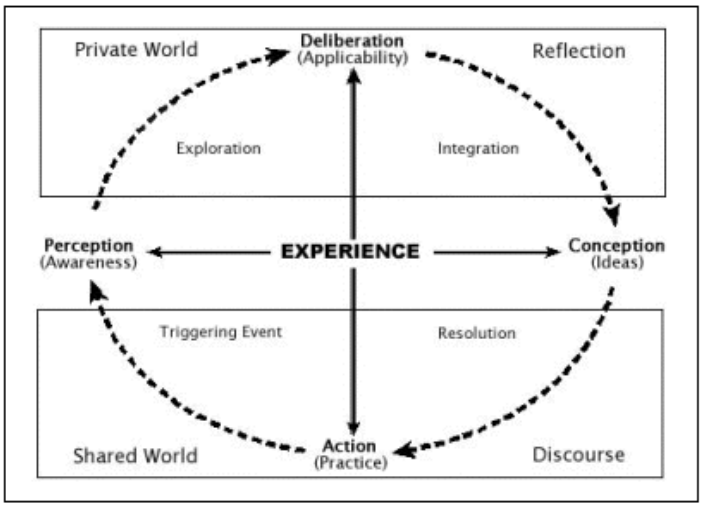


Figure 2. The Practical Inquiry Model (Garrison et al., 2001).

Intersections among social, teaching and cognitive presences

Research in investigating the interrelationship among the three presences and other motivational factors influencing students' online higher-order learning has gained much attention (Garrison & Cleveland-Innes, 2005; Kozan & Richardson, 2014). For example, teaching presence and social presence work together could create a sustainable learning community; successful teaching presence would also promote social presence by well-designed curriculum, profound pedagogical insight and skills in guiding the learners. Specifically, efficient strategies tend to include activities which help in getting to know other learners by sharing personal information, and

providing guide to reply politely and reflectively, such as the application of the Ladder of Feedback protocol developed by the researchers at the Harvard Graduate School of Education (Redmond & Lock, 2006; Slotte & Tynjälä, 2005; Wilson, 2003).

The Ladder of Feedback protocol (Wilson, 2003) is also a good example of the intersection of teaching and cognitive presence. As a guide of providing feedback to the peers, it encourages students to start at asking for clarification, expressing appreciation, offering concerns and then giving suggestions. The whole procedure could not only support an environment of understanding and help learners recognize their own strength, but also encourage them to a higher learning stage, including the problem solving and knowledge transferring. Therefore, learners achieve a higher level of the cognitive presence by appropriate teaching presence. As stated by Garrison et al. (2001), the goal in higher order learning is to move discussion from exploration to integration and then to resolution.

When the learners contrast and integrate ideas from others and the literature, their cognitive private and public worlds begin to intersect. In the CoI framework, it is at the point of the intersection between social and cognitive presence (Garrison et al., 2000; Garrison et al., 2001; Redmond & Lock, 2006). Group activities or interactions with peers to solve a problem is conductive to the development of critical thinking skills, since they provide opportunities for learners to expose to an environment where different perspectives congregate and integrate. It is also challenging for course designers and instructors to choose appropriate platform of the discourse to best promote the cognitive presence. For example, would it be more efficient if the learners could work synchronously or asynchronously? The choice needs to be carefully considered based on the course content and learners' backgrounds (Redmond & Lock, 2006).

Online Technology Self-Efficacy

Bandura (1997) defined self-efficacy as an individual's belief in his or her "capacities to organize and execute the courses of action required or produce given attainments" (p.3). Self-efficacy is a way of self-assessment that contributes to ones' goal settings, decision making, efforts, and performance. According to the computer-mediated communication, two types of self-efficacy are popularly discussed in the literature: computer self-efficacy and internet-self efficacy (Wrench & Punyanunt-Carter, 2007). Computer self-efficacy refers to a "judgment of one's capability to use a computer" (Compeau & Higgins, 1995, p.192). Internet self-efficacy refers to one's perception of his or her abilities in using the Internet. It is associated with higher metacognitive skills for information searching (such as by hyperlinks) and problem-solving in the online environment (Tsai & Tsai, 2003).

Regarding the academic environment, Miltiadou and Yu (2000) then developed the Online Technology Self-efficacy instrument which is specifically focused on students' self-efficacy with online technologies. The instrument helps identify student's confident level in online learning according to technical difficulties. The online technical difficulty has become one of the biggest barriers in the success of online learning, which may take up learner's focus and increase the cognitive load (Song, Singleton, Hill, & Koh, 2004).

Other than the technology, research in online self-efficacy also needs to consider aspects of learning and social interaction (Alqurashi, 2016; Shen, Cho, Tsai, & Marra, 2013). Ergul (2004) believed that self-efficacy has positive effects on learner's academic achievement. Based on the socio-cognitive prospect (Bandura, 1986), Shea, and Bidjerano (2010) also suggested that social presence is positively related to learner's self-efficacy.

Situational Interest

Interest has been recognized as a motivation factor which is related to our emotional engagement. It plays an important role in the learning process, determining how we select and persist in processing certain types of information in preference to others (Alexander & Jetton, 1996; Hidi, 1990; Schraw & Lehman, 2001). One of the most influential contributors was John Dewey (1913). He described interest as ‘‘being engaged, engrossed, or entirely taken up with some activity because of its recognized worth” (Dewey, 1913, p. 17). He believed that interest mediated the relationship between effort and learning.

Emerged on Dewey’s work, more contemporary theories divided interest into two domains: individual interest and situational interest. Situational interest is environmentally activated and context-specific. It tends to have a short time effect. In contrast, individual interest is activated internally and it persists over time, depending on individual’s prior experiences and emotions. (Hidi, 1990; Renninger, 1992; Schraw & Lehman, 2001).

Compared with personal interest (PI), situational interest (SI) affects learning in quite different ways. SI is more amenable to change and activated by the immediate context. Most research thus has focused on various aspects influencing SI including the text, task, and knowledge. Text-based interest focuses on the impacts of information and content. Task-based interest deals with the aspects of instruction and facilitation, for example, the discussion topic selected by instructors in online courses. Besides, it is also associated with learners’ goals. Knowledge-based interest deals with the aspects of learner’s relevant knowledge background (Schraw & Lehman, 2001).

According to the phases of interest development, situational interest is differentiated into triggered SI and maintained SI. In educational settings, triggered SI is associated with learners’

attention and engagement as a starting point of interest. With the continuous support by the environment and instruction, interest develops into maintained SI that sustains through leaners' sense-making of the content and personal involvement. (Hidi & Renninger, 2006; Linnenbrink-Garcia et al., 2010). Triggering and maintaining SI may generate the stable individual interest over time, and can be responsible for cognitive achievement, therefore, for successful learning (Ainley, 2007; Hidi & Renninger, 2006).

Chapter 3

Methods and Procedures

This chapter will start by briefly describing the study design, followed by a comprehensive explanation of the participants, the instrumentation, the research procedures and the data analyses methods.

Study Design

To address the research questions, a sequential explanatory mixed methods design was utilized which consisted of two distinct phases: quantitative followed by qualitative. Participants from different classes completed the same survey investigating their online technology self-efficacy by using the discussion board in HuskyCT, cognitive presence, social presence, teaching presence and situated interest in the middle of the semester. Quantitative analysis was used to examine the data from the Situated Interest (SI) Questionnaire, Community of Inquiry (CoI) Survey and Online Technologies Self-Efficacy Scale (OTSES) (See Appendix 1, 2 & 3). Interview protocols were used to further examine and interpret the findings from the quantitative phase.

Participants

The participants were 127 students from the University of Connecticut (UConn), who were taking at least one three-credit fully online course in the Spring 2018 or Summer 2018 semester when the research was conducted. Firstly, a number of 167 instructors from UConn who were teaching online courses were contacted to ask that if they would like their courses to participate in the study, and sent the survey information with a link to their students. Specifically, there were 26 instructors from 28 different courses, including 10 graduate courses and 18 undergraduate courses, were willing to participate and they sent the survey online with the study

information to their students. Along with the survey, participants were asked that if they were willing to participate in the follow-up interviews. There were 33 participants who agreed to be contacted for the interview and 13 of them responded to the later interview invitation. Based on their availability and willingness, 12 were selected to participate in the interview phase. Before the study has been conducted, a power analysis suggested a required sample size is 85, given the four predictors, using the G-power software. The Type I error was set at .05, with an effect size f^2 of .15 and a power of .8. The power analyses results are shown in Table 1.

Table 1

Sample Size Analysis

F tests:	Linear multiple regression: Fixed model, R^2 deviation from zero	
Analysis:	A priori: Compute required sample size-given	
Input:	Effect size f^2	= .15
	α err prob	= .05
	Power (1-β err prob)	= .8
	Number of predictors	= 4
Output:	Noncentrality parameter λ	= 12.750000
	Critical F	= 2.4858849
	Total Sample Size	= 85
	Actual Power	= .8030923

Instrumentation

Situational Interest Questionnaire

To measure the situational interest, Chen, Darst and Pangrazi (1999) developed a Situational Interest Questionnaire. The scale consists of 24 five-point Likert type items (5 = Strongly Agree, 1 = Strongly Disagree) to measure levels of students' responses about each item, in terms of the activity they are experiencing.

Exploratory factor analyses showed that all items loaded in their respective dimensional sources with values ranging between .64 and .90. Item internal consistency coefficients (Cronbach's alpha) ranged between: .78 and .95 for the six subscales: Novelty, Challenge, Attention Demand, Exploration Intention, Instant Enjoyment, and Total Interest (Chen, Darst, & Pangrazi, 2001) see Appendix 1 (items 1-24).

The Community of Inquiry (CoI) Survey

The CoI survey, developed and validated by Arbaugh et al. (2008), has been found useful for studying online learning and the relationship among the cognitive, teaching and social presence. The CoI framework views the online learning experiences as functions that are shared among three presences: Social presence, Teaching presence, and Cognitive presence (Richardson et al., 2012). The CoI Survey (items 25-58) consists of 34 five-point Likert type items (5 = Strongly Agree, 1 = Strongly Disagree). Items 25-37 are related teaching presence and loaded .425 or higher on the single factor. Item 38-46 are indicated as social presence and loaded .473 or higher on the single factor. Item 47-58 are indicated as cognitive presence and loaded .619 or higher on the single factor. Cronbach's Alpha yielded internal consistencies of 0.94 for Teaching Presence, 0.91 for Social Presence, and 0.95 for Cognitive Presence (Arbaugh et al., 2008). Details are presented in Appendix 2.

Online Technologies Self-Efficacy Scale (OTSES)

OTSES has been created and validated by Miltiadou and Yu (2000), which measured online students' self-efficacy with computer-mediated communication tools. The instrument consisted of 29 four-point Likert type items (4= Very Confident, 1=Not Confident at all) in four subscales: Internet Competencies Subscale, Synchronous Interaction Subscale, Asynchronous Interaction 1 subscale (electronic mail systems), and Asynchronous Interaction 2 Subscale (discussion boards). The Cronbach's Alpha yielded an internal consistency of .95 for the entire 29-item instrument.

Based on the research focus on asynchronous discussion boards, only the Asynchronous Interaction 2 Subscale was used. Based on the functions, specifically in the HuskyCT discussion board, items were adjusted and item 65 and 66 were added. Additionally, the item, "replying to a message posted on an asynchronous conferencing system so that only one member can view it" was deleted since the function was not available in HuskyCT. See Appendix 3 for the final format of the Asynchronous Interaction 2 Subscale.

Research Procedures

At the first phase, an online survey includes the OTESE, the CoI Survey and the SI questionnaire was distributed in Qualtrics after the middle of each semester. According to Akyol and Garrison (2008), students begin to understand the expectation of the online discussions at approximately the middle of the semester and their needs of teacher's facilitating discussions has stabilized. They also concluded that cognitive presence remained steady and did not change significantly over time in one course (Akyol & Garrison, 2008). Participants were asked to think about their experience of taking the online course with the specification in using discussion boards when responding to the questionnaire. Demographic information was also gathered,

including gender, course number; degree they were pursuing; prior experiences of completing other online courses and the reason for taking this specific online course.

In the second phase, 12 interviews were carried out online to further interpret the factors influencing the students' online learning and understand the students' online learning experiences. The interviews were conducted from 10 to 20 minutes. Eleven interviews were conducted through the Google Hangout call function and 1 was conducted through the Skype call service. The interview was semi-structured, which included open-ended questions that allowed more flexibility to respond to the specific situation and promotes new ideas (Merriam & Tisdell, 2016). The interview contained a variety of questions, including participants' adaption to online technologies, their reactions to different formats of the online lectures and communications, their social needs, and overall goals. See Appendix 4 for the interview protocol.

Research Questions

The research questions were proposed as:

1. What is the relationship among social presence, teaching presence and cognitive presence among online learners?
2. How do individual's motivational factors, including situational interest and online technology self-efficacy impact the relationship?

Chapter 4

Data Analysis

This Chapter describes the data cleaning process and the factor analysis, demographic and descriptive data analyses; includes the reviews of the research questions and associated data analyses. Analyses for each research question are described separately.

Data Cleaning Process

Before the analyses, data cleaning process was conducted to define missing data and outliers. As shown in Table 2, there were seven responses that were incomplete. All seven records were believed as being missed randomly, since the questionnaire was anonymous, and questions were not sensitive to specific population, which is called *Missing Completely at Random (MCAR)* by Allison (2001). Allison also suggested that listwise deletion, which is a method for handling missing data excluding the entire record from the participant would be an appropriate choice for MCAR data and "will not introduce any bias into parameter estimates" (p.75). Therefore, records 3, 6, 23, 31, and 46 were removed entirely. Specifically, participants 3, 6, 23, and 31 missed at least one entire scale (showing a 0% under at least one scale). Participant 36 and 64 completed all scales, however, they did not fill out their course number in the demographic question section. Considering the further analysis of course variance, they were removed as well.

Table 2

Completion Percentage for Missing Data

	Completion			
Participant Number	SI	CoI	OTSES	Demographic
3	100%	100%	0%	100%
6	0%	0%	0%	100%
23	100%	100%	0%	100%
31	0%	0%	0%	16.7%
46	100%	94%	62.5%	100%
36	100%	100%	100%	83.3%
64	100%	100%	100%	83.3%

Based on the common rule, any z-score greater or less than 3 is considered to be an outlier. Two outliers from OTSES and one outlier from teaching presence were identified. After review of the raw data, there was little chance that the data were entered by mistake. Additionally, the sample size is sufficient. Thus, the outliers were kept to keep the nature of the data. The results are presented in Table 3.

Table 3

Z-Scores for Extreme Values

Variable	Lowest Z-Scores	Highest Z-Scores
Social Presence	-2.779	+1.981
Efficacy	-3.746 (Participant No.23) -3.099 (Participant No.92) -2.452 (Participant No.46)	+0.999
Teaching Presence	-3.290 (Participant No.15) -2.919 (Participant No.93)	+1.410
SI	-2.646	+2.220

Factor Analysis Process

A Principal Component Analysis (PCA) was conducted to check the items, since the instruments were edited from the original versions to adapt the current study (as explained in Chapter 3). In addition, SI questionnaire was not invested based on online learning environment and no study had been found testing its validation in online environment. Thus, before further statistical analyses, PCA and reliability tests were conducted.

Factor analyses were conducted for SI, CoI and OTSE separately. The first analysis was based on the eigenvalues for SI. Results show that the two factors solution fit the data the best, and items 17, 18, 19, 20 were eliminated (see Appendix 5) since they were loaded on a separate no- significant component. Specifically, items 17 to 20 were indicated as "the level of difficulty relative to one's own ability" in the Challenge subscale (Chen, Darst, & Pangrazi,1999, p.159). Then, three components were extracted from the CoI items as indicated as teaching presence (item 25-37), social presence (item 38-46), and cognitive presence (item 47-58). Finally, all items in OTSE were loaded in a same component, which indicated that the OTSE as a scale testing one factor was valid. Additionally, the Cronbach's Alpha value are reported in Table 4.

Table 4.

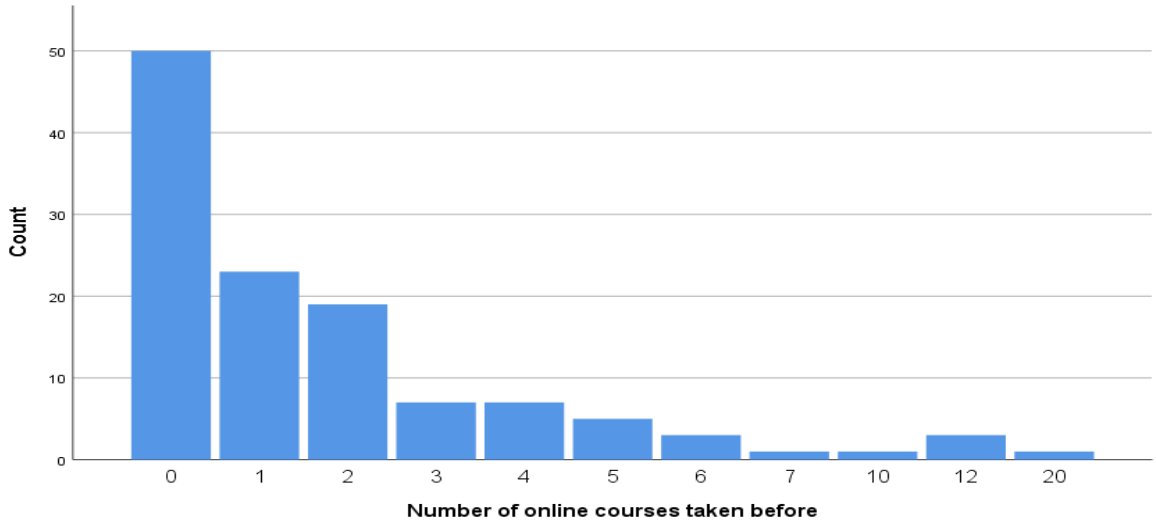
Reliability Statistics for Subscales

Subscales	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
SI	.906	.911	24
TP	.933	.936	13
SP	.890	.893	9
CP	.921	.922	12
OTSE	.910	.916	8

Demographic and Descriptive Data Analysis

After removing students with missing data, a final sample of 120 students were subjected to the data analyses examining the relationship within the CoI constructs and the impact of motivational factors. 26.7% of the participants were male while 73.3% were female. Also, undergraduate students, graduate students and others account for 80%, 15.8% and 4.2% respectively. There were 50 participants (41.67%) who did not have any 3-credit (or equivalent) online courses learning experiences(novice), while 70 participants (58.33%) had taken at least one before the current course (experienced learner). Within experienced learner, 35% had taken one or two courses before and 23.2% had experiences of 3 to 20 online courses before. The frequency histogram is presented below in Figure 3.

Figure 3. Frequency Histogram of Number of Online Courses Taken Before.



Research Question 1

To address the research question 1: What is the relationship among social presence, teaching presence, and cognitive presence among online learners, a multiple linear regression analysis was adopted to test the hypotheses. Of specific interest was the relationship among learners' cognitive presence (dependent variable), social presence (independent variable), and teaching presence (independent variable). The model was defined as: $Y_{cognitive}=\beta_0+\beta_1 X_{social}+ \beta_2 X_{teaching} +e$ (Model 1). The hypotheses were: H_0: $\beta_1= \beta_2=0$; H_1: $\beta_1\neq \beta_2\neq 0$. Further, qualitative data were transcribed and analyzed to explain the results from the regression analyses.

Before utilizing the single level regression models, a baseline Hierarchical Linear Modeling (HLM) was run to analyze the data structure where students (level-1) were nested within different online courses (level-2). HLM is useful when the variance in outcome variables are at different hierarchical levels; for example, students in a classroom share variance according to the same teaching and environment. The first step was to calculate the intra-class correlation (ICC)[1], which represents the percent of the variance in the dependent variable that is among courses (Woltman, Feldstain, MacKay, & Rocchi, 2012). In this study, 120 students (level-1) were nested within different online courses (level-2). The result yielded a zero variance of the random effect (course), and the ICC was not significant, the model building procedure was therefore not processed, and single level multiple regression analysis was used instead (see Tables 5 and 6).

[1] ICC= between-group variance/ (between-group variance + within-group variance)

Table 5

Baseline HLM from R Studio-Fixed Effects

Fixed effects	Estimate	Std. Error	T value
Intercept	46.281	0.639	72.48

Table 6

Baseline HLM from R Studio-Fixed Effects

Random Effects	Variance	Std. Dev.
Course (Intercept)	0.000	0.000
Residual	49.340	7.024
Number of observations: 120	Number of groups: 28	

Multiple Regression Analyses

Multiple regression analyses were conducted to study the relationship among cognitive presence, teaching presence and social presence within the CoI framework. As shown in the coefficients table (Table 7), social presence is a significant predictor of cognitive presence ($p < .001$). The null hypothesis $\beta_1=0$ was rejected. Teaching presence also significantly predicts cognitive presence ($p < .001$). The null hypothesis $\beta_2=0$ was rejected. According to the ANOVA table (Table 8) as below, social presence and teaching presence can significantly explain the variance in cognitive presence.

Table 7

Coefficients Table for Social Presence and Teaching Presence

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.762	.257		2.960	.004
	S	.353	.061	.406	5.808	.000
	T	.437	.066	.463	6.615	.000

a. Dependent Variable: Cognitive presence
b. S indicates to Social presence; T indicates to Teaching presence.

Table 8

ANOVA Table for Social Presence and Teaching Presence

Model			Sum of Squares	df	Mean Square	F	Sig.	R Square Change
1	Subset Tests	S	6.737	1	6.737	33.731	.000a	.126
		T	5.193	1	5.193	43.755	.000a	.164
	Regression		23.100	2	11.550	75.017	.000c	
	Residual		18.014	117	.154			
	Total		41.114	119				

a. Tested against the full model.
b. Dependent Variable: Cognitive Presence
c. Predictors in the Full Model: (Constant), T (teaching presence), S (social presence).

Qualitative Data Analysis

The interviews data were transcribed into text and reviewed by the researcher making notations and margins. Next, statements and phases according to their online learning experiences were extracted as quotations, then the data were developed into descriptive and interpretive categories based on the evidence presented in the transcripts and the literature. Then the researcher developed connections among the categories. The validation was preceded by triangulation. A person outside of the study conducted a thorough review and decided on each coding category.

Interview data were first transcribed into text for initial review by the researcher. There were 161 quotations in total were selected for coding. The category was than constructed based on the CoI framework mentioned in this study earlier, which concludes three elements for a successful online learning: teaching presence, social presence and cognitive presence (See Table 9 for the description and example for each category). A reviewer outside of the research had a thorough review with the coding. Her review was divided into two parts. She firstly reviewed 113 quotations. She felt unsure about 25 quotations and checked with the researcher. After clarification about the research questions and discussion, she had different opinions about one quotation (the example from Gavin in table 9) between social presence and cognitive presence. A consensus was made, and it fell into the social presence category. At the second part, the reviewer was unsure about 5 out of 48 quotations and agreed with the original coding after further discussion.

Table 9

Categories Table

Category	Description (Richardson et al., 2012)	Example
TP	Learners' perception of the instructional design and organization (learning materials, course organization, assignment…), facilitating of productive discourse (proving guide and feedback), and direct instruction (teaching skill and professional knowledge) of the online community provided by the instructors.	… She's just kind of staring into the camera talking on her experience. She does a good job pacing it out and, you know, fluidly switching between subjects. It's obvious that she had a plan when he recorded the lecture. But it's also obvious that she's very comfortable speaking to people even if she's speaking through a computer screen recording herself switching between subjects…(Tom) …It's more like the students teaching each other or learning by themselves. The professor doesn't really encourage that you email him asking questions, all the questions he wants you to put them online under

		discussion board. So it's not really him helping you or clarifying things, like I've been wanting to email him about some stuff but I don't have his email because he didn't post it. He wants all the questions to be done through a discussion board. or to contact the TAs…(Tony)
SP	Learners' "perceived ability to be socially and emotionally connected and purposeful communicated within the community". For example, feeling a sense of community, being comfortable to the discussion…	…I remember looking back, I had a classmate of mine who wrote at least like a couple of paragraphs to a post that I did. That was pretty in-depth and so I kind of appreciate them taking the time to really read my post and respond to a lot of the key points that I proposed in, in the questions that I answered, so I, you know them taking the time to write back meant a lot to me…(Gavin)
CP	"The extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" , which including four phases: being triggered by a problem/question; exploring relevant recourses; integrating the information/knowledge obtained; solving the problem or applying to the real world.	…overall I just really enjoyed the course in terms of the way it made me think about the future. And I don't know if that was like the online component or just the course itself where you know anything about your career, your professional development in life, that things you need to aware…(Gavin)

Results show that that 83% participants were satisfied with the teaching presence, based on the course design, learning material, teaching skills and instructors' involvement/facilitation. In terms of the social presence, participants believed that there was a big difference between online and in-person social presence. They felt less fear and more voices were being heart because everyone needs to write down and post their ideas in public. Additionally, they felt online communication was still as less natural as a traditional one. For cognitive presence, all of them stated that they had learned in different degrees. They appreciated the asynchronous communication which provided a flexible space to get more perspectives of others and think deeply before post it.

Research Question 2

To address the research question 2, two independent variables were added to the regression model, "online technology self-efficacy" and "situational interest" to examine their relationship with the dependent variable (cognitive presence) and their influence on the relationship among cognitive presence, social presence and teaching presence within the CoI framework.

Multiple Regression Analyses were conducted to study how the motivational factors, in this study, including online technology self-efficacy and situational interest, would influence the relationship among three presences. The model was $Y_{cognitive}=\beta_0+\beta_1X_{social}+ \beta_2X_{teaching} + \beta_3X_{efficacy} + \beta_4X_{SI} +e$ (Model 2). As shown in the coefficients table (Table 10), social presence is not a significant predictor of cognitive presence (p=.101>.05) when taking motivational factors into account. The null hypothesis $\beta_1=0$ was not rejected. Teaching presence still significantly predicts cognitive presence (p<.001). The null hypothesis $\beta_2=0$ was rejected. Online technology self-efficacy is a significant predictor of cognitive presence (p<.001). The null hypothesis $\beta_3=0$ was rejected. Situational interest is a significant predictor of cognitive presence (p<.001). The null hypothesis $\beta_4=0$ was rejected.

Table 10

Coefficients Table for Social Presence and Teaching Presence[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.094	.243		.388	.699
	S[b]	.101	.061	.116	1.651	.101
	T[b]	.297	.058	.314	5.094	.000
	SI[b]	.376	.057	.438	6.616	.000
	OTSE[b]	.255	.059	.252	4.355	.000

a. Dependent Variable: Cognitive presence

b. S indicates to Social presence; T indicates to Teaching presence; SI indicated to situational interest and OTSE indicated online technology self-efficacy

Table 11

ANOVA Table for Social Presence and Teaching Presence.[b]

Model			Sum of Squares	df	Mean Square	F	Sig.	R Square Change
1	Subset Tests	T	2.761	1	2.761	25.945	.000[a]	.067
		S	.290	1	.290	2.727	.101[a]	.007
		SI, OTSE	5.776	2	2.889	27.138	.000[a]	.140
	Regression		28.876	4	7.219	67.836	.000[c]	
	Residual		12.238	115	.106			
	Total		41.114	119				

a. Tested against the full model.

b. Dependent Variable: Cognitive presence

c. Predictors in the Full Model: (Constant), OTSE, SI, T, S.

Based on the ANOVA table above (Table 11), motivational factors, including SI and OTSF, increased R^2 by 14% for significantly predicting cognitive presence after taking teaching presence and social presence into account. Social presence increased R^2 by 0.7% for predicting cognitive presence after taking teaching presence and motivational factors into account. Teaching presence increased R^2 by 6.7% for predicting cognitive presence after taking social presence and motivational factors into account.

A correlational analysis was conducted to examine the relationship between the variables (See Table 12). Cognitive presence has positive moderate to high correlation with social presence, teaching presence, OTSE and ST at an r value of .631, .660, .465, .692 respectively. Social presence is also highly correlated to SI (r= .594, p< .001). OTSE and SI are correlated at a small rate (r= .306).

Table 12

Correlations among variables

		Cognitive	Social	Teaching	OTSE	SI
Pearson Correlation	Cognitive	1.000	.631	.660	.465	.692
	Social	.631	1.000	.485	.433	.594
	Teaching	.660	.485	1.000	.306	.478
	OTSE	.465	.433	.306	1.000	.155
	SI	.692	.594	.478	.155	1.000
Sig. (1-tailed)	Cognitive	.	.000	.000	.000	.000
	Social	.000	.	.000	.000	.000
	Teaching	.000	.000	.	.000	.000
	OTSE	.000	.000	.000	.	.045
	SI	.000	.000	.000	.045	.

Chapter 5

Discussion

The purpose of this study was to investigate the relationships among the three key variables, cognitive presence, social presence and teaching presence, as defined in the Community of Inquiry framework. Additionally, the study also investigated how the individual student's motivational differences may influence these relationships. The results of this study showed that social and teaching presences are both significant predictors of cognitive presence within the CoI framework; further, motivational factors significantly affect their relationship; and social presence became insignificant when SI and OTSE were added to the regression model.

Based on the literature, high scores of cognitive presence in CoI means the perception of a higher order of learning which generalized from relating problems to problem-solving or knowledge application; high scores of social presence means the perception of being highly socially connected within the learning community as a function in support of the cognitive presence, and high scores of teaching presence means the perception of a well-designed curriculum, effective course facilitation, and professional teaching by the instructor (Garrison et al., 2000; Richardson et al., 2012). High scores on SI suggests that the learner was highly engaged by the current discussion board activity, which may promote learning (Dewey, 1913; Schraw & Lehman, 2001). High scores on OTSE is interpreted as perceived confidence in using online technologies (Miltiadou &Yu, 2000).

For the first research question investigating factors including social presence and teaching presence, the quantitative data analyses suggested rejecting the null hypotheses $\beta_1 = 0$ and $\beta_2 = 0$, demonstrating that within the CoI, social presence and teaching presence are significant predictors of cognitive presence in online learning. In addition, based on the correlation matrix, there were

high, positive correlations among cognitive presence and social presence (r=.631, p<.001), and teaching presence *(*r=.660, p<.001). Social presence and teaching presence were also highly associated with each other (r=.485, p<.001). These all refer to strong relationships among the three presences.

The qualitative data analysis is consistent with the quantitative analyses above. Teaching, social and cognitive presence were connected with each other. Research in recent years has also revealed that successful learning is from reflecting what they know, integrating ideas from the others, and attempting to solve real world problems. None of these could proceed without the integration of three presences (Harris, 2000; Shea et al., 2010; Wiske et al., 2005). Participants have explained their perception of the importance of instructor's involvement in order to create a more "natural" online learning environment. Participants who experienced a "limited" social presence indicated that they hoped the instructor could be more involved in the discussion board. For example, to give feedback about their posts and let students know if they were correct in understanding the content. Strategies for online instructors to promote social presence also include activities which focus on getting to know their classmates and the instructor, by using some social communication platform outside of the class, or sharing personal information (Redmond & Lock, 2006). One participant said that the instructor in his class created a place in the discussion board and sharing personal life stories, which had significantly brought them (instructor and students) together.

All the interview participants thought social connection is very important in their learning, which could expand their knowledge by connection with peers, and help with learning because "you're more invested in the work that you are doing". This is consistent with the literature that the interaction between social presence and cognitive presence is a place where learners move beyond the exchange of information and achieve a deeper thinking and learning (Redmond &

Lock, 2006). They also believed that social presence was probably "the biggest barrier" in online platform.

> *I mean I definitely think, yes, for sure. I mean I think that (social connection) increases the level of engagement…. And I think that's like a major component. I don't think that it necessarily happens so much in this class, but I know it's really hard to generate that over an online platform which is probably the largest barrier, but yeah, that's really important. (Sarah)*

Where does the barrier come from? One possible explanation brought up from the interviews may be the difficulty to balance the tradeoff between the flexibility of options and learners' cognitive load limitation. Meaningful learning is defined as a change in long-term memory. According to the cognitive load theory, it requires learners to actively engage in substantial cognitive processing. In the research of multimedia learning, cognitive overload is a central consideration in the curriculum design and development (Chandler & Sweller, 1991; Mayer & Moreno, 2003). Online learning, as a format of multimedia learning, provides us more options about learning, including the technology use, information obtaining and the pedagogy, however, a learner's cognitive capacity is limited at a time (Chandler & Sweller, 1991). Social presence in online environment is different with personal social connection, since the former one requires more cognitive efforts in selecting from massive information and adapting to the technologies. In conclusion, it is a challenge for instructors to balance the trade-off.

Considering the different cognitive process in online learning, the implication for instructors is that they need to carefully design and develop the courses. For example, they need to pay careful attention to the choice of learning materials. According to the interview, online learning materials created/organized by the instructors have different formats, including readings, PowerPoint slides, videos from public sources, self-recorded videos, etc. Participants in the interview said that the instructor pre-recorded video helped with their learning, especially for

audio learners. Some also stated that in certain situations, showing both of the instructor's image and the slides separately in one video may be distracted to their learning, while the light board presentation technology was very much appreciated, which instructors face toward learners and he or she can write on the PowerPoints slides behind a reflective light board. Adding components to a technology-based learning do not always promote learning. For example, in a game research study by Adams and colleges (Adams et al.,2012), adding the narrative theme to an educational computer game did not significantly improve learning. Therefore, before deciding the format, instructors may need to consider the learning goals and content area, in order to choose a the most effective format of the online course.

Does social presence really improve learning? Another question has raised by the result of the second research question. After added motivational factors into the model, the social presence became no longer significant to predict cognitive presence. The null hypotheses $\beta_1 = 0$ cannot be rejected. One possible explanation is that social presence has a moderate to high correlation with OTSE ($r = .594$, $p < .001$) and SI ($r = .433$, $p < .001$), which may influence their prediction of the dependent variable. Another explanation may be the concern that social presence, per se, as defined in the CoI framework may be problematic in predicting cognitive presence.

In recent years, research has begun to study the social presence and especially its influence in cognitive presence. In a literature review by Annand (2011), the author concluded that the social presence itself is questionable in certain circumstances. There is research showing that "several specific indicators of social presence are very difficult to interpret reliably" (Shea et al. 2010b, p.17). Annand (2011, p.44) consistent with Nagel and Kotze (2010), also suggested that social presence may be more like a "result of other presences' interactions and may not be a precursor to cognitive presence at all." In the current study, participants believed that even they perceived less social presence, only "small things are missing" and they still felt they were

learning. That is not to say, educators should ignore the building of social presence, but they should pay more attention to how much social presence is needed for an efficient online discourse and to figure out the "small things". For example, as shown in the results, OTSE and SI still significantly predict the cognitive presence when social presence becomes insignificant, indicating that social presence, as defined in the CoI itself, may not be a predictor of cognitive presence, but there may exist additional latent factors within the interaction of social presence, SI and OTSE.

Another thing needs to be clarified is that interaction is not equal to social presence. Many participants mentioned their knowledge exchange experiences in the discussion board, which is only a part of the social presence. Social presence goes beyond that simple interaction, which could be understood as a social interaction, or a lower level cognitive exchange. Students may have interactions with peers, however, it does not mean there is a perceived social presence. Successful social presence engages the higher order learning (Garrison & Cleveland-Innes, 2005; Picciano, 2002).

Participants in the interview also shared their experiences with the "forced discussion board" and nearly half of them either felt "not very comfortable" or doubted its learning outcome. A "forced discussion" is a popular structure in current online learning which includes two parts of activities: posting an initial thoughts based on the course content, which can be an essay or short paragraph, and then response to at least 1 peer to earn course credits. Eleven of 12 participants said they were required to post their opinions and reply to peers weekly. However, they felt that it was more like focusing on "participation", instead of "quality". They mentioned that seldom did students reply back and forth to achieve higher learning after they completed their required posts. Especially when the instructor was less involved, students reported that there was a lack of direction and motivation.

"Because to me, after seven online classes, I have a strong preference for being in a classroom because I think some of that required response to other people's posts is a little bit forced and I'm not so sure that there's general learning that goes on during that component of an online class." (Bill)

"I found the requirement to respond to other people's posts to be sort of the most forced and artificial component of online learning. The access to the materials and the readings or the videos, I learned a lot and I found all of that interesting. But I do feel that when students are responding to each other's posts, even at the graduate level, they often take the form of 'I really like what you had to say', 'good post', and because that's just an obligation of the class." (Kat)

Social presence may not be directly predicting learning, but it is important since it may be a basis where learners generate their interest and engagement, decrease technology difficulties, thereby potentially reducing cognitive load and improving learning outcomes. Kanuka (2011) revealed in her research that, only well-implemented interactions promote a higher level of understanding and critical discourse. The interactions should be structured, planned, and include direct roles and responsibilities for the learners. Some participants still enjoyed the "forced discussion" because they enjoyed the opportunities to sit down, read others' posts, and generate deeper thinking, especially when instructors occasionally participated in it. One participant mentioned that these discussions raised his interest of the course, and also engaged him to think about his career and life choice. For students who thought they were reserved, they believed online discussion provided a more comfortable environment to express their ideas. Online discussion also decreases some learners' fear of speaking out and being ignored in a traditional classroom. They believed that online discussion increases their ability to appreciate others' work and gain more sense of being understood. In a word, what matters is the course design and how much engagement can be generated from the discussion activity, not the apparent degree of social connection.

Final discussion of the findings includes the implication for instructors to provide more guidance on the course flow and technology usage for students. Learners sometime felt lost and

had no idea about the course flow if there is no clear introduction and guidance at the beginning of the class. Learners may lose interest and dismiss the learning. Instructors may also consider sending reminders during the courses to help learners plan and regulate. It would be helpful to learners who have other commitments outside of the course, such as a job at the same time, or even if they are taking the course from another country. Additionally, instructors also need to consider the schedule and timelines in a more flexible way, since learners may experience different time zones, other commitments and learning time preferences.

> *I think the hardest part honestly is not quite understanding how the program should flow. And like I'm realizing I should probably be registered for the fall but I'm not. Ha-ha… I mean I worked for a college, and... it's a smaller college than UConn, but we worked really hard to make sure our students are on track. And I think I have been kind of shocked how easy it is to fall through the cracks especially through an online learning thing… So I think great online advisers need to do a lot to help their students get registered and stay on track you can kind of know what's up. (Sally)*

Summary

This study may provide insights for further online learning educators on designing and facilitating the courses, by showing the relationship between factors which may influence student learning. Additionally, it may be as a reference for researchers in online learning to discover latent variables which may be related to the cognitive presence within the CoI framework. Online learning is still new, and it is continuously evolving by the rapidly changing technologies. More efforts are required by all online educators to integrate pedagogy with technologies, in order to enhance student learning.

Limitations for this study are in two groups. First, it is about the assessment of the cognitive presence and situational interest. For the cognitive presence, the current research used a measurement scale which assessed the learner's perceived score, however, it could be problematic. Learners' different personality, metacognitive skills, and even the wording of the

survey, may have influenced their perceptions and lead to bias. Further research in this field should utilize a variety of assessment tools, such as the eye movement testing, which may attain a more accurate understanding of the intrinsic cognition process. For the situational interest, since the current study dropped four items from the original scale based on the factor analysis, the definition of SI in this study may be slightly different than other studies which tested all items from the SI questionnaire. Secondly, a richer qualitative data collection and detailed analysis would be valuable for the next step. The current study used the interview data as a subordinate analysis for the quantitative results, while the qualitative data could be more helpful, especially to enhance the current theoretical framework.

In conclusion, online discourse as a communication activity, could be very beneficial in current online learning environment, by providing a space for information exchange and to generate deeper thinking, but only if educators understand how it would work and how students learn in the online environment.

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Appendix 1. Situational Interest Scale Items

Below is a list of statements dealing with your feelings about your recent online discussion activities in your current online class. Please indicate how strongly you agree or disagree with each statement.
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Exploration Intention

1. I want to analyse it to have a grasp on it.
2. I want to discover all the tricks in this activity.
3. I like to find out more about how to do it.
4. I like to inquire into details of how to do it.

Instant Enjoyment

5. It is an enjoyable activity to me.
6. This activity is exciting.
7. The activity inspires me to participate.
8. This activity is appealing to me.

Novelty

9. This activity is new to me.
10. This activity is fresh.
11. This is a new-fashioned activity for me to do.
12. This is an exceptional activity.

Attention Demand

13. My attention was high.
14. I was very attentive all the time.
15. I was focused.
16. I was concentrated.

Challenge

17. It is a complex activity.
18. This activity is complicated.
19. This activity is a demanding task.
20. It is hard for me to do this activity.

Total Interest

21. This activity is interesting.
22. The activity looks fun to me.
23. It is fun for me to try this activity.
24. This is an interesting activity for me to do.

<u>Based on a 5 point Likert-type scale</u>
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Appendix 2. Community of Inquiry Survey Items

Below is a list of statements dealing with your feelings about your recent online discussion activities in your current online class. Please indicate how strongly you agree or disagree with each statement.
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Teaching Presence

Design & Organization

25. The instructor clearly communicated important course topics.
26. The instructor clearly communicated important course goals.
27. The instructor provided clear instructions on how to participate in course learning activities.
28. The instructor clearly communicated important due dates/time frames for learning activities.

Facilitation

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

Direct Instruction

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

Social Presence

Affective expression

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

Open communication

41. I felt comfortable conversing through the online medium.
42. I felt comfortable participating in the course discussions.
43. I felt comfortable interacting with other course participants.

Group cohesion

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

Cognitive Presence

Triggering event

47. Problems posed increased my interest in course issues.
48. Course activities piqued my curiosity.
49. I felt motivated to explore content related questions.

Exploration

50. I utilized a variety of information sources to explore problems posed in this course.
51. Brainstorming and finding relevant information helped me resolve content related questions.
52. Discussing course content with my classmates was valuable in helping me appreciate different perspectives.

Integration

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

Resolution

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

Based on a 5 point Likert-type scale

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Appendix 3. Online Technologies Self-Efficacy Scale(OTSES) (adjusted)

Below is a list of statements dealing with your feelings about using the discussion board in the online learning environment. Please indicate how strongly you are confident or not confident in each statement.
1 = Not Confident at All, 2 = Not Very Confident, 3 = Somewhat Confident, 4 = Very Confident

The Asynchronous Interaction 2 Subscale

I would feel confident…

59. Finding and closing the discussion thread
60. Creating a new post to the discussion thread
61. Reading a post under the discussion thread
62. Replying to a post under the discussion thread
63. Downloading (saving) a file from the discussion board to a local disk
64. Uploading a file to your post
65. *Opening a hyperlink from the discussion board to explore more information
66. *Creating a new thread to the discussion board

Appendix 4. Interview Questions

1. Do you have experiences of completing 3-credit, or equal online courses before?

   If yes, ask following:

   a. How many?

   b. Can you briefly describe your experiences?

   c. How did your previous online course experiences help in this course?

   d. How did this course meet with your expectation or imagination of an online course?

   If No, ask following:

   a. How did this course meet with your expectation or imagination of an online course?

2. Is this course mostly taken in HuskyCT?

   If yes, ask following:

   a. What is the format of the lectures? (slides, video from websites, instructor self-recorded video, etc.)

   b. How do you like the lectures?

   If no, ask following:

   a. What is the online platform in this course?

   b. How do you like it other than HuskyCT?

3. Did you communicate with your classmates online?

   Follow-up:

   a. Where did you usually communicate? (Discussion board, emails, text messages, etc.)

   b. What are the purposes for the communications?

   c. Did you find the communication efficient?

4. What did you do when you have questions or difficulties in this course?

5. . How do you think about the importance of the sense of community in online learning, for example, being socially or emotionally connected with classmates and teachers?

   Follow-up:

   a. How do you think it is different from a face-to-face learning?

6. Is there anything that I did not ask that you think I should know?

Appendix 5. Factor analysis of SI, CoI and OTSE

Factor Analysis for SI

Subscale	Item	Component[a]	
		1	2
Exploration Intention	1	.499	-.118
	2	.599	-.060
	3	.476	-.232
	4	.508	-.238
Instant Enjoyment	5	.844	.144
	6	.875	.065
	7	.849	.164
	8	.861	.194
Novelty	9	.466	-.421
	10	.708	-.094
	11	.650	-.303
	12	.791	-.029
Attention Demand	13	.808	.192
	14	.688	.136
	15	.541	.396
	16	.515	.383
Challenge	17	.395	.717
	18	-.366	.755
	19	-.183	.796
	20	-.055	.798
Total Interest	21	.834	.153
	22	.843	.092
	23	.854	.127
	24	.840	.119

a. higher loading scores suggest stronger factor contributions to each of the component

Factor Analysis for CoI

Subscale	Item	Component[b]		
		1	2	3
Teaching Presence	25	.783	.004	-.125
	26	.758	-.107	-.150
	27	.605	-.061	-.280
	28	.714	-.057	-.079
	29	.736	.247	.065
	30	.804	.085	.041
	31	.743	.213	.144
	32	.802	-.064	-.121
	33	.616	-.114	-.265
	34	.623	.210	.080
	35	.685	.067	-.168
	36	.663	.026	.044
	37	.661	-.134	-.075
Social Presence	38	.037	.525	-.258
	39	-.159	.478	-.334
	40	.185	.765	.123
	41	.063	.831	.123
	42	.144	.749	.079
	43	-.042	.687	-.211
	44	.007	.720	-.011
	45	.103	.532	-.295
	46	-.016	.589	-.336
Cognitive Presence	47	.049	-.111	-.749
	48	.149	.110	-.425
	49	.061	-.036	-.710
	50	.107	.068	-.662
	51	.253	.240	-.450
	52	.326	.194	-.421
	53	.112	.083	-.664
	54	.045	.036	-.679
	55	-.171	.307	-.622
	56	.097	.000	-.722
	57	.121	.004	-.701
	58	.104	-.013	-.692

Extraction Method: Principal Component Analysis.
Rotation Method[a]: Oblimin with Kaiser Normalization.
a. Rotation converged in 10 iterations.
b. Higher loading scores suggest stronger factor contributions to each of the component.

Factor Analysis for OTSE[a]

Items	Component[b]							
	1	2	3	4	5	6	7	8
59	.685	.464	-.423	.314	.131	.038	.137	.006
60	.882	.030	-.206	.001	-.051	-.273	-.305	-.095
61	.684	-.576	.145	.356	.209	-.075	.064	-.004
62	.830	-.198	-.111	.110	-.384	.312	-.048	-.005
63	.627	.402	.636	.177	-.041	.006	-.067	.055
64	.889	.022	.127	-.234	-.115	-.123	.253	-.215
65	.838	.003	.026	-.290	.356	.273	-.100	-.043
66	.903	-.067	-.077	-.233	-.044	-.129	.079	.310

Extraction Method: Principal Component Analysis.

a. 8 components extracted.
b. Higher loading scores suggest stronger factor contributions to each of the component.