

Online Learning: Practices, Perceptions, and Technology

Apprentissage en ligne : Pratiques, perceptions et technologie

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Abstract

The purpose of this study was to examine factors influencing online learning given its rapid growth combined with the necessity to reduce attrition in online classes by providing quality instruction. This study was contextualized using the three elements of the community of inquiry (CoI) framework. We surveyed 93 students currently registered in online classes about their online learning experiences, perceptions, and technological delivery of their course. Findings revealed that the majority of online courses were asynchronous using Moodle. There was a statistically significant difference between the three CoI dimensions and level of education where graduate students had more favourable online learning experiences, as measured by an adapted CoI survey. In conclusion, we pose a revised model for the CoI showing a hierarchy of presences for future considerations.

Keywords: Online learning, synchronous, asynchronous, learning management system, community of inquiry framework

Résumé

L'objectif de cette étude était d'examiner les facteurs qui influencent l'apprentissage en ligne compte tenu de sa croissance rapide combinée à la nécessité de réduire l'attrition dans les cours en ligne en offrant un enseignement de qualité. Cette étude a été contextualisée en utilisant les trois éléments du cadre de la communauté d'apprentissage. Nous avons interrogé 93 étudiants actuellement inscrits dans des cours en ligne sur leurs expériences d'apprentissage en ligne, leurs perceptions et la prestation technologique de leur cours. Les résultats ont révélé que la majorité des cours en ligne étaient asynchrones en utilisant Moodle. Il y avait une différence statistiquement significative entre les trois dimensions de la communauté d'apprentissage et le

niveau d'éducation où les étudiants de deuxième et troisième cycle avaient des expériences d'apprentissage en ligne plus favorables, comme mesuré par une enquête adaptée de communauté d'apprentissage. En conclusion, nous présentons un modèle révisé de communauté d'apprentissage montrant une hiérarchie des présences pour des considérations futures.

Introduction

Online learning has grown at an incredible rate due to the changing nature of our current technological society as well as the more recent global pandemic that has seen schools around the world transition to online learning (Li & Lalani, 2020; Tuckman, 2007). Institutions of higher education are now at the forefront to restructure and provide innovative educational opportunities, capitalizing on advancements in technology in order to meet the learning needs of all levels of education in addition to the need for post-secondary institutions to cast wider nets in their recruiting initiatives (Capra, 2011). In 2015, it was estimated that in Canada alone there were over 1.3 million online course registrations each semester (Jean-Louis, 2015). This paralleled an 11% increase in the number of institutions that provided online courses between 2011 and 2016 (Bates, 2018). We anticipate that the number of online courses in 2020 has increased by tenfold.

Several studies have documented a shortfall in learning opportunities in online classes. For example, Sun, and Rueda (2012) attributed low student engagement to students' physical absence in class, while Tuckman (2007) attributed low student engagement to instructors being physically distant from online courses. Whether low student engagement stems from the physical distance of the instructor or the student, this shortfall can be bridged by creating what Garrison, Anderson, and Archer (2000) call the Community of Inquiry (CoI). These researchers weaved social presence with teaching and cognitive presence to create three dimensions that serve as a theoretical framework underpinning the online CoI (Garrison, Anderson, & Archer, 2000). As online education develops, more research is needed to build on the CoI framework in many ways (Castellanos-Reyes, 2020; Garrison, 2017). With the evolution of technology and ongoing skills necessary for online learning, it is important to explore how students' skills and technology impact their online experiences which is underpinned by the CoI framework. Further, it is unknown whether online learning is suitable for undergraduate versus graduate programs. Although prior research has reported that graduate students were better at critical thinking, undergraduates tended to procrastinate while reporting high motivation levels (Artino & Stephens, 2009). More research has been called for a deeper delve into this relationship (Artino & Stephens, 2009). Another variable that requires further research is students' areas of study, as it is unknown whether some areas of study are more favourable for delivering online education (Pektas & Gürel, 2014). This paper examined these areas and posed three primary research questions: What do current online courses look like in terms of the learning management system (LMS)? What is the level of student technological expertise in online courses and is technology perceived as a barrier to online learning? Is there a difference in perceptions towards online learning as measured by the three dimensions of the CoI framework with respect to (a) different areas of study, (b) level of education, (c) technological experience, and (d) LMS?

Prior to describing this study further, it is important to define key terminology used in this paper. A learning management system (LMS) refers to learning that is provided in an online format that manages the learning using a software package (Long, 2004). The software can be synchronous (learning occurs in a real time environment) or asynchronous (students read and respond to class at a place and time that is convenient for them).

The following section describes the CoI theoretical framework underpinning this study and is followed by a synthesis of literature in this field. Next, a description of the methods followed by the findings, discussion, and conclusion is presented.

Theoretical Framework

The CoI framework was developed by Garrison, Anderson, and Archer (2000) and has been widely utilized for conceptualizing online learning (Rockinson-Szapkiw, Wendt, Wighting, & Nisbet, 2016; Stenbom, Jansson, & Hulkko, 2016). These researchers structured the theoretical framework on the three key dimensions previously stated (i.e., social presence, teaching presence, and cognitive presence; Garrison, Anderson, & Archer, 2000). Social presence is defined as participants' ability to share their individual personalities as well as their capacity to present themselves as real people through the medium used in the CoI (Garrison, Anderson, & Archer, 2000). This promotes peer-to-peer engagement and fosters positive and productive working experiences. Social presence is key to increasing student engagement because it helps students develop a sense of belonging and fosters working together as a community of learners. Dixson (2015) drew upon Vygotsky's (1978) zone of proximal development (ZPD) to explain how students learn significantly more through collaboration than they do on their own; however, it is important to be cautious in drawing on Vygotsky's ZPD because a key component is that students collaborate with others who are more capable, which could be their peers or the instructor. Regardless, the ZPD requires that collaboration involve a range of students' skills; particularly, higher cognitive skills where students with lower cognitive skills could advance their learning through collaboration.

While social presence focuses on community and connection, teaching presence focuses on how the teacher facilitates and supports the CoI (Garrison, Anderson, & Archer, 2000). Garrison, Anderson, and Archer (2000) stated that teaching presence was the most integral presence when working in an educational CoI. Teaching presence includes design, facilitation, and instruction of the online learning course (Garrison, Anderson, & Archer, 2000). It is important for instructors to be mindful of human connectedness and to be intentional in their planning and facilitation of learning in an online context. In a later study, Peneva and Keremedchiev (2016) go as far as to state that it is the instructors' responsibility to create a community of learners.

Cognitive presence refers to students' ability to construct meaning through learning activities and discourse with peers and the instructor (Garrison, Anderson, & Archer, 2000; Garrison, Anderson, & Archer, 2001). Garrison, Anderson, and Archer's (2000) model representing the three dimensions of the CoI framework is shown in Figure 1 and is supported by

several studies citing the three-dimensional construct (Kovanovic et al., 2018; Kozan & Richardson, 2014; Olpak & Cakmak, 2018).

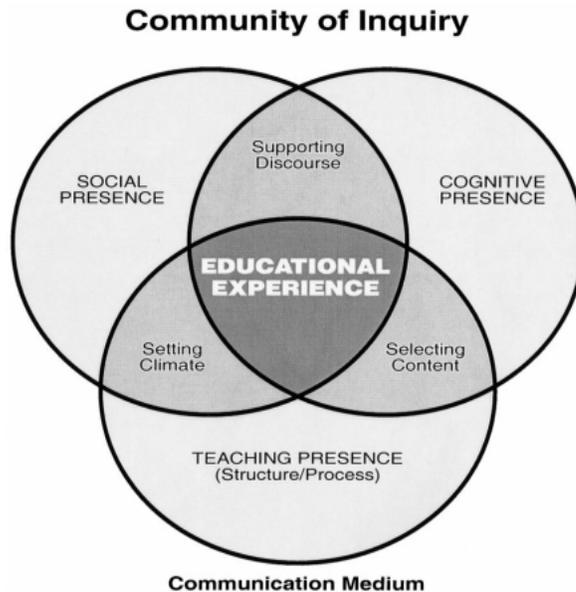


Figure 1. CoI framework proposed by Garrison, Anderson, and Archer (2000; shared with permission from the authors).

In the literature review below, we synthesis research that has examined aspects of the CoI framework as well as the impact of technology related factors on online learning.

Literature Review

A number of studies have examined online learning with the majority of research being framed according to social, teaching, and cognitive presence individually, while other studies have viewed the CoI framework as one construct that built upon the three overlapping presences (Kovanovic et al., 2018; Kozan & Richardson, 2014; Olpak & Cakmak 2018). It is at the intersection of these overlapping presences where many believe online learning occurs (Arbaugh et al., 2008; Capra, 2011; Hart, 2012; Rovai, Wighting, Baker, & Grooms, 2009; Sahin & Shelley, 2008).

Teaching Presence

Online teaching presence involves designing and organizing the course, creating and monitoring engagement opportunities, and sharing knowledge through direct instruction (Anderson, Rourke, Garrison, & Archer, 2001; Garrison, Anderson, & Archer, 2000). There is a large body of research that advocates for the importance of technology, resources, and quality feedback (Clark, Strudler, & Grove, 2015; Seckman, 2018; Sheridan & Kelly, 2010; Skramstad, Schlosser, & Orellana, 2012). Communicating by video in a synchronous environment enhances teaching presence with students and produces an ease in speaking with their instructor and

receiving information orally (Clark, Strudler, & Grove, 2015). There appears to be a need for instructor feedback whether it is orally through synchronous learning, as in the case of the Clark, Strudler, and Grove (2015) study, or in text as noted in Preisman's (2014) study. Similarly, the outcome of Sheridan and Kelly's (2010) survey of undergraduate and graduate students also acknowledged the importance of instructor feedback. A key element of teaching presence is providing quality feedback to students that guides and enhances the learning process. Quality feedback does not replace or diminish other factors associated with online learning such as instructional design, but rather quality feedback should be recognized as a key element. This focus on feedback was also noted by Preisman (2014), who reported that students were more interested in feedback than any benefits from the instructor's goal to elevate teaching presence by creating visual and audio resources.

Other challenges found in creating teaching presence resided in the dichotomous nature of online versus in-person classes. Research has shown that students choose online learning because of its flexibility (Bartolic-Zlomistlic & Bates, 1999), and learners do not seek a personal connection with the instructor (Preisman, 2014). It has also been argued that online instructors are viewed more as facilitators of learning, thus distancing them from the teaching and social presence conceptualized in the CoI framework (Garrison, Anderson, & Archer, 2000; Lowenthal & Parscal, 2008).

In contrast, Garrison, Anderson, and Archer (2000) noted that all three presences were essential in ensuring online learning is meaningful for students. Garrison (2019) highlighted Kucuk and Richardson's (2019) study which provided further validity to the CoI framework. These researchers identified teaching presence, cognitive presence, emotional engagement, behavioural engagement, and cognitive engagement as critical to learner satisfaction in online programs. Teaching presence was the most influential presence, which further supported the validity of the CoI framework. Garrison (2019) also recognized the work of Zhu (2018), who found that social presence, teaching presence, and cognitive presence had strong interconnected relationships. In particular, social presence and teaching presence predicted cognitive presence. This further validates the Garrison, Anderson, and Archer (2000) CoI framework.

In summarizing, teaching presence involves numerous interconnected factors related to design, instructional practices, and student feedback.

Social Presence

Research exploring social presence has typically focused on the effects of different techniques aimed at promoting social presence where students who interact with their peers in online courses tend to be more satisfied with their learning experience (Kim, Kwon, & Cho, 2011). Unsurprisingly, a number of studies have reported a positive relationship between students' social presence and satisfaction with their online learning (Annand, 2011; Hart, 2012; Martin & Bolliger, 2018; Oztok & Brett, 2011). Satisfaction was found in activities such as icebreakers and working collaboratively using online discussion forums, as these learning activities increased students' engagement and thereby their social presence (Martin & Bolliger, 2018).

Technology can influence social presence in online classrooms in two ways (Clark, Strudler, & Grove, 2015; Koh & Hill, 2009; Rubin, Fernandes, & Avgerinou, 2013). Rubin, Fernandes, and Avgerinou (2013) connected student satisfaction with LMS and showed that students' satisfaction with the LMS used in a course predicted the degree of social presence in the course. Specifically, the technological feature of the LMS in enhancing communication was a critical factor that influenced all three dimensions of the CoI framework (Rubin, Fernandes, & Avgerinou, 2013). However, the extent to which students' technology skills influenced their satisfaction is largely unknown.

The Clark, Strudler, and Grove (2015) study also showed that technology helped students feel more connected to each other. However, the web-based environment fundamental to online learning was conversely shown to contribute to communication problems, which influenced social presence. In the study by Koh and Hill (2009), it was found that online learning eliminated many physical barriers such as time and location demands; however, online learning could be problematic when nurturing students' sense of community. It is important to recognize that Koh and Hill's work was conducted in 2009 and since then, there has been considerable advancement in LMSs, particularly in software supporting synchronous learning.

Cognitive Presence

Cognitive presence, as put forth by Garrison, Anderson, and Archer (2000), facilitates higher order thinking and knowledge creation. In a study examining cognitive presence as documented in 116 discussion messages from an asynchronous class, and 260 discussion messages from an online class, researchers found that discussions were paramount in promoting the cognitive presence (Molnar & Kearney, 2017). Results showed the importance of synchronous web-conferencing for elevating cognitive presence in online learning.

When examining the quality of cognitive presence, Lee (2014) found that more discussion posts, as measured from 672 discussion messages, had a positive relationship to social presence but did not guarantee higher order thinking skills given that some off-topic discussions hindered cognitive presence. Further, cognitive presence was enhanced by teaching presence when the instructor provided quality and varied means of engaging students in their online courses (Akyol & Garrison, 2008).

Technology

Students' level of technological competence (e.g., typing speed), the LMS, and computer hardware (e.g., headset, connectivity) may create barriers in online courses (Clark, Strudler, & Grove, 2015; Foronda & Lippincott, 2014). In comparison to the CoI framework, little has been written about technology or the technological skills required by students to navigate online learning.

The LMS has influence on students' general perception of the online class (Clark, Strudler, & Grove, 2015). Students who received video posts and synchronous video conferencing felt more connected because they could see and hear their peers and instructor (Clark, Strudler, & Grove, 2015). In a similar study using video conferencing, students had strong perceptions of enjoyment, interaction, flexibility, and equal to higher levels of satisfaction

with their online program; however, technological problems, including software and hardware, negatively impacted students' experiences (Foronda & Lippincott, 2014). Advances in technology have created intuitive interfaces with new and alternative ways for students to engage in online learning. While it is expected that implementing new technologies will create challenges, advancements in technology will ideally contribute to students' online learning experiences.

Given the literature presented above, it appears that there are many factors influencing the CoI framework; some being more influential than others. The quality and timeliness of feedback appears to be a key factor influencing teaching presence, while social presence seems to be underpinned by communication between students or between students and the instructor, which is also influenced by the LMS. Factors influencing cognitive presence are probably the least known. However, it has been found that cognitive presence does not necessarily equate with higher order thinking because cognitive presence involves creating the learning context for higher order thinking to occur (Garrison, Anderson, & Archer, 2000). As illustrated by Garrison, Anderson, and Archer (2000), the four categories included in cognitive presence are triggering event, exploration, integration, and resolution. Triggering events fall into the learning context for higher order thinking, while the other three categories call on the learners to develop their higher order thinking skills.

Methodology

An online questionnaire was used to survey graduate and undergraduate students currently enrolled in an online course about their experiences and perceptions towards online learning. The survey was distributed to 10 different programs.

Survey

Our survey was adapted from the original CoI survey which contained 34 items (Arbaugh et al., n.d.). Of Arbaugh et al.'s 34 items, we used 31 items. We kept one item as is and made minor revisions to 28 items which primarily focused on changes to verb tense, given that our survey was distributed to students who were currently in the latter half of an online course. For example, we changed "I was able" to "I am able" in the item that asked participants if they could form distinct impressions of some course participants. Other minor revisions included changing eight teaching presence items to focus on the student rather than the instructor given that students were currently registered in their online courses, and we wanted to avoid concerns related to items being perceived as evaluating the quality of instructors. For example, instead of saying "the instructor clearly communicated course goals" the item was changed to "I know the goals of this course." We made major revisions to two items by condensing the items. For example, the item, "the instructor provided feedback that helped me understand my strengths and weaknesses relative to the course goals and objectives" was changed to "I receive feedback that helps me improve."

The three items that we did not use (i.e., items 6, 8, and 11) were believed to be double-barreled, such that the items touched upon multiple issues (Driscoll & Brizee, 2010). For example, each of these three items started with a statement that the instructor was helpful in

some way (i.e., guiding, keep participants on task, and focus discussion) and the second part of the item was the impact of the instructor's helpfulness on clarifying or learning. Given that it was possible an instructor could be perceived as guiding or focusing students and not have any impact on students' learning, we opted to remove the three items rather than separate the items and increase the length of the survey. We were uncertain if these changes would distance our survey too far from Arbaugh et al.'s original work; hence, we were cautious in interpreting our findings.

In addition to these items measuring the CoI, we included items measuring: demographic characteristics (nine items), perceptions about online learning (14 items), experiences related to online learning (16 items), experiences related to different forms of online learning (13 items), and two open-ended items to document participants' blended learning format and additional thoughts about their online learning experiences (Appendix A). A 5-point rating scale anchored at each end with strongly disagree (or not at all for items surveying frequency of practice) = 1 and strongly agree (or very often) = 5 was used to collect participant responses using the Survey Monkey platform.

Analysis

Data analysis consisted of descriptive and inferential statistics. Descriptive analyses included frequency, percent, mean, and standard deviation. Analysis of variance (ANOVA) was also used to identify differences between the grouping variables (i.e., discipline, levels of education, technological expertise, and online learning platform) and the three presence from the CoI framework where each set of items was summed into one variable. In the event of a significant difference, eta squared (η^2) was calculated as a measure of effect size to determine any practical significance (Norouzian & Plonsky, 2018).

The analysis of the open-ended items was informed by the work of Patton (2002) and Creswell (2014). Responses were read while highlighting key points and identifying themes. Data was read several times by two researchers to ensure responses were accurately coded.

Participant Recruitment

The recruitment of student participants occurred in November 2018 and was completed by soliciting support from instructors from various online courses across Canada. Instructors were asked to forward the letter of information and questionnaire to their students. This recruiting procedure resulted in the completion of 93 student questionnaires. Participants were offered a chance to win one of 20 gift cards worth \$25 to a movie theatre.

Findings

This section is organized into descriptive and inferential findings. The descriptive section contains a description of participants' demographic characteristics, description of online learning environment, patterns in responses related to the scale measuring CoI framework, and technology. Inferential findings are drawn from an ANOVA.

Descriptive Findings

Demographic characteristics.

The majority of participants (82.8%) were from Atlantic Canada. Asynchronous format was the most prevalent format; 79.6% were participating in asynchronous classes. Most participants self-reported being average (52.7%) or expert (44.1%) when asked to indicate their technological skill. Participants' also identified their level of study as undergraduate (25.8%) or graduate (74.2%). With respect to discipline, students in education constituted 67.7% of all respondents. Other larger disciplines represented in the data set included business (9.7%) and physics (7.5%). Differences between the groups could not be determined due to unequal sampling based on discipline.

Moodle was the LMS most frequently used in participants' online courses (83.9%) and was the preferred form of online learning by nearly half (48.4%) of the participants. Blended (in-person and online [any form of online]) came in second with 21.5% of participants indicating it as their preference. 12.9% of students in online classes preferred in-person class.

Teaching presence.

For the most part, students tend to be positive in their responses to teaching presence. There were positive responses related to: surveying instructors' practice of responding promptly to emails (item 50: $M = 4.28$, $SD = 0.98$), communicating big ideas (item 53: $M = 4.25$, $SD = 0.88$), and course goals (item 54: $M = 4.38$, $SD = 0.77$). Areas of disagreement among participant responses included receiving weekly feedback (item 51: $M = 2.96$, $SD = 1.36$) and working in small groups to complete assignments (item 57, $M = 2.67$, $SD = 1.40$). All other items fell in the middle of the scale. In terms of differences in responses based on the grouping variables, there were no notable differences (i.e., mean scores differed by less than 0.5).

Social presence.

Overall, findings for items measuring social presence tended to be lower than those for teaching presence. Students in the synchronous and blended courses responded at the higher end of the scale on items related to interacting with peers. There may also be some tension in synchronous and blended courses given that the reverse was true for items that asked about recognition for points of view (item 32) where only 52.7% of students in synchronous and blended courses responded with a 4 or 5 on the scale compared to 78.4% of students in asynchronous courses. When social presence items were grouped by level of education, graduate students responded more positively than undergraduate students for all but three items suggesting that graduate students experienced a greater social presence than their counterparts.

Cognitive presence.

Cognitive presence had the highest total mean score among the three presences meaning students were the most positive about gains in their learning ($M = 3.86$, $SD = 0.7$). In terms of differences in responses based on the LMS grouping variable, students in synchronous and blended settings responded more positively to the item exploring the use of knowledge in creative ways (e.g., solve problems, defend points of view, etc.) resulting in a total of 84.2% at

the high end of the scale in comparison to 71.6% from students in asynchronous settings. When responses were grouped by education level, graduate students were more positive on all cognitive items in comparison to undergraduate responses suggesting graduate students have stronger and perhaps a more engaging cognitive presence. This patterning was not the same when responses were grouped based on self-reported technology ability.

Technology.

When examining response patterns to individual items, a greater percentage of students (31.6%) from the synchronous group reported needing to clarify information/tasks with the instructor (item 11) compared to those in the asynchronous group (20.3%). This group of asynchronous participants also reported having to troubleshoot technical issues (item 13) more often than the asynchronous group. Overall, technology did not appear to be an issue for self-identified average and expert abilities. Further, graduate students tended to be more comfortable with technology as determined by higher mean scores, than undergraduate students.

Open-Ended Items

Participants' open-ended responses resulted in three major themes: positive factors regarding online learning experiences, areas for improvement regarding online learning experiences, and characteristics of the online learner. Thirty-six participants responded to item 77 (an open-ended comment section that stated "Use the text box below to add any other experiences or thoughts about online learning that will help with our study"). Two participants expressed their appreciation of flexibility in online learning. Similar to other studies, the flexibility of online programs was a motivating factor influencing students' decisions to take online learning courses. In addition to flexibility, participants also noted that they valued quality instruction involving timely feedback and formative assessment. Participants also valued human connectedness with seven out of 36 responses explicitly indicating it was an appreciated element of their program. Unfortunately, eight out of 36 students noted human connectedness was missing or inadequate in their online experience.

An overemphasis on the task of preparing a literature review was reported as an area to improve as it had a negative impact on some participants' experience with their online program. Participant 67 stated "Most courses are stuck in a 'read this article and reflect,'" while participant 24 noted, "Sometimes the entire course is just a literature review..." While technological problems were relatively low, a few participants noted that more training for students and instructors would be beneficial.

Inferential Findings

Upon examining the mean and standard deviation of the three CoI scales (teaching, social, and cognitive presence), it was found that participants from the blended group consistently had more positive perceptions in each of the three dimensions of the CoI framework than those experiencing synchronous or asynchronous classes (Table 1). It is important to recognize that the synchronous and blended groups had small sample sizes, subsequently, any findings need to be corroborated in a larger study.

Table 1

Cross Tabulation: LMS Versus Dimensions of Community of Inquiry Framework

	Social Presence		Cognitive Presence		Teaching Presence	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Synchronous (8)	3.33	0.83	3.64	0.78	3.63	0.87
Asynchronous (69)	3.45	0.58	3.88	0.72	3.77	0.66
Blended (8)	3.49	0.35	3.88	0.47	3.90	0.43

Note: *M* (mean); *SD* (standard deviation)

To determine whether items in our survey formed the same three groups or presences found in Arbaugh et al.'s (n.d.) scale, a factor analysis is needed. Unfortunately, our sample size was too small (minimum of 300 is recommended), thus, we would have violated conditions underpinning its use (Tabachnick & Fidell, 2012). We subsequently calculated Cronbach's alpha as a measure of the internal consistency of the items in each scale, which resulted in the following coefficients: teaching presence (0.858), social presence (0.825), and cognitive presence (0.904). These scales were considered reliable given the minimum coefficient is 0.7 (Nunnally & Bernstein, 1994). We also examined the corrected item-total correlation values to ensure that the items in each presence were indeed measuring the same construct. In this case, correlations were acceptable (above 0.3; Pallant, 2016), with average corrected item-total correlation values of: 0.533 (teaching presence), 0.423 (social presence), and 0.602 (cognitive presence).

While we had anticipated four factors (i.e., areas of study, level of education, technological expertise, and LMS) would contribute to students' experience in each dimension of the CoI framework, our results revealed that students' level of education significantly shaped their responses. Analysis of variance was used to examine this relationship between graduate and undergraduate groups of participants. Assumptions underpinning ANOVA were checked and verified. Table 2 shows the significant *p* values (< 0.05) for each scale.

Table 2

ANOVA: Degree Level x Three Dimensions of the CoI Framework

		Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Sig.	η^2
TTL_TP	Between groups	1.981	1	1.981	4.810	.031	0.2201
	Within groups	37.071	90	.412			
	Total	39.052	91				
TTL_SP	Between groups	4.543	1	4.543	15.932	.000	0.3973
	Within groups	24.237	85	.285			
	Total	28.780	86				
TTL_CP	Between groups	4.229	1	4.229	9.577	.003	0.3182
	Within groups	37.537	85	.442			
	Total	41.766	86				

Note: df (degrees of freedom); F (F is a fraction that represents the ratio of the between group variance to the within group variance); Sig (Significance level); η^2 (eta squared)

Discussion

What do Current Online Courses Look Like in Terms of LMS?

The predominant form used in the delivery of online courses was asynchronous learning (79.6%), which was delivered using a variety of LMS including: Moodle, Google Apps, Blackboard Collaborate, etc. Moodle was the most used LMS (83.9%). The challenge in using these asynchronous platforms is that they are typically limited to independent work that is completed in isolation (Goralski & Falk, 2017). In the open-ended response item, several students echoed this challenge, indicating the asynchronous LMS used in their course had not extended beyond simple postings. Four out of 36 comments were related to this theme. Student comments also suggest that instructors may not be using instructional practices that promote online learning founded on the CoI framework. It is possible that the absence of instructor training on LMS may have limited their instructional practices. The inferences drawn here need further research to corroborate these suppositions.

What is the Level of Student Technological Expertise in Online Courses and is Technology a Barrier to Online Learning?

Given the necessity for technological skills required to engage in online learning, it is important to obtain an understanding of students' self-reported technological ability. In this study, few students reported having beginner level technology skills, while the majority of students self-reported having average (52.7%) or expert (44.1%) skills. This finding seems reasonable in that those who feared online learning the most would likely pursue learning in an in-person format. For those reporting beginner levels skills, the learning curve may be overwhelming as noted by one student who stated, "I spent the first week of the class getting a

handle on the format. More information on how an online course works would have helped me avoid starting out behind the 8-ball. I have been trying to catch up ever since week one” (student 27).

Given that technology that was intuitive in nature would influence students’ perceptions of social and teaching presence as the ease of communicating make it easier to engage in discussions (Rubin, Fernandes, & Avgerinou, 2013), we had included four items exploring the ease of technology and whether it was perceived as a barrier to learning. The mean for the 4 items ($M = 3.98$, $SD = 0.87$) suggests that technology was not a barrier to students’ learning, which supports findings in earlier studies (Mullenburg & Berge, 2005); however, there was a number of students who indicated that technology was a barrier to their learning. Hence, it is important for instructors to obtain an understanding of students’ technological abilities prior to starting an online course to determine how much additional technology support may be needed. The challenge of advancing students’ technological abilities does not necessarily rest with the instructor alone but may be better served through a university wide support program.

Is There a Difference in Perceptions Towards the Three Dimensions of the CoI Framework with Respect to (a) Different Areas of Study, (b) Level of Education, (c) Technological Experience, and (d) LMS?

When comparing the three dimensions of the CoI framework with areas of study (i.e., discipline), self-reported technology ability, and LMS, there were no significant differences. However, given the unequal distribution of participants in these groups, it may have contributed to a type II error. A type II error refers to the situation where the researcher failed to reject the null hypothesis when it was false (Huck, 2012). In this case, small sample sizes can influence the probability of a type II error (Columb & Atkinson, 2016). It should also be noted that since the CoI survey used in this study was modified, the results should be interpreted accordingly.

When comparing the three dimensions of the CoI framework with students’ level of education (i.e., undergraduate or graduate), the mean scores for each of the three dimensions of the CoI were higher for graduate students’, suggesting graduate students have better experiences with online learning as measured by the CoI framework. The ANOVA revealed that the difference in mean score was statistically significant between undergraduate and graduate students for each of the three dimensions of the CoI framework. Given that online learning requires higher levels of self-regulation than in-person courses (Pool, Reitsma, & van den Berg, 2017), graduate students may have sophisticated learning skills to address any barriers and the independence to confront feelings of isolation often experienced in online learning environments (Clark, Strudler, & Grove, 2015; Tsai, 2007). Since undergraduate students may not have sufficient social support and subsequent difficulty dealing with stress (Ickes, Brown, Reeves, & Martin, 2015), and maturity for post-secondary education in general, it is not surprising that undergraduate students’ may not be ready for a foyer into the independence and rigour called for in online post-secondary courses.

Additional Thoughts

Following the review of literature, including studies performing factor analysis, we posit a hierarchy in the CoI framework where teaching presence is a foundational dimension that

fosters social presence and together, they create opportunities for the third dimension, cognitive presence. For example, in the 2008 study by Arbaugh et al., teaching presence alone counted 51% of the variance, while social and cognitive presence each contributed around 5% of the variance. In research by Diaz, Swan, Ice, and Kupczynski (2010), cognitive presence contributed 44% of the variance, followed by the 10% by teaching presence, and 7% by social presence. In another study in 2010 by Garrison, Cleveland-Innes, and Fung, teaching presence, again, had a loading of 38%, cognitive presence 9%, and social presence 6%. A 2014 study by Kozan and Richardson also suggested a hierarchy structure given that teaching presence had 48%, cognitive presence 10%, and social presence 6%. In short, all these studies showed a disproportionate loading of variance from the factor analysis, indicating different weights or hierarchy for each of the three presences. Therefore, we pose an alternative model for the CoI framework that models a hierarchical structure to the three dimensions (Figure 2).



Figure 2. CoI framework modelling a hierarchy in the three presences.

Molnar and Kearney (2017) alluded to this model when they suggested that cognitive presence may be the most important component in online learning. Szeto (2015) added that teaching presence was most influential when examining the effects of the CoI as an instructional approach in a blended and synchronous online engineering program. Although Szeto (2015) did not imply a further hierarchical structure, Garrison, Cleveland-Innes, and Fung (2010) alluded to a hierarchy of presences when they acknowledged that teaching influenced social and cognitive presence. The more recent work of Zhu (2018) provided confirmation of the model as he reported that social presence and teaching presence were significant predictors of cognitive presence.

Limitations and Implications

As with many studies, soliciting students to participate is a challenging undertaking. Although the incentive to participate in the study (i.e., chance to win a movie voucher) was believed to entice students to participate, it was the instructors' role in forwarding the survey information and encouragement to complete the survey that drove participation. In hindsight, better networking at other universities would have improved the sample size and representation of students in each of the grouping variables. However, we have been cautious to avoid over-

stating our findings and encourage other researchers to replicate this study using the same grouping variables and revised CoI survey.

Based on the findings in this study, there may be a need to expose instructors to synchronous LMS to widen their repertoire of instructional practices. Second, although there was no statistically significant difference between the CoI dimensions and student's self-reported technology abilities, there was some evidence suggesting students with weaker abilities needed more support. Third, undergraduate students' online learning experiences were not the same as graduate students. The difference may be attributed to the different supports available and maturity for independent work. Subsequently, programs should explore whether online courses are truly suitable for undergraduate students and if so, what supports are needed to ensure they have positive experiences. Last, the model we proposed for the CoI framework may shape how the CoI is conceptualized; in particular the importance of teaching presence in promoting social and cognitive presence.

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Appendix A

Welcome to our survey! After you read the letter of consent, press NEXT to begin the survey.

Letter of Consent

I have read the information sheet for this study (attached to this email) and know that I can print a copy for my records. The letter of information provides a contact number of the Principal Investigator and an invitation to ask questions about the study or my participation in the study.

I understand...

- a. that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected and I give consent for any data already given to be retained and used.
- b. that I will not benefit financially if this study leads to the development of education and training or future research/education/technological developmental outcomes.
- c. how to contact the study team if necessary.
- d. that I can contact the UPEI Research Ethics Board at (902)620-5104, or by email, at reb@upei.ca if I have any concerns about the ethical conduct of this study.
- e. that the act of completing the questionnaire will be my consent to participate in the study.
- f. that a written summary of the findings will be available to participants through reports produced by the research team and disseminated via professional and academic journals and conferences as well as an online asynchronous presentation, the link to which will be circulated on December 14, 2018.

Once you complete the survey, we invite you to enter your name into a draw for 20, \$25 gift cards to Cineplex Odeon by emailing (studentsurveydraw@gmail.com) with your name and address.

If you agree to participate in this research, begin the survey by pressing the NEXT button.

Welcome! Please answer all questions based on your experience in the online course you are taking.

The questions below will provide us with a description of your background.

1. What kind of online course are you currently taking?
 Online (synchronous [live] - such as Blackboard or Zoom)
 Online (asynchronous - such as Moodle)
 Blended (in-person and online [any form of online]; synchronous and asynchronous)
2. How many online courses have you taken?
 Less than 3 4-6 7-9 10-12 More than 12
3. Approximately how many students are in the online class you are currently taking?
 Fewer than 10 10-15 16-20 21-25 26-30 More than 30
4. In what discipline are you studying (e.g., business, education, history, language, etc.)?
5. Indicate your experience with technology.
 Beginner (e.g., check email, use the Internet, word processing)
 Average (e.g., manipulate documents, use templates, navigate online learning platforms)
 Expert (e.g., troubleshoot, install software, use cloud apps, others come to me for help with technology)
6. What geographic region is your university located?

- Atlantic Canada Central Canada Western Canada
7. Indicate the level of your online course.
 Undergraduate/Bachelor's Graduate/ Master's Other (please specify)
8. What platform is most often used in your online course?
 Moodle, Google Apps, Skype, BlackBoard Collaborate, Adobe Connect, Zoom, Blog, Wikis
 Social Media (Facebook, Twitter, etc.), BigBlue Button
 Other (please specify)
9. Indicate your preference for the different forms of online delivery.
 Online (synchronous [live] - such as Blackboard or Zoom)
 Online (asynchronous - such as Moodle)
 Blended (in-person and online [any form of online])
 Blended (synchronous and asynchronous)
 I prefer in-person course.

The following questions examine your experiences and beliefs towards online learning.

10. Taking an online-course involves more time than taking an in-person course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
11. I have to come to the instructor for help/clarification more frequently during an online course than an in- person course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
12. I spend more time completing assignments in an in-person course than an online course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
13. I spend a lot of time troubleshooting technical issues when taking an online course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
14. I have not experienced any technical issues during my online course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
15. I am comfortable with the technology required in my online course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
16. I have contacted the instructor about the technology issues related to my online course.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
17. Technical issues with this course have been frustrating.
 1 Strongly Disagree 2 3 4 5 Strongly Agree
18. For each communication tool below, indicate the frequency in which you interact with your peers.
- | | | | | | |
|-------------------|--------------|---|---|---|--------------|
| Discussion forum | 1 Not at All | 2 | 3 | 4 | 5 Very Often |
| Twitter/Messenger | 1 Not at All | 2 | 3 | 4 | 5 Very Often |
| Chat room | 1 Not at All | 2 | 3 | 4 | 5 Very Often |
| Video | 1 Not at All | 2 | 3 | 4 | 5 Very Often |
| Facetime/Skype | 1 Not at All | 2 | 3 | 4 | 5 Very Often |

Other 1 Not at All 2 3 4 5 Very Often

The questions below survey your interactions with other course participants.

- 19. I interact with classmates outside of class to work on assignments.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 20. I am required to work with a partner(s) in my online course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 21. I am required to facilitate a discussion as a class exercise.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 22. The large number of students in this class makes it difficult to get to know each other.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 23. I did not engage in active learning (e.g., worked together) with my classmates.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 24. Certain students tend to dominate discussions.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 25. Students in my class participate equally in discussions.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 26. I have given feedback to one of my peers.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 27. Getting to know other course participants gives me a sense of belonging.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 28. I am able to form distinct impressions of some course participants.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 29. I have developed friendships with other course participants.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 30. Online communication is my preferred medium for social interaction.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 31. I feel comfortable...
 - communicating through the online medium. 1 Strongly Disagree 2 3 4 5 Strongly Agree
 - participating in course discussions. 1 Strongly Disagree 2 3 4 5 Strongly Agree
 - interacting with other course participants. 1 Strongly Disagree 2 3 4 5 Strongly Agree
 - disagreeing with other course participants while still maintaining a sense of trust. 1 Strongly Disagree 2 3 4 5 Strongly Agree
- 32. My point of view is acknowledged by other course participants.
1 Strongly Disagree 2 3 4 5 Strongly Agree

33. I have a productive working relationship with my other course participants.
1 Strongly Disagree 2 3 4 5 Strongly Agree
34. Online discussions help me develop a sense of collaboration.
1 Strongly Disagree 2 3 4 5 Strongly Agree

The questions below survey your cognitive involvement in this course.

35. How frequently does your course emphasize memorization of course content (e.g., theory, concepts, procedures, etc.)?
1 Not at All 2 3 4 5 Very Often
36. How frequently does your course emphasize analyzing information of course content (e.g., case studies, literature review, etc.)?
1 Not at All 2 3 4 5 Very Often
37. How frequently does your course emphasize applying knowledge in creative ways (e.g., solve problems, defend points of view, innovative research that builds on existing knowledge or uses existing knowledge in new ways, etc.)?
1 Not at All 2 3 4 5 Very Often
38. Problems posed in this course increase my interest in relevant issues.
1 Strongly Disagree 2 3 4 5 Strongly Agree
39. Course activities stimulate my curiosity.
1 Strongly Disagree 2 3 4 5 Strongly Agree
40. I feel motivated to explore content related questions.
1 Strongly Disagree 2 3 4 5 Strongly Agree
41. I utilize a variety of information sources (e.g., the web, articles from the library, textbooks, etc.) in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
42. Brainstorming helps me resolve content related questions.
1 Strongly Disagree 2 3 4 5 Strongly Agree
43. Online discussions are valuable in helping me appreciate different perspectives.
1 Strongly Disagree 2 3 4 5 Strongly Agree
44. Combining new information with what I already know helps me answer questions raised in course activities.
1 Strongly Disagree 2 3 4 5 Strongly Agree
45. Learning activities help me better understand course topics.
1 Strongly Disagree 2 3 4 5 Strongly Agree
46. Opportunities for reflection on class discussions help me understand fundamental concepts in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
47. I can describe ways to apply the knowledge that I have acquired in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
48. I have developed solutions to course problems that can be applied in practice.
1 Strongly Disagree 2 3 4 5 Strongly Agree

49. I can apply the knowledge acquired in this course to real-world contexts.
1 Strongly Disagree 2 3 4 5 Strongly Agree

The questions below survey the course design and facilitation.

50. The instructor responds promptly to my emails.
1 Strongly Disagree 2 3 4 5 Strongly Agree
51. I receive weekly feedback from my instructor.
1 Strongly Disagree 2 3 4 5 Strongly Agree
52. I have had opportunities for formative assessment.
1 Strongly Disagree 2 3 4 5 Strongly Agree
53. I know what the big ideas are in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
54. I know the goals of this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
55. I know the due dates for assignments in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
56. Instructions on how to participate in course learning activities were given before the start of this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
57. I work in small groups to complete class activities.
1 Strongly Disagree 2 3 4 5 Strongly Agree
58. The instructor clarifies areas of agreement and disagreement on course topics that helps me learn.
1 Strongly Disagree 2 3 4 5 Strongly Agree
59. I feel engaged in productive dialogue in this class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
60. I have explored new concepts in this course.
1 Strongly Disagree 2 3 4 5 Strongly Agree
61. I feel a sense of community with course participants.
1 Strongly Disagree 2 3 4 5 Strongly Agree
62. I receive feedback that helps me improve.
1 Strongly Disagree 2 3 4 5 Strongly Agree

Respond to the questions below if you are in a SYNCHRONOUS COURSE (online live)

63. I have attended all synchronous classes.
1 Strongly Disagree 2 3 4 5 Strongly Agree
64. I really like my synchronous class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
65. I find it challenging to share my opinions in a synchronous class.

1 Strongly Disagree 2 3 4 5 Strongly Agree

Respond to the questions below if you are in an **ASYNCHRONOUS COURSE** (e.g., Moodle).

- 66. I really like my asynchronous class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 67. Reading everybody's posts is tedious.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 68. I make posts but seldom read the article(s).
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 69. I feel like I have gotten to know my instructor in this class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 70. I don't know anybody in this class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 71. Asynchronous classes (e.g., Moodle) are easier than synchronous classes (e.g., Blackboard).
1 Strongly Disagree 2 3 4 5 Strongly Agree

Respond to the questions below if you are in a **BLENDED COURSE**.

- 72. Describe your blended learning format (e.g., do you have some synchronous such as Blackboard and some asynchronous such as Moodle; some in-person and some online; etc.)
- 73. There is an appropriate balance between the blended formats.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 74. I really like this blended format.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 75. I know my peers in this class.
1 Strongly Disagree 2 3 4 5 Strongly Agree
- 76. I feel like I have gotten to know my instructor in this class.
1 Strongly Disagree 2 3 4 5 Strongly Agree

One Last Question

- 77. Use the text box below to add any other experiences or thoughts about online learning that will help with our study.

Thank you very much for completing this survey. Don't forget to email your information to studentsurveydraw@gmail.com for a chance to win one of 20, \$25 gift cards to Cineplex Odeon. Winners will be notified by Friday, Nov. 30, 2018.

Authors

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