Community of Inquiry Framework and Learner Achievement

by

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Abstract

First described by Garrison, Anderson, and Archer (2000), the Community of Inquiry (CoI) framework suggests social presence, teaching presence, and cognitive presence are essential elements to foster successful educational experiences in computer-mediated higher education distance learning environments. While hundreds of CoI-based articles have been published since 2000, those critical of the framework and related research suggested a lack of empirical evidence to support the framework's central claim that a CoI leads to deep and meaningful learning outcomes (Rourke & Kanuka, 2009). The current study conducted with 51 graduate students in five distance education courses at a single university, compared the students' responses to a CoI perception survey with three instructor-assessed learning achievement measures. While significant positive relationships were indicated among social, teaching, and cognitive presences, as well as between each of these presences and student-perceived learning and satisfaction in the course, no relationship was suggested between the CoI composite score and any of the three instructor-assessed learning achievement measures. Only the cognitive presence subscale was found to be significantly positively correlated ($r^2 = .08$) with one of the three instructor-assessed learning achievement measures. With no relationship suggested between the CoI framework and objective measures of learning, the value of the CoI framework as an educational process model remains challenged. In addition, results of this study suggested that CoI survey-based measures and student self-reports of learning are more appropriately used as approximations of student attitude toward the course rather than as measures of student learning achievement.

Introduction

The Community of Inquiry (CoI) is a conceptual framework for the optimal use of computer-mediated communication to support critical thinking, critical inquiry, and discourse among higher education students and teachers (Garrison, Anderson, & Archer, 2000). Garrison et al. (2000) first presented the CoI as a framework for interaction and communication that suggested deep and meaningful learning in computer-mediated distance learning environments occurs through the interaction of three essential elements, including (a) social presence, (b) teaching presence, and (c) cognitive presence. As proposed by Garrison et al., "The elements of a community of inquiry can enhance or inhibit the quality of the educational experience and learning outcomes" (p. 92). A recent review of Google Scholar listed over 1,050 citations to Garrison et al.'s 2000 *Internet and Higher Education* article and the ProQuest Dissertation and Theses database listed over 60 studies with "community of inquiry" in the title or abstract since January of 2000, suggesting that the CoI framework is a popular foundation for both practitioners and researchers in distance education.

However, the CoI framework and the body of surrounding research were criticized for a lack of empirical evidence that the framework leads to deep and meaningful learning outcomes (Rourke & Kanuka, 2009). While some view CoI research as supportive of the underlying theoretical assumptions (Akyol et al., 2009; Garrison & Arbaugh, 2007; Garrison, Anderson, & Archer, 2010), others argue CoI research has been preoccupied with validation of methods to measure communication, interaction, and student perceptions while failing to investigate the framework's central claim that a CoI, with the prerequisite elements of social presence, teaching presence, and cognitive presence, leads to meaningful learning outcomes (Rourke & Kanuka, 2009). In addition, the reliance of prior CoI studies on students' self-reports of learning may

suggest a potential and important research limitation (Gonyea, 2005). The purpose of the current study was to examine the extent to which students' perceptions of a community of inquiry, as defined within the social presence, teaching presence, and cognitive presence constructs, are related to actual course learning achievement outcomes as assessed by the course instructor.

Literature Review

CoI Framework

Garrison et al. (2000) proposed CoI as a framework to facilitate student and teacher computer-mediated interaction and communication and a template for distance learning research. The CoI was presented as a theoretical communication and interaction framework to optimally support the learning process and builds on social-constructivist approaches to learning and instruction. The focus of the CoI is on facilitating critical reflection on the part of the student and critical discourse among the teacher and peer students. Garrison et al. (2000) argued that distance-learning environments supported by computer-mediated communication must include the three essential elements of social presence, teaching presence, and cognitive presence to foster the development and practice of higher-order thinking skills.

Social presence. Social presence includes (a) emotional expression seen in affective responses, (b) open communication seen in interactive responses, and (c) group cohesion seen in cohesive responses (Rourke, Anderson, Garrison, & Archer, 1999). Social presence theory builds upon the concept of social presence from the work of Short, Williams, and Christie (1976) in technology-mediated communication and is often used as a theoretical framework in the study of asynchronous computer-mediated communication (DeWever, Schellens, Valcke, & Keer, 2006). Theory and research on social presence in asynchronous computer-mediated learning environments have moved beyond an evaluation of the medium's effect on social presence to an

examination of the extent to which students feel connected while engaging in mediated communication (Swan & Shih, 2005), as well as how social presence can be cultivated through instructional methods to support critical thinking and critical discourse within the computer-mediated environment (Garrison et al., 2000). Some argue that while social presence alone will not ensure the development of critical discourse, it is difficult for such discourse to develop without it (Arbaugh, 2008; Garrison & Cleveland-Innes, 2005). Similarly, others view social presence as a mediating variable between teaching presence and cognitive presence (Garrison, Anderson, et al., 2010; Garrison, Cleveland-Innes, & Fung, 2010).

While some studies have suggested a relationship between social presence and student-perceived learning (Arbaugh, 2008; Richardson & Swan, 2003; Swan & Shih, 2005), findings in other research have not found a correlation between social presence and student-perceived learning measures (Akyol & Garrison, 2008; Shin, 2003). Similarly, findings are mixed regarding the relationship between social presence and satisfaction with some studies reporting a positive correlation between social presence and measures of satisfaction (Akyol & Garrison, 2008; Arbaugh, 2008; Richardson & Swan, 2003; Swan & Shih, 2005), while others found either no relationship (So & Brush, 2008) or that social presence was not a predictor of satisfaction (Joo, Lim, & Kim, 2011). Findings are also mixed regarding the relationship between social presence and a student's intent to persist with some indicating a correlation (Shin, 2003) and others reporting social presence was not a predictor of persistence (Joo et al., 2011).

Teaching presence. Teaching presence is described as a binding element in a CoI that influences the development of both cognitive presence and social presence through the direction and leadership of the educational experience (Garrison et al., 2000). Teaching presence is comprised of three primary social, organizational, and managerial components, including (a)

instructional design and organization, (b) facilitating discourse, and (c) direct instruction (Anderson, Rourke, Garrison, & Archer, 2001). Research has suggested the need for facilitation to support the construction of knowledge in an online environment (Kanuka & Anderson, 1998). Many argue that research has demonstrated the importance of teaching presence in establishing and sustaining a CoI (Akyol et al., 2009; Garrison, Anderson, et al., 2010; Garrison, Cleveland-Innes, et al., 2010). Other research has also indicated a statistically significant correlation (r^2 = .56) between the teaching presence construct as defined within the CoI and *instructor immediacy* (Baker, 2010), a construct that has been widely studied in instructional communication research (Witt, Wheeless, & Allen, 2004). Immediacy refers to both verbal and nonverbal communication behaviors that influence perceptions of closeness to another (Mehrabian, 1968). A meta-analysis of teacher immediacy research suggested statistically significant positive correlations between teachers' nonverbal and verbal immediacy with both student-perceived learning and affective outcome measures (r^2 = .24 to .25), but smaller positive correlations with cognitive learning outcomes (r^2 = .01 to .03) (Witt et al., 2004). While CoI research has suggested significant differences in the extent and type of teaching presence within a given online course (Anderson et al., 2001), studies have indicated a statistically significant positive relationship between teaching presence and student satisfaction (Abdous & Yen, 2010; Shin, 2003), as well as between teaching presence and student-perceived learning (Arbaugh, 2008; Shea, Li, & Pickett, 2006; Shea, Li, Swan, & Pickett, 2005; Shin, 2003; Swan & Shih, 2005).

Cognitive presence. Cognitive presence is defined within the CoI framework as the extent to which distance students construct meaning through both critical reflection and discourse, and is suggested to be a vital element in critical thinking (Garrison et al., 2000). Framed within a social-constructivist perspective, cognitive presence focuses on higher-order

thinking associated with community members' critical inquiry processes versus specific individual learning outcomes (Garrison, Anderson, & Archer, 2001).

Cognitive presence is operationalized in the CoI framework through a group-based practical inquiry process focusing on four phases of critical inquiry, including (a) the triggering event, (b) exploration, (c) integration, and (d) resolution (Garrison et al., 2001). The CoI framework assumes a progression through the phases of the inquiry process that requires direction through teaching presence design, facilitation, and direct instruction, and is influenced by the social presence within the group (Garrison, 2007). The relative frequency of each of the four cognitive presence categories were compared by Garrison et al. (2001) and Kanuka, Rourke, and Laflamme (2007) and results indicated 8% to 11% of message level segments (as a percentage of total segments) were coded as trigger messages, 42% - 53% as exploration messages, 13% - 26% as integration messages, and only 4% - 10% as resolution messages. These finding of low levels of discourse and knowledge construction support earlier research that suggested asynchronous computer-mediated communication among students rarely moves beyond sharing and comparing of information (Gunawardena, Lowe, & Anderson, 1997), but are in contrast to recent survey-based research in which the majority of responding students reported achieving the highest levels of cognitive presence (Shea & Bidjerano, 2009a).

Perspectives on Learning and Instruction

The CoI builds on social-constructivist approaches to learning and stands in contrast to both behavioral and cognitive perspectives. While constructivist viewpoints vary, most share a common perspective that learning is an active process of constructing versus acquiring knowledge (Duffy & Cunningham, 1996). Critics of behavioral and cognitive perspectives on instruction argue that instruction is too often focused on the information or content presented (or

made available to learners) and the learner's processing of that information without sufficient attention to knowledge creation activity and the context (Wilson, 1997). In contrast, instruction based on constructivists beliefs that knowledge is individually constructed and based on experiences and perceptions of the environment focuses on support of multiple perspectives, learning within relevant contexts, and critical discourse among participants (Duffy & Cunningham, 1996; Garrison, Anderson, & Archer, 2000). However, some argue that while constructivism offers a philosophical framework, it has yet to evolve into a refined theory that describes effective instruction or design strategies (Tobias & Duffy, 2009).

CoI Research

Content analysis. With the growth of computer-mediated distance learning environments has come research to study the quantitative aspects of participation and the qualitative nature of the interaction and discourse through a range of content analysis techniques based on the asynchronous discussion transcripts (DeWever et al., 2006). In early research based on the CoI framework, Rourke et al. (1999) presented a content analysis categorization for examining both the quantitative and qualitative aspects of social presence within a CoI from asynchronous discussion transcripts based on defined categories and indicators of social presence. Similarly, (Garrison et al. (2001) offered a transcript analysis method to assess cognitive presence in an asynchronous computer-mediated environment using a set of descriptors and indicators for each of the four phases of the practical inquiry model embedded in the CoI framework, and Anderson et al. (2001) developed a similar methodology to assess the existence of the three teaching presence categories through content analysis of asynchronous computer conferencing transcripts.

Student perception surveys. These initial CoI studies using text-based transcript analysis as a means of exploring and describing student interactions and discourse have been

described as *interpretivist* in nature (Garrison & Arbaugh, 2007). In an effort to move beyond descriptive qualitative studies of computer-mediated discourse, a team of researchers recently developed and tested a 34 item, five-point Likert-type scale survey instrument to quantitatively measure students' perceptions of social presence, teaching presence, and cognitive presence within a computer-mediated learning environment (Arbaugh et al., 2008, 2007). Building from research that also attempted to capture students' perceptions of the CoI presences using a variety of survey instruments (Arbaugh & Hwang, 2006; Garrison, Cleveland-Innes, & Fung, 2004; Gunawardena, 1995; Gunawardena & Zittle, 1997; Shea et al., 2005; Swan & Shih, 2005; Tu, 2002), a primary objective of creating a new survey instrument was to examine the relationships among perceived social presence, teaching presence, and cognitive presence, as well as their relationships to perceived learning outcomes (Garrison & Arbaugh, 2007). Following a multi-institution study utilizing the survey, Arbaugh et al. (2008) suggested that the CoI survey offers a valid measure of perceived social presence, teaching presence, and cognitive presence to augment the qualitative transcript analysis. Within a subsequent survey of over 5,000 college students, Shea and Bidjerano (2009b) modified the CoI survey items related to teaching presence in an effort to better assess the instructor's influence. From the responses to the modified 37-item survey instrument, the researchers conducted a factor analysis that suggested that teaching presence, social presence, and cognitive presence accounted for 69.19 % of the variance in the correlation matrix, or 58.17%, 7.91%, and 3.11% respectively.

CoI critique. While some recent reviews of CoI research suggested the framework offers an important conceptual perspective and useful approach to studying online communication and interaction (Garrison, 2007; Garrison & Arbaugh, 2007), others argued that existing CoI research offers little support for deep and meaningful learning in a course using a CoI frame work

(Rourke & Kanuka, 2009). Rourke and Kanuka (2009) reviewed 252 journal articles from 2000 to 2008 referencing the CoI and found only 48 that analyzed course data related to CoI framework. Only five reported an assessment of student learning and the measure was limited to student-perceived learning as the measure assessed, typically as a single item on a student perception survey. Rourke and Kanuka concluded that most CoI research focused on learning processes versus specific learning outcomes and was sidetracked with investigations of student satisfaction, research measurement, and students' perceptions of their learning, social presence, teaching presence, and cognitive presence while failing to investigate the framework's central claim that a CoI, comprised of the three presences (as independent variables), influences deep and meaningful learning outcomes (as the dependent variable).

In a response to the Rourke and Kanuka (2009) critique of CoI research, Akyol et al. (2009) asserted that the CoI was forwarded as a learning process model based on a constructivist orientation emphasizing knowledge construction, which Akyol et al. contrast to an objectivist focus on learning outcomes as the end products of inquiry. Akyol et al. argue that it was unreasonable to criticize the underlying value of the CoI as educational inquiry process framework (emphasizing the process of knowledge construction, critical inquiry, and discourse) based on an absence of existing studies examining the influence of the CoI on objective measures of learning outcomes. Others argue that the difference in reported cognitive presence in research suggested a need to extend research on learning process outcomes to more course activities than just course asynchronous discussions (Archer, 2010; Shea et al., 2011).

While CoI research has suggested that perceptions of social presence, teaching presence, and cognitive presence are related to students' perceptions of learning (Arbaugh, 2008) and studies based on student perceptions suggested that most students reported achieving the *highest*

levels of cognitive presence (Shea & Bidjerano, 2009b), these findings are in sharp contrast to content analysis of discussion transcripts (Garrison et al., 2001; Kanuka et al., 2007) . The difference in findings may suggest the potential limitations of relying on students' self-reports (Falchikov & Boud, 1989; Gonyea, 2005; Pike, 1996, 1999; Pohlmann & Beggs, 1974). While a meta-analysis of research examining the validity of self-evaluation of ability suggested a small positive correlation (r^2= .08) between self-perception and objective measures of performance (Mabe & West, 1982), others have argued that self-reports should be used as a general indicator of achievement, but not as a substitute for objective measures of academic gain (Pike, 1996). In addition, the use of student-perceived learning in research assumes a subjective measure of cognitive learning is as valid as an objective measure (Baker, 2010). Some have used self-reports of learning to overcome potential limitations from inconsistencies across courses and instructors and the restricted grade range in graduate-level courses (Arbaugh, 2008). However, others have argued student's self-reported growth and objective pre-post objective assessment of growth are relatively independent and that self-report measures of academic growth appeared to be influenced by the growth in orientation and attitudes toward the course subject matter (Pohlmann & Beggs, 1974). In addition, Pike (1999) urged caution when using students' self-reports of gains to differentiate among outcomes due to research evidence suggesting the influence of *halo error*, or the tendency of survey respondents to give consistent evaluations across a set of items based on general perceptions of the subject (Gonyea, 2005).

Beyond CoI Research

While a central goal of the CoI framework is the creation and sustainability of a community of inquiry that goes beyond student-content interaction to incorporate collaborative educational experiences among students and the teacher within the distance learning

environment (Garrison et al., 2000), beyond specific CoI research, findings are mixed with regard to the effects of whole class, small group, and individual instruction on learning outcomes. Meta-analyses of small group, whole class, and individual learning strategies suggested that under certain conditions, instructional strategies involving small groups (two to four students) resulted in a small, but significantly positive effect on individual achievement over either whole class (Lou, Abrami, & Spence, 2000) or individual learning approaches (Lou, Abrami, & d' Apollonia, 2001). However, the effects of small group instruction were significantly larger for students of all ability levels when (a) teachers were trained in small group instruction (b) grouping was based on ability and group cohesiveness, and (c) cooperative learning (which promotes both interdependence and individual accountability within carefully designed activities) was used as the method of instruction (Lou et al., 2000). In addition, even when superior group products or task outcomes were produced, no significant positive effects on individual achievement resulted when the group work (a) used no cooperative learning strategies, (b) groups were large, or (c) group work used unstructured exploratory environments (Lou et al., 2001). Overall, these finding suggested that when working in groups, not all students learn equally well and group task performance was not positively related to individual learning achievement in large groups with no designed cooperative strategies (Lou et al., 2001).

Three interaction types are frequently considered within distance education, including (a) student-content, (b) student-teacher, and (c) student-student interactions (Moore, 1989). An underlying assumption in the CoI is that all three interaction types are necessary in order to support deep and meaningful learning. While a recent meta-analysis offered support for the individual influence of all three interaction types on student learning, a difference in effectiveness was suggested favoring student-content and student-student interactions over

student-teacher interaction, as well as for student-content interaction in combination with *either* student-teacher or student-student interaction suggesting that high quality student-content strategies which help students engage in the content *and* with the teachers or other students makes a significant difference in student achievement. However, the researchers note that the results are heterogeneous based on a range of instructional strategies and student interactions and that future distance education research is needed to evaluate *which* designs to support interaction improve learning outcomes.

Purpose of Research

From the literature review, gaps exist in our understanding of the relationships among the CoI presences and student learning outcomes. Studies of group work and interaction do not support a claim that any opportunity for student-student, student-content, and student-teacher interaction will lead to deep and meaningful learning. In addition, while online student-student interactions combined with rich student-content and student-teacher interaction may lead to increased student *perceptions* of learning, social presence, teaching presence, and cognitive presence, these perceptions may not be related to *actual* student achievement outcomes. The purpose of this research was to examine the relationships between students' perceptions of a CoI, including student-perceived social presence, teaching presence, and cognitive presence, and actual course learning achievement outcomes as assessed by the instructor. Three research questions guided this study: (a) To what extent are student perceptions of CoI related to objective measures of student achievement?; (b) To what extent are student perceptions of learning achievement related to objective measures of student achievement?; (c) To what extent are student perceptions of learning achievement and course satisfaction related to student perceptions of CoI?

Method

Participants

Participants included graduate students enrolled in five courses within a college of education at a public university. All five courses were conducted during the same 15-week Fall 2010 semester starting August 28, 2010 and ending December 10, 2010. Courses were selected to attain a similar student demographic (graduate students) in classes with similar subject matter (college of education courses) using the same type of delivery format. Fifty-one students (68% of those enrolled as of the semester's end) consented to participate with the distribution per course shown in Table 1. As all courses were graduate-level, 96% of the students were 26 years of age or older as of the semester's start with 67% being between 26 and 45 years of age. Fifty-seven percent of the participants were male.

Table 1

Participant Distribution per Course

Course	Enrolled (*n*)	Consenting (*n*)	Consenting (%)[a]	Participation (%)[b]
1	15	11	73.3	21.6
2	15	12	80.0	23.5
3	19	10	52.5	19.6
4	16	12	75.0	23.5
5	10	6	60.0	11.8
Total	75	51	68.0	100.0

[a]Percentage of enrolled in the class. [b]Percentage of total in study.

All courses used a hybrid delivery format with a combination of face-to-face and computer-mediated communication (CMC) to facilitate both synchronous and asynchronous course lecture and discussion. Participants were geographically dispersed and attended the live sessions either (a) on the main campus (27%), (b) at remote learning centers managed by the university, but away from the main campus (24%), or (c) at other distant locations, such as the

student's home or work via personal computer (49%). The participants' prior distance learning experience course ranged from none to over 30 prior courses *(M* = 10, *SD* = 9). At the start of the semester, 98% of students assessed their level of computer expertise to be average or better and by the end of the semester, 94% of students assessed their level of proficiency with the live conferencing interface to be average or better suggesting a comfort level with the learning environment technology. All courses used the Blackboard learning management system (LMS) to facilitate asynchronous course communication. All instructors used the LMS to post the course syllabus, assignments, and asynchronous discussion boards. Table 2 shows the mean LMS access for both participating students and instructors for each course in the study based the number of screens accessed in the LMS during the 15 weeks of the semester.

Table 2

Synchronous and Asynchronous Activity

	Live Sessions			LMS Access	
Course	*n*	Total Minutes	Audio-Video Type	Student (*M)*	Teacher (*M*)
1	7	927	Two-way	597	1,241
2	10	1,368	Two-way	594	931
3	13	1,693	One-way	617	1,882
4	11	1,172	Two-way	875	919
5	5	730	One-way	576	685
Total	10	1,215		663	1,152

All courses incorporated live lecture and discussion facilitated by the instructor located in a classroom in a broadcasting center on the main campus. As shown in Table 2, during the 15 week semester, the number of live sessions and total minutes of synchronous class time differed among the five classes. Two different types of synchronous CMC technologies facilitated a connection to the live sessions for participants located either in remote learning centers or at

other distance locations, including either (a) a one-way audio and video streaming technology to broadcast the live session from the main campus, or (b) a two-way audio and video conferencing technology in which all participants could speak and be seen by other participants.

Design

This non-experimental study used correlation methods to examine the relationships contemplated within the research questions in a real-world instructional setting. The primary sources of data collected in this study included: (a) the five course instructors' assessments of the consenting students' learning achievement; (b) a survey of student perceptions (performed twice during the semester); and (c) course data collected through the LMS and observation of the live session recordings. The following describes the materials and data collection procedures.

Instruments

Instructor-assessed learning achievement data. Data examining individual learning achievement were collected based on the course instructor's assessment of both a significant project or paper in the course and the final course assessment. A paper or project was selected in each course based on the instructor's feedback and an evaluation of the significance in terms of both course objectives and the student's final grade. The selected papers or projects represented between 13% and 33% of the total possible points in the course. For the final course assessment, the cumulative points assigned to each consenting student by the instructor for all work in the course were collected and converted to a percentage based on the total possible points for the course. Similarly, for the significant project or paper, the total points assigned by the instructor for the significant work were collected and converted to a percentage based on the total possible points. As an additional measure of achievement for the significant work, the course instructor provided an overall learning assessment (on a 1 to 5 point scale) for the significant work for each

participant based on levels of learning achievement prescribed by the Structure of the Observed Learning Outcomes (SOLO) taxonomy (Biggs & Collis, 1982; Biggs & Tang, 2007).

The SOLO taxonomy is a *hierarchy of learning* evaluation based on both the learning quantity (amount learned) and quality (deep versus surface processing) and has been shown to effectively measure different kinds of cognitive learning outcomes within a range of subject areas in higher education settings and across various academic tasks (Biggs, 1979; Chan, Tsui, Chan, & Hong, 2002; Kanuka, 2005). The five levels include the following (Biggs & Collis, 1982): (a) *prestructural*, where the student does not address the problem; (b) *unistructural* where the student jumps to conclusion focusing on only one aspect of the task or problem with little consistency; (c) *multistructural*, where the student can generalize only a few limited and independent aspects closing too soon based on isolated data or reaching different conclusions with same data; (d) *relational*, where the student can generalize within the given context and relate aspects from relevant data; or (e) *extended abstract*, where the student can generalize to situations not experienced and allows logically possible alternatives.

Student perception survey. An online survey instrument (see Appendix) collected students' perceptions of both CoI, as well as basic demographic data and the students' perceptions of other course features. Using 37-items from a CoI survey provided by Shea and Bidjerano (2009b), which was based a 34-item CoI survey developed and validated by Arbaugh et al. (2008), the CoI portion of the survey measured perceived cognitive presence, social presence, and teaching presence using a 5-point Likert-type scale (see the 37 questions in Section II: Community of Inquiry). A composite CoI score was calculated for each student based on the mean responses to all 37 items comprising the CoI section of the survey. Subscales for each presence were also calculated based on the mean responses to the applicable question groupings

for social presence (mean of questions 1 – 15), teaching presence (mean of questions 16 – 25), and cognitive presence (mean of questions 26 – 37). The student perception survey also captured additional student demographic and student perception data, including the student's perceived learning and satisfaction with the course.

Other course data. The syllabus, all video recordings of the live sessions, and online learning management system (LMS) data were collected for each course. Collected course data included the total minutes of live class sessions held in the course during the semester, as well as the student and instructor LMS access, which was based on the number of screens in the LMS accessed during the semester.

Procedure

The study was conducted with students registered in regularly scheduled courses at the university. Following approval of the study by the university's Institutional Review Board, five course instructors were contacted approximately five weeks prior to the start of the semester. The survey of student perceptions was administered twice during the semester. Using the registered students' contact information from the LMS, an email containing the link to the online survey was sent to each registered student in the five courses during the fifth week of classes that also included the informed consent form. Students who provided their voluntary consent and completed the first survey were later sent the link to the second (identical) survey approximately two weeks before the end of the semester to capture changes in perceptions during the course.

Each student was required to provide his or her name on the survey in order to match the instructor's learning assessment to the student's responses to the first and second surveys. Students were not offered compensation, but were informed that those who completed both surveys would be entered into a random drawing for four $25 Amazon.com gift certificates.

While three consenting students dropped the course during the semester and were removed from the study, 100% of those who completed the first survey also completed the second (n = 51). For each course, the syllabus was collected at the start of the semester and all video recordings of the live sessions were saved and reviewed as the course progressed. The online learning management system data, including the student and instructor access data and discussion board posts, were collected at the end of the semester. The five course instructors' assessments of the consenting students' learning achievement were also collected at the end of the semester after the students' grades had been submitted to the university.

Analyses

Five students received extensions beyond December 2010 to complete required coursework, including three students who did not complete the significant project or paper. Thus, the data analysis included the survey responses from the 51 consenting students, but calculations including actual learning achievement data excluded participants with incomplete coursework (i.e. pairwise exclusion was used, where applicable). A descriptive analysis of the study's variables was conducted, including a frequency distribution by course of the (a) mean CoI composite and subscale data, (b) mean instructor-assessed learning achievement data, and (c) mean student-perceived learning and satisfaction data. One-way within-subjects analysis of variance (ANOVA) was computed to compare the student perception data between the two surveys, while one-way between-subjects ANOVA with post hoc was conducted to compare the mean CoI composite and subscale data, instructor-assessed learning achievement data, student-perceived learning, and satisfaction data between the courses. The research questions were investigated using Pearson correlation and stepwise multiple regression methods using the variables and statistical procedures described in Table 3.

Table 3

Research Questions, Variables, Instruments, and Statistical Procedures

Research Question	Variable	Statistical Procedure
To what extent are student perceptions of CoI related to object measures of student achievement?	CoI composite Teaching presence subscale Social presence subscale Cognitive presence subscale SOLO score Project score Course Score	Pearson product-moment correlation Stepwise multiple regression
To what extent are student perceptions of learning achievement related to objective measures of student achievement?	Student-perceived learning SOLO score Project score Course Score	Pearson product-moment correlation Stepwise multiple regression
To what extent are student perceptions of learning achievement and course satisfaction related to student perceptions of CoI?	Satisfaction Student-perceived learning CoI composite Teaching presence subscale Social presence subscale Cognitive presence subscale	Pearson product-moment correlation Stepwise multiple regression

Results

Descriptive Statistics

Community of inquiry measures. Table 4 shows the CoI composite and subscale measures between courses in the study. Cronbach's alpha reliability coefficients of 0.94 and 0.95 were found for the CoI composite measure in the survey administered to the 51 respondents in this study in the middle and at the end of the semester, respectively. Cronbach's alpha reliability coefficients of .95 to .97 for the CoI subscales have been reported in other research using this survey (Shea & Bidjerano, 2009b). A one-way between-subjects ANOVA (based on data from the second survey) compared the mean teaching presence, social presence, and cognitive

presence subscales and the CoI composite score between the courses suggested no significant difference (p >.05) between courses for any of the measures.

Table 4

Mean Community of Inquiry Composite and Subscale Measures by Course

		Teaching Presence		Social Presence		Cognitive Presence		CoI	
Course	n [a, b]	M [a]	M [b]	M [a]	M [b]	M [a]	M [b]	M [a]	M [b]
1	11	4.21	4.15	3.76	3.91	3.94	3.98	4.00	4.03
2	12	4.30	4.41	4.06	4.01	4.29	4.43	4.23	4.31
3	10	4.13	4.43	3.87	3.91	3.98	4.13	4.01	4.19
4	12	4.23	4.29	3.67	3.78	4.16	4.17	4.05	4.11
5	6	3.91	4.27	3.78	3.78	3.68	4.29	3.80	4.14
Total	51	4.18	4.31	3.83	3.89	4.05	4.20	4.05	4.16
Skewness		-.41	-.74	.12	-.24	.02	-.45	-.11	-.64
Kurtosis		.02	.13	.53	-.63	.05	-.30	.10	.05
Cronbach's α		.84	.84	.93	.94	.97	.90	.94	.95

[a]Data collected middle of semester. [b]Data collected end of semester.

Table 5 compares the means for each of the 37 CoI questions in both the first and second surveys. A one-way within-subjects ANOVA computed to compare the mean social presence, teaching presence, and cognitive presence subscales between the first and second surveys was statistically significant only for the change in the cognitive presence subscale $F(1, 50) = 5.97$, $p = .018$, partial $\eta^2 = .11$, indicating a statistically significant increase in students perception of cognitive presence during the semester. In addition, a one-way within-subjects ANOVA computed to compare the mean cognitive presence, teaching presence, and social presence subscales within the second survey suggested a statistically significant difference, $F(1, 50) = 20.70$, $p < .001$, partial $\eta^2 = .29$. Bonferroni pairwise comparison tests ($p < .001$) indicated that the social presence subscale was significantly smaller than both the cognitive presence and teaching subscales suggesting lower perceptions of social presence than perceptions of teaching and cognitive presences within the group of study participants.

Table 5

Mean Community of Inquiry Measures by Question

	Survey 1			Survey 2		
CoI Survey Questions	*M*	Skewness	Kurtosis	*M*	Skewness	Kurtosis
1	4.43			4.61		
2	4.47			4.55		
3	4.25			4.25		
4	4.25			4.14		
TP Design & Organization	*4.35*			*4.39*		
5	4.06			4.39		
6	4.31			4.49		
7	4.22			4.37		
8	4.06			4.14		
9	4.45			4.59		
10	3.96			4.14		
TP Facilitation	*4.18*			*4.35*		
11	4.06			4.27		
12	4.20			4.31		
13	4.20			4.39		
14	4.12			3.98		
15	3.73			4.04		
TP Direct Instruction	*4.06*			*4.20*		
Teaching Presence Subscale	4.18	-.406	.017	4.31	-.737	.127
16	3.75			3.76		
17	3.78			3.71		
18	3.37			3.55		
19	3.53			3.73		
SP Affective Expression	*3.61*			*3.69*		
20	4.04			4.12		
21	4.14			4.20		
22	4.16			4.24		
SP Open Communication	*4.11*			*4.18*		
23	3.90			4.02		
24	3.98			4.08		
25	3.67			3.49		
SP Group Cohesion	*3.85*			*3.86*		
Social Presence Subscale	3.83	.119	.528	3.89	-.244	.631
26	4.00			4.12		
27	3.94			4.12		
28	4.02			4.22		
CP Triggering	*3.99*			*4.15*		
29	4.14			4.39		
30	3.88			4.16		
31	3.73			3.73		
CP Exploration	*3.92*			*4.09*		
32	4.10			4.24		
33	4.12			4.27		
34	4.24			4.18		
CP *Integration*	*4.15*			*4.23*		
35	4.00			4.25		
36	4.14			4.29		
37	4.31			4.41		
CP Resolution	*4.15*			*4.32*		
Cognitive Presence Subscale	4.05	.016	053	4.20	-.450	.304
CoI Composite Score	4.05	-.109	.100	4.16	-.635	.054

Learning outcome and satisfaction measures. Table 6 summarizes the mean student-perceived learning score from the both surveys, the significant project SOLO score (SOLO), the scaled significant project or paper (Project) score, and the scaled total earned points in the course (Course) score for each course in the study, as well as in total for all participants. A one-way between-subjects ANOVA with post hoc was computed to compare the three mean instructor-assessed achievement measures and the student-perceived learning scores between the courses and a significant mean difference between courses was suggested for only the SOLO score, $F(4, 43) = 2.85$, $p < .05$, partial $\eta^2 = .21$, and the project score, $F(4, 43) = 8.83$, $p < .01$, partial $\eta^2 = .45$. As equal variances cannot be assumed for both SOLO and project scores, a Games-Howell post hoc test indicated that the Course 1 mean SOLO score was significantly lower than the Course 3 and 5 mean SOLO scores, and the Course 1 mean project score was significantly lower than the mean project scores for each of the other courses.

Table 6

Mean Instructor-assessed and Student-perceived Learning Measures by Course

	Instructor-assessed Learning Achievement						Student Perception				
	SOLO		Project		Course		Perceived Learning		Satisfaction		
Course	*M* [b]	*n* [b]	*M* [b]	*n* [b]	*M* [b]	*n* [b]	*M* [a]	*M* [b]	*M* [a]	*M* [b]	*n* [a, b]
1	3.45	11	3.78	11	4.73	11	4.00	4.18	3.91	4.18	11
2	4.08	12	4.54	12	4.62	12	4.25	4.83	4.17	4.67	12
3	4.75	10	4.72	8	4.71	8	3.80	4.10	3.70	4.10	10
4	3.67	12	4.67	12	4.64	10	4.58	4.25	4.50	4.17	12
5	4.80	6	4.82	5	4.78	5	4.00	4.68	3.50	4.50	6
Total	4.02	51	4.46	48	4.68	46	4.16	4.39	4.02	4.31	51
Skewness	-.90		-1.24		-1.15		-.01	-1.42	-.94	-.48	
Kurtosis	-.20		.65		.963		-.06	2.84	2.69	-.74	

[a]Data collected middle of semester. [b]Data collected end of semester.

In addition, a one-way within-subjects ANOVA compared the mean student-perceived learning scores between the first and second surveys and indicated a significant difference, $F(1, 50) = 5.61$, $p = .022$, partial $\eta^2 = .10$, suggesting an increase in student-perceived learning as the

semester progressed. A one-way within-subjects ANOVA indicated a statistically significant increase in satisfaction scores between the first and second surveys, $F(1, 50) = 7.72$, $p = .008$, partial $\eta^2 = .13$. A one-way between-subjects ANOVA comparing the mean satisfaction scores from the second survey between the courses indicated no significant difference ($p > .05$).

Research Question One

Pearson bivariate correlation coefficients were calculated to assess the extent student perceptions of CoI were related to the instructor-assessed measures of learning achievement, including the SOLO score, the project score, and the course score. As shown in Table 7, no significant correlations ($p > .05$) were indicated between the CoI composite measure and any of the three instructor-assessed measures of learning achievement.

Table 7

Community of Inquiry Measures and Instructor-assessed Learning Achievement Correlations

Measure	1	2	3	4	5	6
1. Teaching presence	-					
2. Social presence	.52***	-				
3. Cognitive presence	.74***	.55***	-			
4. CoI	.92***	.76***	.88***	-		
5. SOLO	.10	-.09	.09	.05	-	
6. Project	.26	-.00	.29*	.23	.76**	-
7. Course	.20	.05	.16	.17	.57**	.43**

* $p < .05$ level, two-tailed. ** $p < .01$ level, two-tailed. *** $p < .001$ level, two-tailed.

However, the social, teaching, and cognitive presence subscales were each significantly positively correlated with the other presences, teaching presence and cognitive presence ($r^2 = .55$), cognitive presence and social presence ($r^2 = .30$), and teaching presence and social presence ($r^2 = .27$), suggesting variance in one presence was accounted for by the other presences. While this correlation among the presences complicates an examination of this research question based upon the CoI subscales, only a significant correlation was found between the cognitive presence subscale and the project score ($r^2 = .08$), suggesting that approximately

8% of the variance in the student's project score was explained by the cognitive presence in the course. Otherwise, no significant correlation ($p > .05$) was suggested between the cognitive presence subscale and either the SOLO score or course score or between either the social presence or teaching presence subscales and any of the three instructor-assessed learning achievement measures.

Stepwise multiple regression analyses were conducted to consider the extent to which either (a) the CoI composite score or (b) each of the CoI subscales predicted actual learning achievement in the class. As expected from the outcome of the correlation analysis, results of the regression analyses indicated that neither the CoI composite score, the social presence subscale, nor the teaching presence subscale (alone or combined with the other subscales in a stepwise multiple regression analysis) were predictors of any of the three instructor-assessed learning achievement measures ($p > .05$). Cognitive presence was not found to be a predictor of the SOLO score or the course score, but cognitive presence was a predictor of the project score, $b = .33$, $\beta = .29$, $t(46) = 2.03$, $p = .048$, and explained approximately 6% of the variance in the project score, $F(1, 46) = 4.14$, $p = .048$, $R^2_{adj} = .06$.

To further examine the cognitive presence and project score relationship, a stepwise multiple regression analysis was conducted using the CoI survey question groupings for the practical inquiry framework that comprised the cognitive presence subscale, including (a) *triggering event* (mean of questions 26 – 28) (b) *exploration* (mean of questions 29 – 31), (c) *integration* (mean of questions 32 – 34), and (d) *resolution* (mean of questions 35 – 37). The triggering event, exploration, and integration groupings were not found to be predictors of the project score ($p > .05$). Only the resolution grouping was a significant predictor of the project

score, $b = .36$, $\beta = .32$, $t(46) = 2.31$, $p = .025$, and explained approximately 8% of the variance in the project score, $F(1, 46) = 5.34$, $p = .025$, $R^2_{adj} = .08$.

Research Question Two

Pearson bivariate correlation coefficients were computed to assess the extent to which student-perceived learning from the second survey was related to objective measures of student achievement, including the instructor-assessed SOLO, Project, and course scores, as shown in Table 8. While each of the three instructor-assessed learning achievement measures are significantly positively correlated, no significant correlation ($p > .05$) was found between any of the instructor-assessed learning achievement measures and student-perceived learning.

Table 8

Correlations between Achievement Measures and Student-perceived Learning

Measure	1	2	3
1. SOLO	-		
2. Project	.76*	-	
3. Course	.57*	.43*	-
4. Student-perceived learning	-.04	-.07	-.04

* $p < .01$ level, two-tailed.

Research Question Three

Pearson bivariate correlation coefficients were computed to assess the extent to which the satisfaction and student-perceived learning scores from the second survey were related to the CoI composite scores and CoI presence subscales, as shown in Table 9. Notably, student-perceived learning and satisfaction were significantly positively correlated ($r^2 = .58$, $p < .001$), suggesting that nearly 60% of the variance in one was accounted from the other. Satisfaction was significantly positively correlated with the CoI composite measure ($r^2 = .35$, $p < .001$) indicating that approximately 35% of the variance in satisfaction was accounted from the CoI composite measure. In addition, satisfaction was also significantly positively correlated with teaching

presence (r^2 = .33, p < .001), social presence (r^2 = .14, p < .001), and cognitive presence (r^2 = .29, p < .001). Perceived learning was also significantly positively correlated with the CoI composite measure (r^2 = .40, p < .001) indicating that approximately 40% of the variance in student-perceived learning was accounted from the CoI composite measure. In addition, student-perceived learning was also significantly positively correlated with teaching presence (r^2 = .33, p < .001), social presence (r^2 = .09, p < .05), and cognitive presence (r^2 = .50, p < .001).

Stepwise multiple regression was conducted to consider the extent to which the teaching presence, social presence, and cognitive presence subscales predicted satisfaction. The regression analysis indicated that only teaching presence was a significant predictor of satisfaction, b = .65, β = .57, $t(49) = 4.90$, p < .001, and explained over 30% of the variance in the satisfaction score, $F(1, 49) = 23.98$, p < .001, with an R^2_{adj} = .32. Stepwise multiple regression was also conducted to consider the extent to which the teaching presence, social presence, and cognitive presence subscales predicted student-perceived learning. The regression analysis indicated that only cognitive presence was a significant predictor of student-perceived learning, b = 1.04, β = .71, $t(49) = 7.01$, p < .001, and explained nearly 50% of the variance in student-perceived learning, $F(1, 49) = 49.18$, p < .001, with an R^2_{adj} = .49.

Table 9

Correlations of Community of Inquiry Measures and Satisfaction

Measure	1	2	3	4	5
1. Teaching presence	-				
2. Social presence	.52**	-			
3. Cognitive presence	.74**	.55**	-		
4. CoI	.92**	.76**	.88**	-	
5. Satisfaction	.57**	.38**	.54**	.59**	-
6. Perceived learning	.58**	.30*	.71**	.63**	.76**

* p < .05 level, two-tailed. ** p < .001 level, two-tailed.

Stepwise multiple regression was conducted to consider the extent to which the teaching presence, social presence, and cognitive presence subscales predicted satisfaction. The regression analysis indicated that only teaching presence was a significant predictor of satisfaction, $b = .65$, $\beta = .57$, $t(49) = 4.90$, $p < .001$, and explained over 30% of the variance in the satisfaction score, $F(1, 49) = 23.98$, $p < .001$, with an $R^2_{adj} = .32$. Stepwise multiple regression was also conducted to consider the extent to which the teaching presence, social presence, and cognitive presence subscales predicted student-perceived learning. The regression analysis indicated that only cognitive presence was a significant predictor of student-perceived learning, $b = 1.04$, $\beta = .71$, $t(49) = 7.01$, $p < .001$, and explained nearly 50% of the variance in student-perceived learning, $F(1, 49) = 49.18$, $p < .001$, with an $R^2_{adj} = .49$.

Discussion

Responding to the call for additional research to examine learning in a CoI (Rourke & Kanuka, 2009), the purpose of this research was to examine the relationships between students' perceptions of a CoI and actual course learning achievement outcomes as assessed by the instructor. Expanding beyond recent research that suggested a relationship between elements of a CoI and grades as a measure of learning achievement (Abdous & Yen, 2010; Akyol & Garrison, 2010; Shea et al., 2011), results of this study suggested no relationship between the CoI composite score and any of the three instructor-assessed learning achievement measures. While a significant positive correlation was indicated between the project score and the cognitive presence subscale (specifically, the highest cognitive presence resolution grouping), no relationship was indicated between either the SOLO score or course score and any of the cognitive, teaching, or social presence subscales, nor was a relationship suggested between the project score and either the social presence or the teaching presence subscales. However, a strong

correlation was indicated among the social, teaching, and cognitive presence subscales, which suggested the subscales are not independent. While studies examining the survey used in this research suggested it is a valid measure of student perceptions of social, teaching, and cognitive presence (Arbaugh et al., 2008; Garrison, Cleveland-Innes, et al., 2010; Swan et al., 2008), others have argued further validation of the CoI survey is needed (Diaz, Swan, Ice, & Kupczynski, 2010; Shea & Bidjerano, 2009a).

As indicated in the analysis of the second research question, no significant correlation was found between any of the instructor-assessed learning achievement measures and student-perceived learning. The lack of significant correlation between student-perceived learning and the instructor-assessed measures of achievement are important to not only this study, but also to the interpretation of previous CoI studies that used student-perceived learning as the only measure of learning outcome. The findings from this study are consistent with prior research that suggested student self-reports of learning are not a substitute for objective measures of achievement (Gonyea, 2005; Pike, 1996), and challenge studies that have relied on student self-reports of learning as a measure of learning outcome (Akyol, Vaughan, & Garrison, 2011; Arbaugh, 2008; Richardson & Swan, 2003; Rovai, 2002; Shea et al., 2006; Shin, 2003).

From the analysis of the third research question, student-perceived learning and satisfaction were significantly positively correlated, with satisfaction accounting for approximately 60% of the variance in student-perceived learning. In addition, the CoI composite measure accounted for nearly 40% of the variance in student-perceived learning. While the cognitive, teaching, and social presence subscales were each significantly positively correlated with student-perceived learning, when controlled for the other presences in the regression analysis, only cognitive presence was a significant predictor of student-perceived learning. This

finding suggested that a student's perceptions of cognitive presence in a course was related to his or her perceived learning, supporting other research that found a correlation between cognitive presence and student-perceived learning (Akyol & Garrison, 2010; Arbaugh, 2008). Further, each of the cognitive, teaching, and social presence subscales were found to be significantly correlated with student satisfaction, and the CoI composite measure accounted for approximately 35% of the variance in satisfaction. However, when controlled for the other presences in the regression analysis, only teaching presence was a significant predictor of satisfaction, explaining over 30% of the variance in satisfaction. This finding suggested a student's interaction with the course instructor and the designed content interaction are more predictive of student satisfaction than the student's interaction with peers, and supports research that found teaching presence to be a predictor of student attitude toward the educational experience (Shea et al., 2006).

Taken together, the findings suggested that student perceptions of CoI and learning were not related to objective measures of achievement, but rather were reflective of the student's attitudes toward the educational experience. These results are in line with findings in other studies that suggested self-reports of academic achievement were related to the student's attitude toward the course (Pohlmann & Beggs, 1974), and provide support to the argument that student interactions with the instructor and other students are more likely to affect measures of attitude and course satisfaction than measures of achievement (Bernard et al., 2009). Results of this study suggested student self-reports of learning and the CoI survey-based measures are best used as approximations of student attitude toward the course, but not as proxies for objective measures of student learning achievement. Without a link between the CoI composite score and objective measures of learning outcome, this study furthers the argument made by Rourke and Kanuka (2009) that there is a troubling lack of empirical evidence that the CoI is an effective conceptual

framework for achieving meaningful learning outcomes. Yet, many argue that the CoI is increasingly influential in explaining the effective conduct of online learning (Akyol et al., 2009; Garrison, Anderson, et al., 2010). What explains these opposing interpretations?

One explanation centers on the choice of outcome measures used in CoI research. As discussed previously, CoI research has focused on either CoI learning process outcomes as operationalized in the cognitive presence construct, student-perceived learning outcomes, or affective outcomes, including satisfaction and persistence. In the present study, the CoI composite score was positively correlated with both student-perceived learning and satisfaction. In addition, student-perceived learning was significantly positively correlated with satisfaction. However, the CoI composite score, student-perceived learning, and satisfaction were not related to objective measures of learning. These findings suggested student self-reports of learning and the CoI survey-based measures are best used as approximations of student attitude toward the course, but should not be considered as an approximation of objective measures of student learning achievement.

Another explanation for the opposing interpretations of the influence of the CoI relates to perceptions of the extent to which the CoI framework provides sufficient guidance to instructors. As a social-constructivist framework, the CoI suggests social, teaching, and cognitive presences are essential elements within a distance learning environment, yet the framers now admit "the dynamic relationships among the presences could have been emphasized to a greater extent (Garrison, Anderson, et al., 2010, p. 6). Some have argued the CoI "describes a generic educational experience" (Akyol et al., 2009, p. 124), and acknowledged that research findings of the inability of student groups to reach the integration and resolution phases of the practical inquiry model were likely due to issues with teaching presence, including design, facilitation,

and direction issues. As others have suggested, constructivism offers a philosophical framework, but has yet to evolve into a refined theory that describes effective instruction or design strategies (Tobias & Duffy, 2009). While the CoI framework implies the importance of providing opportunities to support student-content, student-teacher, and student-student interaction within learning environments that foster social, teaching, and cognitive presences, the framework offers little direction regarding the optimal design of these interaction types to support instructional objectives, as forwarded in other inquiry-based approaches (Morrison & Lowther, 2010).

In addition, distance education research has shown that providing opportunities for interaction does not mean interaction occurs or that if interaction does occur that it does so effectively in terms of learning (Abrami, Bernard, Bures, Borokhovski, & Tamim, 2011; Ertmer, Sadaf, & Ertmer, 2011; Gunawardena et al., 1997). Further, are student-content, student-teacher, and student-student interactions equivalently effective in supporting meaningful learning if offered at a high level (Anderson, 2003)? As seen in this study, the social presence subscale was (a) significantly smaller than both the cognitive presence and teaching presence subscales, (b) predicted less than 5% of the variance in student-perceived learning, and (c) was not a predictor of any of the instructor-assessed learning achievement measures or satisfaction. Similarly, in a recent study, social presence was not significantly correlated with two objective learning outcome measures (Shea et al., 2011). While the CoI framework suggests social presence is an essential element to the educational transaction and social presence has received the most attention of the three presences in research (Garrison & Arbaugh, 2007), recent studies described social presence as an *indirect* or *mediating* variable between teaching presence and cognitive presence in which teaching presence predicted variance in social presence and together predicted variance in cognitive presence (Garrison, Cleveland-Innes, et al., 2010; Shea & Bidjerano,

2009a). Do these findings add support to those who argue that research has not offered sufficient evidence of the instructional value of social interaction (Mayer, 2009)? The results of this study and other research findings suggest the need to go beyond distance education research that contemplates and measures the existence and student perceptions of interaction opportunities within the learning environment to research that directly compares of the relative effectiveness of specific and purposeful interaction strategies on learning outcomes (Abrami et al., 2011; Kanuka, 2005; Rourke & Kanuka, 2009).

Conclusions

The strong positive correlation among CoI, student-perceived learning, and satisfaction measures and the lack of correlation between instructor-assessed learning achievement measures and both CoI and student-perceived learning are important to not only this study, but also to the interpretation of previous CoI studies. The findings of this study support the assertion by Rourke and Kanuka (2009) that research to date has yet to offer evidence that a CoI (as the independent variable) leads to meaningful learning outcomes (as the dependent variable). While some argue the CoI framework should be considered as a process model focused on the nature of the educational transaction (Akyol et al., 2009), with no relationship suggested between the framework and objective measures of learning, the value of the CoI framework as an educational process model remains challenged. Results of this study suggested that the CoI survey-based measures and student self-reports of learning are more appropriately used as approximations of student attitude toward the course than as measures of student learning achievement. The findings from this study support the call for new research to examine which interaction conditions and at what level of interaction intensity contribute to student achievement in distance learning (Abrami et al., 2011; Anderson, 2003; Bernard et al., 2009).

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Appendix. Student Perception Survey Instrument[a]

Section 1: General Information

A. Name
First _____
Last _____

B. Gender (Select): ___ Male ___ Female

C. Please select the option which best describes how you participate in the live class sessions for this course:

___ ABC University – On-site - Main Campus
___ ABC University – Remote On-site – Other than Main Campus
___ ABC University – Web Conference or Video-Stream to Personal Computer

D. What was your age at the start of this course?

___ 25 or under
___ 26 - 35
___ 36 – 45
___ 46 – 55
___ 56 or above

E. Estimate your level of overall computer expertise?

___ Expert
___ Above Average
___ Average
___ Below Average
___ Novice

F. How many distance learning courses have you taken prior to this course? Respond to all options by entering a number (0 or higher).
[Open Response] ABC University – On-site - Main Campus
[Open Response] ABC University – Remote On-site – Other than Main Campus
[Open Response] ABC University – Web Conference or Video-Stream to Personal Computer
[Open Response] At an institution other than ABC University

G. How proficient are you in using the conferencing interface used for the live sessions in this class?

___ Expert
___ Above Average
___ Average
___ Below Average
___ Novice

Appendix. Student Perception Survey Instrument[a]

Please read each statement carefully and then indicate the degree to which you agree or disagree with the statement

H. Course Difficulty

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
H.1	Compared to other courses I have taken, this is a difficult course.	5	4	3	2	1
H.2	Compared to other courses I have taken, this course has a large required work load.	5	4	3	2	1
H.3	Compared to other courses I have taken, I work very hard in this class.	5	4	3	2	1

I. Perceptions of this course

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I.1	I am satisfied with this course.	5	4	3	2	1
I.2	I learn a great deal in this course.	5	4	3	2	1

J. Perceptions of Course Interactions

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
J.1	Live class sessions greatly contribute to my learning in this course.	5	4	3	2	1
J.2	One-on-one communication with my instructor greatly contributes to my learning in this course.	5	4	3	2	1
J.3	Readings greatly contribute to my learning in this course.	5	4	3	2	1
J.4	Projects and papers greatly contribute to my learning in this course.	5	4	3	2	1
J.5	Course related discussions with other students greatly contribute to my learning in this course.	5	4	3	2	1

Section II: Community of Inquiry[a]

Teaching Presence

	Teaching Presence: Design & Organization	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The instructor clearly communicates important course topics.	5	4	3	2	1
2	The instructor clearly communicates important course goals.	5	4	3	2	1
3	The instructor provides clear instructions on how to participate in course learning activities.	5	4	3	2	1
4	The instructor clearly communicates important due dates/time frames for learning activities.	5	4	3	2	1

Appendix. Student Perception Survey Instrument[a]

	Teaching Presence: Facilitation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5	The instructor is helpful in identifying areas of agreement and disagreement on course topics that helps me to learn.	5	4	3	2	1
6	The instructor is helpful in guiding the class towards understanding course topics in a way that helps me clarify my thinking.	5	4	3	2	1
7	The instructor helps to keep course participants engaged and participating in productive dialogue.	5	4	3	2	1
8	The instructor helps keep the course participants on task in a way that helps me to learn.	5	4	3	2	1
9	The instructor encourages course participants to explore new concepts in this course.	5	4	3	2	1
10	Instructor actions reinforce the development of a sense of community among course participants.	5	4	3	2	1

	Teaching Presence: Direct Instruction	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11	My instructor provides useful illustrations that help make the course content more understandable to me.	5	4	3	2	1
12	My instructor presents helpful examples that allow me to better understand the content of the course.	5	4	3	2	1
13	My instructor provides explanations or demonstrations to help me better understand the content of the course.	5	4	3	2	1
14	My instructor provides feedback to the class during the discussions or other activities to help us learn.	5	4	3	2	1
15	My instructor asks for feedback on how this course could be improved.	5	4	3	2	1

Social Presence

	Social Presence: Affective Expression	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
16	Getting to know other course participants gives me a sense of belonging in the course.	5	4	3	2	1
17	I am able to form distinct impressions of some course participants.	5	4	3	2	1
18	Online or web-based communication is an excellent medium for social interaction.	5	4	3	2	1
19	I am able to identify with the thoughts and feelings of other students during the course.	5	4	3	2	1

Appendix. Student Perception Survey Instrument[a]

	Social Presence: Open Communication	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
20	I feel comfortable conversing through the online medium.	5	4	3	2	1
21	I feel comfortable participating in the course discussions.	5	4	3	2	1
22	I feel comfortable interacting with other course participants.	5	4	3	2	1

	Social Presence: Group Cohesion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
23	I feel comfortable disagreeing with other course participants while still maintaining a sense of trust.	5	4	3	2	1
24	I feel that my point of view is acknowledged by other course participants.	5	4	3	2	1
25	Online discussions help me to develop a sense of collaboration.	5	4	3	2	1

Cognitive Presence

	Cognitive Presence: Triggering Event	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
26	Problems posed increase my interest in course issues.	5	4	3	2	1
27	Course activities pique my curiosity.	5	4	3	2	1
28	I feel motivated to explore content related questions.	5	4	3	2	1

	Cognitive Presence: Exploration	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
29	I utilize a variety of information sources to explore problems posed in this course.	5	4	3	2	1
30	Brainstorming and finding relevant information helps me resolve content related questions.	5	4	3	2	1
31	Online discussions are valuable in helping me appreciate different perspectives.	5	4	3	2	1

	Cognitive Presence: Integration	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
32	Combining new information helps me answer questions raised in course activities.	5	4	3	2	1
33	Learning activities help me construct explanations/solutions.	5	4	3	2	1
34	Reflection on course content and discussions helps me understand fundamental concepts in this class.	5	4	3	2	1

	Cognitive Presence: Resolution	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
35	I can describe ways to test and apply the knowledge created in this course.	5	4	3	2	1
36	I am developing solutions to course problems that can be applied in practice.	5	4	3	2	1
37	I can apply the knowledge created in this course to my work or other non-class related activities.	5	4	3	2	1

[a]Section II was adapted from the CoI survey instrument provided by P. Shea and used in research by Shea and Bidjerano (2009b), which was based on the survey instrument developed by Arbaugh et al. (2007) and validated in research by Arbaugh et al. (2008).