Perceived and Actual Cognitive Presence: A Case Study of an Intentionally-Designed Asynchronous Online Course

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Abstract
Online instructional design and how to engage students cognitively in online asynchronous courses have been an ongoing question. This case study presents an intentional design of an asynchronous online graduate course to foster cognitive presence. The research questions investigate students' cognitive presence (CP) captured by two measures: Community of Inquiry (CoI) survey (for self-report) and Linguistic Inquiry and Word Count (LIWC) software (for actual behaviors) in this online course. Additionally, it also addresses how cognitive presence is related to other presences and how the online course design elements were perceived by students. Results showed that students perceived high levels of cognitive presence and they showed high cognitive presence in their discussion board acts. There was a relationship between three presences; and findings showed that teacher and social presence were strong predictors of perceived cognitive presence. Although students in the study rated themselves high on the CoI instrument and scored high on the LIWC for cognitive presence, self-presentation bias still emerged. Strategies that helped students to stay cognitively present in this asynchronous online course included: instructor responsiveness in discussion posts and creating dialogue, creating course assignments as online hands-on project, interviewing guest speakers on specific course topics, weekly recap and orientation videos, feedback, case-based discussions, and other elements.

Keywords: community of inquiry, cognitive presence, cognitive engagement, online Course

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Online course offerings in higher education in the United States continue to grow in number. Seaman et al. (2018) reported that 6.4 million students took an online course in 2016, an annual growth rate of 5.6%, which was up from 3.9% the previous year. On top of the regular growth patterns projected for online course offerings, the COVID-19 pandemic resulted in an urgent transition to online learning to provide safe learning environments for students (Hodges et al., 2020). As a result of the pandemic in March 2020 for over 1,300 institutions of higher education in the U.S. transitioned to online (Marsicano, 2020).

In line with the ever-increasing demand for online courses, in the past several years, researchers have investigated questions related to whether to transition or offer online courses or programs in regular traditional brick-and-mortar universities. Research questions posed included if online classes were as good as face-to-face (Cole et al., 2014; Shelly et al., 2008; Wisneski et al., 2017), or if faculty was ready to teach online (Martin et al., 2019), or if students should be allowed to take online courses for their degree completion when they are enrolled in a campus program (Wavle & Ozogul, 2019) and such. But now, with the COVID-19 disruption, providing online course options in programs and offering various degree programs fully online becoming the new normal for many higher education institutions (Xie et al., 2020) as the purpose of online has changed to support continuity of instruction and various audiences (Lockee, 2021). However, what happened during the pandemic was unique in many respects; teaching was switched to online, primarily synchronous modalities, and was supported by substantial administerial and emergency financial resources (Hodges et al., 2020; Manfuso, 2020). Based on the trends and newfound further appreciation for online courses, it is important to investigate how to systematically design asynchronous learning environments within the affordances and limitations of the online context and bring empirically tested design ideas to instructors and practitioners

To study the online courses, the Community of Inquiry (CoI) framework is a widely used theoretical framework. The framework presents a social-constructivist orientation toward learning (Akyol & Garrison, 2011) and focuses on how to foster learning by increasing levels of three overlapping presences: cognitive presence, teaching presence, and social presence (Garrison et al., 2010; Garrison & Arbaugh, 2007). Cognitive presence refers to learners' ability and behaviors of constructing and confirming meaning in CoI (Garrison et al., 2001). Along with the other two presences, cognitive presence is viewed as one of the important elements of online course design, and the prior literature reported that it is contributing to fostering learning in online environments (Garrison et al., 2001; Sadaf & Olesova, 2017). Cognitive presence and other presences are generally captured by the CoI survey instrument. The CoI survey was developed and validated by Arbaugh et al. (2008), which relies on student perceptions of their own presences.

Purpose of the Study

This study aimed to further our understanding of cognitive presence by capturing it through actual student behaviors in addition to self-report of the CoI instrument, as self-report data may contain self-presentation bias (Kopcha & Sullivan, 2007). The purpose of the study was to explore how an asynchronous online course was designed to foster cognitive presence and how students were cognitively engaged as measured by the CoI survey and through their discussive acts in the online discussion space. Additionally, the correlations between three presences and how the specific design elements perceived by students as contributing to their cognitive presence were explored. The specific research questions were:

1. To what extend were students cognitively engaged in the online course as measured by the CoI scale and by the LIWC software?
2. How cognitive presence was correlated with social presence and teaching presence in this course?
3. What did students perceive as specific design elements or strategies that contributed to their cognitive presence?

The findings of this study are intended to help instructors or instructional designers to design asynchronous online courses, better understand the relationship between the three presences, and uncover how students' perceptions and actual behaviors of cognitive presence appear in relation to each other. This study may serve as a basis for capturing cognitive presence from multiple perspectives and guide course instructors while making instructional strategy choices regarding course design and fostering cognitive presence in asynchronous courses.

Literature Review

CoI Framework

The CoI framework, developed by Garrison et al. in 2000, has been used to develop and evaluate online learning experiences for over twenty years. CoI provides a conceptual framework to study the effectiveness of online learning and to define, describe, and measure the elements of a collaborative, educational experience (Garrison et al., 2010a). The CoI framework assumes that the development of the community is critical to online learning (Swan et al., 2009). The CoI framework consists of three core components: social presence, cognitive presence, and teaching presence (see Figure 1).

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

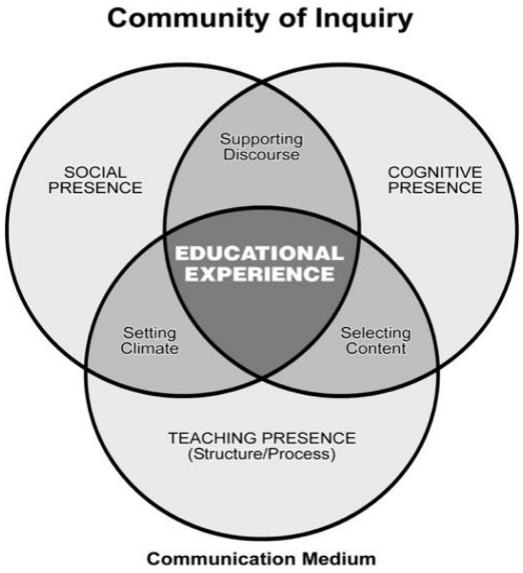


Figure 1 shows that social presence, teaching presence, and cognitive presence are all interrelated to create an effective online educational experience for the learner. The interaction between social presence and cognitive presence is supporting discourse; the intersection between

teaching presence and social presence is setting the climate for online learning; and the intersection between cognitive presence and teaching presence is content selection.

Social Presence. Social presence refers to the extent that learners can present themselves as "real people" in an online learning environment (Garrison et al., 2000). Social presence emphasizes social interaction, which supports critical thinking and deep learning (Garrison & Akyol, 2013). It is considered as a process of sustaining relationships among participants and involving in open communication (Garrison, 2009). Social presence is categorized into three indicators: (1) open communication, where students have mutual trust and express ideas with risk-free; (2) affective expression, where students express emotions and camaraderie using personal expressions of feelings, beliefs, and values; and (3) group cohesion, where students build and maintain a sense of community with a feeling of belongingness and group commitment (Garrison et al., 2000; Swan & Shih, 2005; Tolu & Evans, 2013).

Teaching Presence. Teaching presence aims to realize meaningful and educational learning outcomes through designing, facilitating, and directing cognitive and social presences (Tolu & Evans, 2013). Teaching presence consists of three elements: design and organization, the facilitation of learning, and direct instruction in online courses (Garrison et al., 2000; Garrison & Akyol, 2013; Tolu & Evans, 2013). The primary responsibility of teaching presence is to enhance social and cognitive presence through design, facilitation learning, and direct instruction (Garrison et al., 2000). Despite that teaching presence is usually undertaken by instructors, it can be distributed to any participants in the CoI, such as students, teaching assistants, and course materials. Teaching presence unifies all the elements of CoI together to build a learning community to enhance learning outcomes and meet learning needs (Garrison, 2011).

Research has indicated that students' perceived learning and interaction with instructors are positively correlated with their perceived learning (Jiang & Ting, 2000; Richardson & Swan, 2003). Similarly, Shea et al. (2005) also found that teaching presence is strongly correlated with learner satisfaction and perceived learning. Moreover, researchers have found that teaching presence is critical for students' success in online learning (Garrison et al., 2010a; Vaughan & Garrison, 2006) and plays a critical role in building online communities of inquiry (Kozan, 2016; Shea & Bidjerano, 2009; Zhu et al., 2019).

Cognitive Presence. Cognitive presence refers to the extent to which learners can construct and confirm meaning in an online CoI (Garrison, 2016). It, based on Dewey's practical inquiry model, involves four phases: triggering event, exploration, integration, and resolution (Garrison et al., 2001). The first phase is triggering an event, in which an issue or problem is identified that needs further inquiry for resolution. The second phase, exploration, refers to searching for information and brainstorming ideas. Followed by exploration is integration, in which learners connect ideas and construct meanings to find solutions. The final phase is resolution, in which learners select and test solutions and come up with resolution (Tolu & Evans, 2013). The four phases were iterative and cyclical (Garrison & Arbaugh, 2007) based on the practical inquiry model. Thus, it is critical to understand cognitive presences to help students' meaningful deep learning.

Cognitive Presence and Its Relation to Other Presences

Given the importance of cognitive presence, research on its relationship to other presences has been conducted by researchers. Researchers have found that the exploration phase appeared more often than the resolution and integration phases (e.g., Galikyan & Admiraal, 2019; Kanuka et al., 2007; Kilis & Yildirim, 2019). This finding was considered as the influence

of teaching presence on the cognitive presence (Garrison, 2007; Garrison & Akyol, 2013; Garrison & Arbaugh, 2007). For example, Garrison and Arbaugh (2007) stated that teaching presence, such as facilitation, direction, and course design, can enhance the resolution phase of cognitive presence. The reaching resolution phase was achieved in the study by Kilis and Yildirim (2019) via teaching presence, and Galikyan & Admiraal (2019) found that resolution is very limitedly accounted for cognitive presence, but both integration and resolution had a role in student performance in the online environment. Stated another way, teaching presence is critical to improving learners' critical thinking to achieve higher levels of cognitive learning (Garrison & Akyol, 2013). Moreover, researchers (e.g., Akyol & Garrison, 2008; Ke, 2010) found that teaching presence and cognitive presence have a significant relationship.

In addition, researchers also explored the relationship between cognitive presence and social, teaching presences. Archibald (2010) used the standard multiple regression approach and found that teaching presence and social presence are significantly related to cognitive presence. Moreover, in that study the social presence accounted for the variance of cognitive presence more than teaching presence. Similarly, Gutierrez-Santiuste et al. (2015) found that cognitive presence can be predicted by social presence better than by teaching presence. Rolim et al. (2019) examined the relationship between social and cognitive presences and found that social presence is more associated with the exploration and integration phases of cognitive presence. Using the structure equational model, Kozan and Richardson (2014) found that cognitive presence has a strong influence on the relation between teaching and social presence; however, cognitive presence and teaching presence relationship, and cognitive presence and social presence relationship are not significantly influenced by the third presence. In addition, Shea and Bidjerano (2009) and Garrison et al. (2010b) found that both teaching presence and social presence have a significant direct effect on cognitive presence.

Instructional Strategies for Cognitive Presence

Cognitive presence is defined as the ability "to construct meaning through sustained communication" through the four iterative and cyclical phases (i.e., triggering event, exploration, integration, and resolution). This iterative cycle may show up in; organization, instructor facilitation, and the actual instruction of the course. In terms of course organization, course topics selected based on real-life situations to stimulate brainstorming and critical thinking (Kilis & Yildirim, 2019), inspiring bringing students own experiences to share with peers, weekly course announcements (Holbeck & Hartman, 2018) found to contribute to the cognitive presence.

In terms of instructor facilitation, instructors' participation in the online discussion by focusing participants on relevant topics (Shea & Bidjerano, 2009), instructor's explanation of the purpose of activities and assessments in the online course (Kumar et al., 2019), instructor timely feedback and timely response to questions (Martin et al., 2018) and instructor video presence (Seckman, 2018). In terms of instruction, the way the online class activities are designed to foster students' higher-order thinking resulted in higher cognitive presence. The prior research results showed that providing meaningful learning experiences (Ghazali & Nordin, 2019) and giving opportunities to use critical discourse can contribute to the cognitive presence (Kanuka & Garrison, 2004). Other instructional strategies that showed outcomes for cognitive presence were using case studies (Richardson & Ice, 2010), using role-playing in the discussion boards (Darabi et al., 2011), providing opportunities for classmates to get to know each other (Shea & Bidjerano, 2009), providing opportunities for reflection and collaboration (Garrison, 2003), and using relevant course material (Kumar et al., 2019).

Linguistic Inquiry and Word Count

With the evolution of the social-constructivist perspective on learning and knowledge building (Brown & Adler, 2008) and the advantages of using student actual online behavior, some studies have used Linguistic Inquiry and Word Count (LIWC) metrics to understand online cognitive engagement. Cognitive engagement is defined as students' effort and willingness to invest in learning while using cognitive and metacognitive strategies to promote understanding (Fredericks, Blumenfeld, & Paris, 2004). Four determinants in the learning environment may effect students cognitive engagement, and in the instructional design of courses these may be used as strategies to foster cognitive engagement; students value judgement, students competence, autonomy and relatedness (Blumenfeld, Fredericks, & Krajcik, 2006). In online courses, various strategies may be used to foster cognitive engagement and contribute to four determinants. Discussion boards postings, in-class activities are displays of cognitive engagement in online courses. For example, researchers have studied students' cognitive engagement via linguistic differences in discussion forum contributions measured by LIWC (Joksimović et al., 2014; Xu et al., 2013). In addition, Yoo and Kim (2014) explored the relations between linguistic characteristics and student learning outcomes. Specifically, Kovanović et al. (2016) focused on investigating learners' cognitive presence in online discussion using LIWC tools (Tausczik & Pennebaker, 2010). Wen et al. (2014) also found that LIWC word categories, such as cognitive words, first-person pronouns, and positive words, could be utilized to measure student cognitive engagement in massive open online courses. Similarly, Cui and Wise (2015) utilized simple word frequency analysis to investigate the types of contributions that are most likely to be acknowledged by instructors. These studies demonstrated that learners' online interaction behavior might impact their knowledge construction, and learning performance could be explored using a linguistic approach.

The way LIWC assists in analysis of the discussion postings via an internal dictionary. Previously, Pennebaker et al. (2003) used LIWC to identify language use differences in gender. This study primarily includes automated counts of nine key linguistic features:

(1) First-person singular pronouns
(2) Social words
(3) Positive emotions
(4) Negative emotions
(5) Cognitive processes
(6) Analytic
(7) Clout
(8) Authenticity
(9) Emotional tone

Based on Pennebaker et al. (2015) and the LIWC2015 operator's manual, a high score for Analytic demonstrates that the language is formal, logical, and involves hierarchical thinking; on the contrary, a lower score in this category signifies more informal, personal, and narrative thinking. The Clout score means to what extent the author's language is confident and reflective of high expertise. Authenticity signifies to what extent the author's language is honest, personal, and disclosing. Lastly, Emotional tone refers to what extent the language is a positive expression. For example, a low score in the emotional tone indicates more negative expression, which suggests the author is anxious or sad. These nine linguistic features are related to the three CoI

presences. Adopted from the study of Zhu et al. (2018), cognitive presence in the form of cognitive engagement was analyzed using cognitive processes and analytic categories, social presence was analyzed using the first-person singular pronouns, social words, positive emotions, negative emotions, authenticity, and emotional tone.

Methods

Research Site, Participants and Course Context

This study was conducted in a public university in the midwestern of United States. The research site of the study was a graduate-level fully online course offered asynchronously through an online learning management system. Two sections of the course, taught by the same instructor included in the study in the spring and summer semesters.

Participants were students who enrolled in a fully online graduate course in education. There was a total of 17 students enrolled in the course. The majority of the students enrolled in this course reported their gender as female (82%), and the rest reported as male (18%). Student ages in the online course varied. Thirty-five percent of the students reported being between 31 and 15 years old, followed by students who reported being over 50 years old (24%), followed by 26–30 years old (12%), 41–45 years old (12%), 45–46 years old (12%), and 36–40 years old (6%). In terms of prior online course-taking experience, nearly 60% of participants reported taking at least ten online courses before, 12% reported taking more than six online courses. Only 30% of participants have taken no more than five online courses. Therefore, most online students in the study were familiar with the online learning environment and taking online courses.

The course instructor taught the course 14 times online prior to this study. The course context was provided to the researchers by the instructor, and the instructor showcased their signature elements prior to the study. The course design included the following elements that the course instructor emphasized as their strategies to provide a cognitive presence to students; each week had an announcement, content revealed weekly, and each week instructor recorded themselves summarizing the prior week and orienting students to the following week, each week had a to-do list included readings from textbooks, published articles from recent years, weekly instructor videos, weekly content presentation via screencast, and biweekly pre-recorded evaluation expert guest speaker interviews related to the topic of the week, and biweekly case study discussions, weekly hands-on in-class activities rotating group or individual work, and simulated project-based assignments of writing two evaluation projects and doing a simulated evaluation project from start to end (to include client relationships, politics, data issues, self-presentation bias, triangulation…etc.). Course instructor also included a weekly discussion thread called “hallway conversations” for students to be able to post any question to the instructor or each other as if they ran into the instructor or each other in a hallway and the instructor committed to checking this thread twice a day.

Data Sources and Procedures

To explore student perceptions of online learning and their behavior in online courses, this study utilized an explanatory sequential mixed methods design (Creswell & Clark, 2017). The researchers used the CoI survey data results to form and construct the interview questions and select interviewees. The reason for choosing the mixed methods approach is to triangulate data and provide both a general picture and detailed descriptions of the online learning phenomena.

The authors collected the data sequentially through three key data sources: (1) online CoI survey with 17 participants; (2) discussion forum posts from the same 17 survey participants; (3)

interviews with nine students who volunteered for an interview. Using different data sources enabled the researchers to cross-check the findings (Patton, 1990). The mixed-method approach provided more nuanced understandings of student perceptions and captured their actual behavior rather than only relying on perceptions (Baxter & Babbie, 2004). The CoI survey was administered at the end of the semester. Based on the survey results, a semi-structured interview protocol was developed and finalized. Then the researchers conducted interviews with volunteering students and analyzed interview data. Later, researchers downloaded all discussion forum data that included all in-class activities and analyzed the data by using LIWC software. The authors received approval from the ethics review board of the university for this study. Below, we describe the three data sources in detail.

Survey. The authors adopted the survey from the CoI framework that was developed to understand the dynamics of online learning experiences in line with the traditional values of higher education to support discourse and reflection (Garrison et al., 2000), and the instrument developed to capture three areas of CoI framework was validated by the authors through a principal component analysis to be a valid measure for teaching, social, and cognitive presences (Arbaugh et al., 2008).

This 34-item survey instrument was used in the study with the goal of capturing student perceptions of teaching, social and cognitive presences in this online higher education course. The final survey included three additional questions capturing students' demographics (gender, age, and prior online learning experience) and the original 34 questions about the CoI instrument. There were no open-ended questions. The survey was transferred to the Qualtrics survey tool, a sharable link was generated, and the link was sent to students' email in the learning management system during the last week of the course.

Interview. The semi-structured interview form included 15 questions with some sub-probing questions. Four questions were asked about students' general online learning experiences. Four questions were related to cognitive presence. Five questions were about their perceptions of social presence and the instructor's facilitation of social presence. Lastly, two questions were related to students' perceptions of the instructor's teaching presence. Two researchers conducted the interview together through Zoom, a synchronous videoconferencing tool. Interviews were video-recorded and later transcribed verbatim within Kaltura. Two researchers reviewed the transcriptions to make sure they were accurate. During the interviews, while one researcher led the interview, the other researcher took notes and asked follow-up questions. After each interview, researchers reflected on the interview process. Each interview lasted around 20 to 30 minutes.

Online discussion posts. During the semester, in each week long session, in-class activities took place in discussion posts (e.g., case discussion, guest speaker discussion, evaluation concepts, evaluation models discussion). Discussion posts were prompted by the instructor of the course. At the end of the semester, the researchers downloaded all the online discussion forum data from the instructor and students into a single location on a password-protected computer. Then the researchers ran the analysis on discussion data on LIWC 2015 software.

Data Analysis

To capture the overall cognitive presence, we administered the CoI to all students after the course was completed. Additionally, we analyzed all student-generated text from online course discussions with the LIWC software. We then extracted two metrics from this analysis: a self-reported CP and an LIWC CP. We standardized both scores, so the maximum possible score

was five. We utilized these two measures to report the perceived and actual cognitive engagement levels in the online course and to capture if there was self-presentation bias in perception versus actual student behaviors (Kopcha & Sullivan, 2007).

We inductively coded interview transcripts for emerging themes using content analyses (Elo & Kyngäs, 2008). Inductive coding can help researchers gain unexpected insights from the data. The two researchers read the transcripts and coded data individually. After that, these two researchers met to discuss the discrepancies and reached a consensus on categories and themes with 90% interrater agreement.

To capture the actual behaviors of students in the course, we analyzed word frequencies using the licensed version of the LIWC tool developed by Pennebaker et al. (2001). LIWC has an internal dictionary that was used to analyze the discussion forum data. We ran LIWC for the messages from 17 survey participants and the instructor separately. We used LIWC results to triangulate whether it is actually reflected in students' online cognitive presence ratings and what contributed to those results through the interviews.

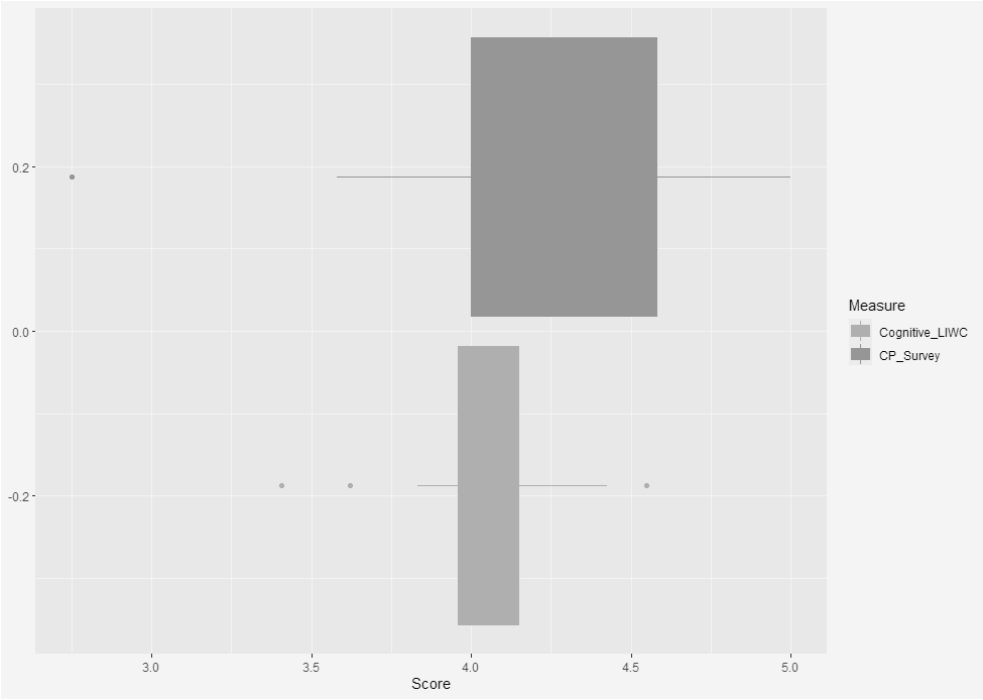
Results

In this section, results are presented by each research question.

(1) To what extent were students cognitively engaged in the online course as measured by the CoI scale and by the LIWC software?

Students showed high cognitive engagement across both LIWC and CoI instruments. On the CoI, the mean self-reported cognitive engagement was 4.25 out of 5, and the mean LIWC measured cognitive engagement was 4.0 out of 5. Figure 2 shows that there was substantially more variance in students' self-reported cognitive engagement in CoI than in the LIWC measure of cognitive engagement.

Figure 2
Summary of Cognitive Engagement



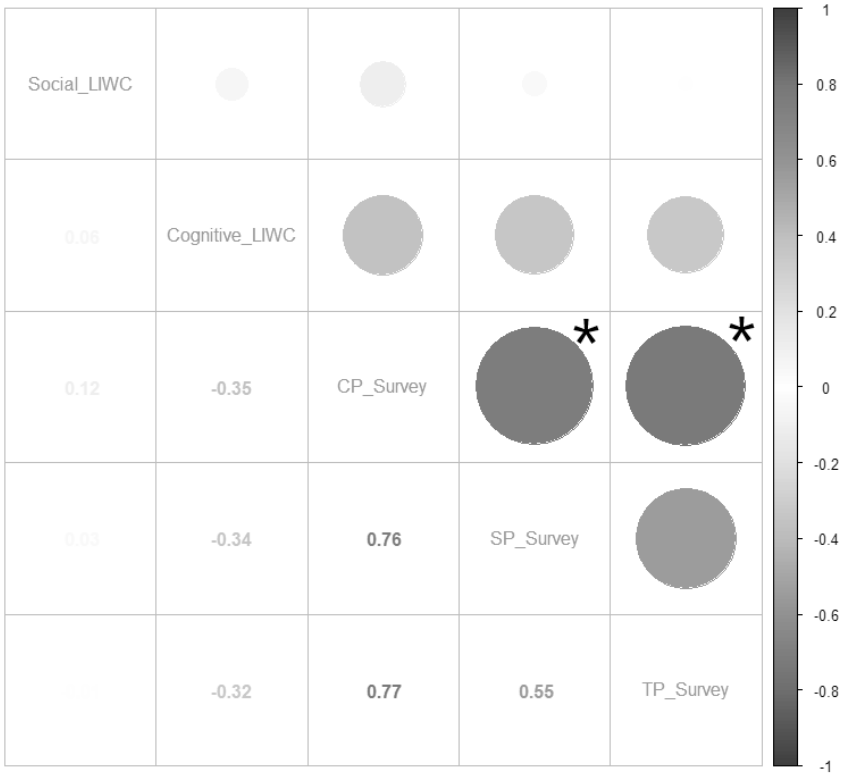
(2) How CP was correlated with social presence (SP) and teaching presence (TP) in this course?

Our second research question investigated the correlation between cognitive presence (CP) and the other two presences: social (SP) and teaching presence (TP). The ratings on each presence were as follows; M = 4.25 SD = 0.24 for cognitive presence, M = 4.44 SD = 0.23 for teaching presence, and M = 4.20 SD = 0.16 for social presence.

To determine the relationship between CP, SP, and TP, we descriptively analyzed the correlation between perceived levels of social, teacher, and cognitive engagement and also analyzed the LIWC measures of cognitive and social engagement. This descriptive analysis revealed a strong correlation between student self-perceptions of social, teaching, and cognitive presence. This same correlation was not present in LIWC measures of social and cognitive presence, with both appearing relatively independent of each other. Additionally, LIWC measured cognitive presence was negatively correlated with self-report measures of cognitive and social. Because of this, LIWC measures of cognitive and social presence were not included in the linear model. Based on this analysis, we created a linear regression that predicted self-assessed CP with self-assessed SP and self-assessed TP. Figure 3 shows the correlation between the three presences, as well as their correlation with LIWC measures of SP and CP.

Figure 3

Correlation Between Measures of Cognitive, Social, and Teaching Presence



Note. * denotes significant correlation at $p < 0.05$

Table 1 gives the summary of the linear model that predicted perceived CP with perceived SP and TP. The model confirms the descriptive correlational analysis, showing that both perceived teacher and social presence are strong predictors of perceived cognitive presence. The model has an extremely high R^2 value of 0.71, suggesting that when students in this course reflect on their course experience in an online community, they are relying on a single perception of quality as a whole and do not make strong distinctions between cognitive, social, and teaching presence in an online classroom.

Table 1
Linear Model of Perceived Cognitive Presence

Variable	Estimate	Standard Error	T-Value	*P*-value
Intercept	-0.973	0.822	-1.184	0.256
Social Presence	0.518	0.175	2.954	0.010
Teaching Presence	0.6851	0.213	3.204	0.006

$F(2,14) = 21.25$. Adjusted $R^2 = 0.71$, $p < 0.001$

(3) What did students perceive as specific design elements or strategies that contributed to their cognitive presence?

During the interview, when asked what made students engaged with the course content and triggered their interest. All students interviewed stated that they were satisfied with the online asynchronous course and the course content was very relevant to them. When specifically defined for them and asked about cognitive presence, students mentioned there might have been differences from week to week on their cognitive engagement. Students commonly mentioned that there were limitations to their cognitive presence based on their familiarity with the topic, and the time they allotted to work on the course while balancing work, personal life, and school commitments. When asked what kept them cognitively present in the course, students' responses fell into specific categories. Students most frequently pointed out the instructor being very responsive in discussion posts and creating dialogue, creating course assignments as online hands-on project, interviewing guest speakers on the course topics, weekly recap and orientation videos of the instructor, feedback, case-based discussions, and overall teacher being present in the course as main strategies that worked for them keeping them cognitively present.

A few of them pointed out that they have meaningful and hands-on activities in an online course that made them think deeply and thus contributed to their engagement with the course content. For example, one student said, "With what she gave, you had to really think about from A to Z as an outside perspective, because all of my evaluation experiences went as an internal evaluation. Or I've never been like an external reviewer. So individually was good. Because you know you had to rely on yourself to get through it. Another student mentioned, "… the individual project where she gave you this scenario, and you had to put together an evaluation proposal individually, which was good."

Two other students emphasized guest speakers being presented in an interview form versus guest speakers just doing a presentation in the course gained their attention. One of them mentioned that this course had a very different style than the other courses they took, mentioned enjoying guest speakers being interviewed by the course instructor on the topic of the week, "There was another course that had like guest speakers as well, but it felt designed specifically for the course, not just an explanation of what someone does or what project they are working on." Another one mentioned, "she would tie the guest speakers into her own weekly screencasts, a kind of picky back on it. So yeah, I thought that was an effective way to do it."

Additionally, for the general organization of the course, all interviewed students mentioned they found the weekly orienting and summary videos very helpful. A student stated, "I thought that the weekly videos kind of help things you know keep moving from one week to the next wrap up the where we're going." Watching her video kind of getting an understanding of what happened last week, what's going to happen this week. Then doing the readings or postings or whatever that she had for the chapters, and then doing weekly assignments. And then knowing kind of on the horizon what was happening on the bigger assignments. I think that was, for me, worked out the best because I could organize my time." One other said, "I really enjoyed the way she gave us face to face, not necessarily lectures each week. But kind of touching base. Gaining as much face to face in an online class I think helps make that connection and make you feel let you get to know your professor a little better." One student mentioned, "she always did like a weekly introduction and kind of review from last week and what we're doing for this week. That was really nice because she would always, if she found a good point in the discussion post she would bring that up. So it's really nice to know that she is reading it. She is actually involved in our class instead of just us talking to each other, so that was really nice. I like that."

Feedback quality and promptness was another area brought up by the students as a course element that engaged them. Students said the instructor gave frequent, timely, and very detailed feedback to each student. The statement from a student "I like how much feedback she gave to us. Some classes I take, you really do not get back on… I felt like she was pretty consistent with giving feedback on posting, or questions she asked. "feedback that's an important piece that you know it's not just what do you do, but commentary kind of reflection and redesign in places or different things like I had for one of these assignments I wasn't really sure if I was heading in the right direction and so I sent it, and I got feedback soon, and so I kind of could mold it back in" Finally, one of the students said for the overall design:

> I really liked her design, where she would introduce a concept and give us a little mini-lecture in the video. And, then, we would go to the discussion boards and have a conversation around that. And I really like how she threw questions out at us and let us, kind of, grapple with it, with each other before jumping in, kind of, redirecting if needed. And then, I also really liked that she brought experts from the field. I thought that was really and valuable for us to hear. We talk about theory. A lot of times, theory and practice are really different. So, I really liked how she bridged that gap.

Discussion

Students self-rated their cognitive presence high, and their actions in the discussion board showed high LIWC scores for cognitive engagement in this intentionally designed course. For both of the instruments, the ratings and actual acts of cognitive engagement were very close to the highest rating possible, suggesting a ceiling effect. This might be due to the prior teaching experience of the instructor with the course, and instructional strategies embedded in the course possibly contributed to the high cognitive presence, as echoed in the student interviews. The instructional strategies embedded in the course by the instructor possibly contributed to the high cognitive presence, as echoed in the student interviews. The instructional strategies such as using critical discourse in discussion boards (Kanuka & Garrison, 2004; Shea & Bidjerano, 2009), providing meaningful experiences (Kilis & Yildirim, 2019; Kumar et al., 2019), feedback (Martin et al., 2018), instructor video presence (Seckman, 2018), using case studies (Richardson & Ice, 2010), were embedded in the course frequently, and these perceived as contributing to the student's cognitive presence in the asynchronous course. As the topic of the course was

evaluation, these strategies might have been natural to embed to this course, but there may be other instructional strategies to contribute further to the cognitive presence, such as using role-playing in the discussion boards (Darabi et al., 2011), providing opportunities for classmates to get to know each other (Shea & Bidjerano, 2009) and such.

When evaluating their course experience, students did not appear to strongly differentiate between their ratings of cognitive, social, and teacher engagement. This aligns with some of Arbaugh and colleagues' (2008) initial concerns with the validation of the CoI instrument, where they found a majority of the variance in survey responses could be accounted for by a single factor. Although there may be some potential for improving survey reliability and validity, it may also be that students experience a "convergence of opinion" over time, whereby they resolve their difference in opinion across the three CoI categories to a single opinion of course quality. If this is the case, it is important that instructors recognize that aggregated student survey data is limited in the insight it can give. Instead of making modifications to online learning environments based on inconclusive differences in the ratings of different survey items, it may be more useful for instructors to ask for more detailed qualitative feedback from students and to rely on existing design principles when working on designing or improving online asynchronous instruction.

When compared to LIWC scores of cognitive presence, there was a much higher variance in student ratings of cognitive presence in the CoI instrument. This may be due to the selective nature of graduate programs. Because all students were admitted and selected the same institution for their graduate work, they most likely all share similar proficiency in their chosen area of study. This may explain the homogony across LIWC scores. However, this homogony in scores hides a diversity of experience where the cognitive effort and experiences of students who express similar behaviors in online behavior are substantially different. It is only through the self-reported cognitive presence measure that these differences are detected. This pattern is important for instructors in asynchronous online instruction to account for in their course design. Because the instructor's perceptions of their students are much more limited than they are in an in-person or even synchronous online learning context, they may perceive false cognitive homogony among their students. Activities that encourage self-expression and frequent opportunities to reflect on their perceptions of the course may be critical for students in asynchronous learning environments.

Even there was a higher variance in the student ratings in CoI versus LIWC scores, the ratings were high for both. Interestingly regardless of them being both very high, the negative correlation between the LIWC and CoI scores may still indicate that there might be a self-presentation bias (Kopcha & Sullivan, 2007). In this study, the negative correlation did not reach significance. High ratings and high scores on both instruments for cognitive presences almost present a ceiling effect in this study. It is not surprising as the participants of this study were high-performing graduate students, and the course was designed to include instructional strategies to foster cognitive presence, but the negative directional correlation between CoI and LIWC cognitive and social presences is still needed to be noted. High scores and high ratings may be due to that all participants of the study being graduate students, the majority of the students being between the ages 26 and 45, and these students being invested in the course as this was a required course. Even they scored high on LIWC, they still rated themselves higher compared to their actual behaviors. This may be important to consider when trying to capture cognitive engagement and what other measures can be incorporated when measuring cognitive presence. Adding also a measure of course performance may shed further light on the cognitive

engagement of students. Different audiences, such as undergraduate students, may show a bigger discrepancy between their actual behaviors versus self-report behaviors of cognitive engagement.

Learners' cognitive presence was influenced by various elements. Instructors' facilitation is critical for online learners' cognitive presence. This study revealed that immediate feedback, hands-on activities, interactive guest speakers, etc., helped students' cognitive presence in the course. This aligned with the prior study findings that teaching presence has a positive influence on cognitive presence (Garrison & Arbaugh, 2007). Therefore, it is critical for instructors in asynchronous courses to increase their teaching presence to design the course, facilitate the online course, and provide instructions to promote cognitive presence based on the needs and background of online learners.

Limitations and Future Research

This study has some limitations. First, this case study was conducted in one graduate-level online educational course. In light of the findings of this study, there is a need for future research in order to validate the findings with different participants and in different contexts, as online course and program offerings increase daily post COVID-19. This study could be replicated with other asynchronous courses with undergraduate students to investigate how instructional strategies that were embedded in course designs result in student perceived cognitive presence and actual cognitive engagement.

Second, this study did not examine learning outcomes. Despite missing learning outcomes, this study increased the trustworthiness of the study using diverse data sources, such as surveys, interviews, and discussion forums. In the future, replicating this study by adding a third measure such as pre-and post-tests on course learning outcomes may add another dimension to capture cognitive presence.

Conclusion

The findings of the study offered insights to when an online asynchronous course was designed with intentions to include specific strategies to have students cognitively engaged, it showed promising results for student cognitive presence. In this study, students perceived themselves cognitively present and they actually showed high cognitive presence in their acts of engagement with course activities hosted in the discussion board. There was a relationship between three presences, and findings showed that teacher and social presence are strong predictors of perceived cognitive presence. Although students in the study rated themselves high on the CoI instrument and scored high on the LIWC for cognitive presence, there still was observation of self-presentation bias. Students rated themselves higher than they were actually cognitively present in the course. The strategies that helped students to stay cognitively present in this asynchronous online course were the instructor being very responsive in discussion posts and creating dialogue, creating course assignments as online hands-on project, interviewing guest speakers on the course topics, weekly recap and orientation videos, feedback, case-based discussions, and overall teacher being present in the course.

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