

A Comparison of Cognitive and Social Presence in Online Graduate Courses: Asynchronous vs. Synchronous Modalities

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Abstract

Over the last decade, the prevalence of online courses has continued to grow, and students in higher education are being offered increased access to technology and communication tools in online learning programs. This action research study analyzed the impact of two distinct types of online course instruction (100% asynchronous and weekly online synchronous meetings) on learning outcomes, including cognitive and social presence, knowledge gained, and student perceptions. Study participants consisted of graduate students enrolled in online sections of a course on program evaluation. Four sections of the course were available: Two included a synchronous meeting using web-conferencing, and two used an asynchronous format. A quasi-experimental design was used and included pre- and post-test knowledge assessment, a modified version of the Community of Inquiry (CoI) questionnaire, and end-of-course student evaluations. Our results suggest that when students learn in an asynchronous format, they have a higher cognitive presence. The average scores on the knowledge pre-test were the same for both sections, but post-test scores were slightly higher in the asynchronous section. Instructor ratings were high for all courses. These findings may offer valuable implications to higher education programs that have recently transitioned to online teaching modalities.

Keywords: Online instruction, synchronous vs. asynchronous format, cognitive presence

Presley, R., Cumberland, D. M., Rose, K. (2023). A comparison of cognitive and social presence in online graduate courses: Asynchronous vs. synchronous modalities. *Online Learning*, 27(2), 245-264.

Over the last decade, the prevalence of online courses has continued to grow, and students in higher education are being offered increased access to technology and communication tools in online learning programs. When the COVID-19 pandemic disrupted work and learning in March of 2020, programs in higher education that had not already adapted to online learning were forced to transition to a digital environment quickly. The importance of recognizing the benefits and limitations of asynchronous and synchronous learning has hence become essential in today's online learning environment. As faculty members discover new ways to engage students in the online classroom, the cognitive and social benefits of these different learning approaches are still being reviewed.

Over the years, research on blended learning (Garrison & Kanuka, 2004; Graham, 2006; Hilliard & Stewart, 2019; Vaughn & Garrison, 2005; Yamagata-Lynch, 2014), flipped classrooms (Ozdamli & Asiksoy, 2016; Young et al., 2014) and distance learning (Midkiff & DaSilva, 2000; Watts, 2016) have provided a variety of recommendations for engaging online students in both asynchronous and synchronous ways. Further, a recent meta-analysis indicated that online synchronous learning could, in fact, result in slightly better learning outcomes when compared to asynchronous online and in-person courses (Ebner & Gegenfurtner, 2019).

Our action research study contributes to this body of knowledge and focuses on a non-traditional graduate student population in particular. The study assesses the value of these types of exchanges in the online environment through both synchronous and asynchronous learning using the Community of Inquiry (CoI) framework. The purpose of the study was to understand how synchronous and asynchronous modalities impact student levels of cognitive and social presence in online learning. Specifically, this research included the following questions:

1. Are there significant group mean differences between the asynchronous and synchronous students' scores on pre- and post-knowledge tests?
2. Does synchronous learning in an online environment elevate social and cognitive presence?
3. Does the use of different online teaching approaches (asynchronous vs. synchronous) impact students' assessment of each course?

Since educational outcomes are “dependent upon the complex dynamics of the purposes, design, and interactions within the educational environment” (Akyol & Garrison, 2001, p. 234), it is important to understand which teaching modalities enable deep learning (Shea & Bidjerano, 2009). The theoretical literature explored includes the CoI instrument (Garrison & Arbaugh, 2007), the type of learning environment, the amount of knowledge gained, and student satisfaction among online classroom modalities.

We should note that throughout this article, we use *synchronous* to refer to online instruction that requires a “live” webinar component of the class. *Asynchronous* refers to online learning that students can complete more autonomously and at an individualized pace. We use these terms generally, recognizing that there are many different models of online instruction (including blended instruction). Our specific online learning contexts are described later in the article.

Literature Review

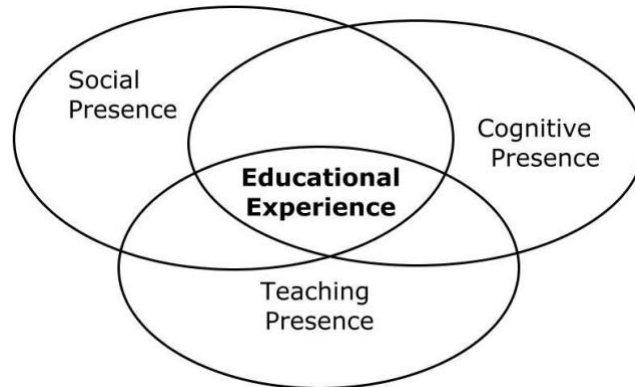
As distance learning has grown, research on the quality of synchronous versus asynchronous learning environments and the quality of the learning experience have improved (Chou, 2002; Lease & Brown, 2009). Thus, teaching methods and practices in the online space have also improved, and different results in student learning outcomes have occurred (Offir et al., 2008). Students have learned to adapt to a variety of online delivery methods and modalities. Because of this, there is increased potential for students to have greater autonomy and flexibility with learning in an online classroom (Slater & Davies, 2020), and the delivery method is key to the primary instructional tasks necessary for student success (Anderson, 2001).

The faculty skills needed to help increase learning in both synchronous and asynchronous classrooms can include facilitation of both social and cognitive learning (Alvarez et al., 2009; Varvel, 2007), and the use of various instructional design tools as well as the traditional tasks of course designer, facilitator, or teacher (Martin et al., 2019). Each of these faculty roles plays an important part in student learning in both synchronous and asynchronous online spaces, and developing an understanding of knowledge building in these environments may help to increase student academic success (Shea et al., 2005). Many faculty members continue to debate whether all course content can effectively be delivered online and whether the most effective delivery is synchronous or asynchronous. Complicating the question of learning outcomes is the issue of faculty instructional preference, student instructional preference, and institutional requirements. Nevertheless, the prevalence of online learning continues to grow whether faculty members are prepared and informed or not (Brown & Green, 2019).

Another confounding issue is how to determine the effectiveness of online education. Some studies examine readily available outcome data like student course evaluations (e.g., Gómez-Rey et al., 2018; Holmes & Reid, 2017) and student course grades (e.g., Joosten & Cusatis, 2020). Other studies have examined factors like course engagement (Cole et al., 2019) and student satisfaction (Choe, 2019). A well-known framework for understanding online classroom engagement and success of an online course is the Community of Inquiry (CoI) framework (Garrison & Arbaugh, 2007). This framework, depicted in Figure 1, is designed to help improve learning online and considers higher-level learning outcomes for cognition and the social presence of students in the online classroom. As asynchronous learning provides students the flexibility to learn at any time, synchronous learning has been viewed as playing a more prominent role in the learning environment, offering immediate feedback and increased learner motivation (Chen, 2006; Hrastinski, 2008). Several studies have been done on the impact of blending online learning with both synchronous and asynchronous (Fadde & Vu, 2014; Power, 2008; Yamagata-Lynch, 2014) and the relationship to learning using the Community of Inquiry (CoI) instrument (Rockinson-Szapkiw et al., 2016). The cognitive and social presence of the CoI instrument has been researched extensively (see, e.g., Garrison et al., 2001; Sadaf & Olesova, 2017) with a variety of implications around the varying abilities of online learners.

Figure 1

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



The CoI framework has been used in prior empirical studies to identify learning outcomes and student satisfaction (Garrison et al., 2001; Swan & Shih, 2005), assess the value of case-based student assignments (Sadaf et al., 2021), and explore student-learner perceptions and satisfaction based on different online modalities (Arbaugh, 2008; Garrison et al., 2010). Research related to online learning has increased significantly over the years (Sitzmann et al., 2006; Tallent-Runnels et al., 2006), with meaningful studies supporting the CoI framework as a valid and reliable instrument (Garrison et al., 2000; Stenbom, 2018). This framework was designed to explain the structures of online learning through the thinking processes individuals construct and the individual learning that takes place in group work (Garrison et al., 2001; Sadaf et al., 2021). The CoI framework, shown in Figure 1, offers the basic theoretical model assessing the cognitive, social, and teaching presence of online learning environments and has been utilized by a number of researchers to consider students' perceptions of online experiences (Arbaugh et al., 2008; Hixon et al., 2016; Roulston et al., 2018).

The CoI was designed to review the social, cognitive, and teaching presences of students and instructors in the online educational experience while looking at the classroom discussions, classroom climate, course content, and communication methods used (Garrison & Arbaugh, 2007). The *cognitive presence* dimension focuses on the ability of students to reflect on and find meaning in course content through dialogue with instructors and classmates (Garrison et al., 2001; Garrison et al., 2000). Cognitive participation is crucial to the learning process but can often be challenging to measure (Atapattu et al., 2019). The *social presence* dimension focuses on how participants identify with other students in the online community, develop trust in the learning process and learning space, and how interpersonal relationships develop in the online classroom (Garrison, 2009). Recent research suggests the recognition and cultivation of social presence in the online classroom may also help enhance learner satisfaction (Arbaugh & Benbunan-Fich, 2006; Peacock & Cowan, 2019). While both cognitive and social presences provide explanations for students' higher-level learning, the *teaching presence* dimension offers an understanding of student perceptions of instructional leadership throughout the course. Past research has suggested that instructor availability and real-time access to instructors in an online classroom can increase learning and help students engage in the content (Chen et al., 2019; Martin & Bolliger, 2018). Using the CoI framework to assess asynchronous and synchronous,

and blended learning environments has been a successful tool in several former research studies (Garrison & Kanuka, 2004; Hilliard & Stewart, 2019).

As asynchronous learning has been shown to increase cognitive participation (Lui et al., 2020) and synchronous learning has increased personal participation on the part of the student (Hrastinski, 2008), an analysis of student perceptions and the intersection of these learning experiences between the two formats seems appropriate. For those faculty members attempting to stay current and improve online learning as course delivery methods continuously change, understanding best practices in asynchronous versus synchronous online learning is essential.

Methods

Design

For this study, we collected data from students enrolled in graduate-level Human Resource and Organizational Development (HROD) courses at a large public university during the Spring 2020, Summer 2020, and Spring 2021 semesters. The HROD program at this university offers large portions of its curriculum online. This university program has relied on weekly synchronous webinars and continually evolves to meet enrollment, student learning, and university goals. This study specifically sought to compare relationships among Community of Inquiry (CoI) presences between courses offered in a 100% asynchronous and 100% synchronous formats. This study used a quasi-experimental design. The data for this study included student responses to a modified version of the CoI questionnaire (Arbaugh et al., 2008), pre- and post-tests of knowledge, and student end-of-course evaluations.

The independent variables include synchronous course offering (0) and asynchronous course offering (1). The dependent variable in this analysis utilized a modified version of the CoI questionnaire designed to help guide research and understand the student online learning experience (Akyol & Garrison, 2011). The other dependent variable was post-course student evaluations.

Participants

The sample for this study consisted of students enrolled in a graduate-level course focused on program evaluation. Four sections of the course were available: Two that included a synchronous meeting each week using web conferencing and two offered in a asynchronous format, meaning that no class meeting time was required. The course materials and assignments were the same for all sections. Students self-enrolled into each course section. A total of 103 students enrolled in this course over three semesters, with 62 students enrolled in a synchronous course section and 41 enrolled in an asynchronous course section. Four students were removed from the study for incomplete data leaving a sample size of 99 students. There were a total of 43 men and 56 women in the combined courses.

Instrumentation

Community of Inquiry (CoI) Questionnaire (Pre and Post)

The original CoI survey was modified to remove a typo and two repeated questions. Additionally, the *teaching presence* section of the original questionnaire was not used, as the student course evaluations offered by the institution provided similar data. The 21-question survey used a Likert-type scale (1=*Strongly disagree*, 2=*Disagree*, 3=*Neutral*, 4=*Agree*, and 5=*Strongly Agree*). The CoI survey assessed both cognitive presence (*Online discussions were valuable in helping me appreciate different perspectives*) and social presence (*Online discussions*

help me to develop a sense of collaboration). The questionnaire is included in Appendix 1 and shows the 21 questions presented to students. Past research has shown the survey to be a reliable and valid instrument (Arbaugh et al., 2008).

Knowledge Questions (Pre and Post)

The questions used to assess knowledge were developed by the lead instructor. Prior to use in the study, they were sent to the author of the textbook used in the course, who is a well-known expert in the field of program evaluation. The expert provided helpful suggestions, and two questions were edited for clarification.

Course Evaluations (Post Only)

End-of-course evaluations offer a rich source of data that can be mined to understand perceptions of the experience of the course (Lowenthal et al., 2015). The data on student evaluation of the course presented were obtained from the aggregated, de-identified, post-course evaluations completed in the university's online evaluation repository. The Office of Institutional Research coordinates survey distribution and completion for the purpose of program evaluation. The response rate for the two courses differed. The two asynchronous courses averaged a 58.81% response from students, while the synchronous courses averaged a 52.27% response rate. The two measures chosen for review were the student's overall assessment of the course by combining all questions, and separately, we examined ratings for the instructor.

Results

The results have been organized according to the three guiding research questions. Data for each research question are presented along with the relevant analytical process.

RQ1: Are there significant group mean differences between the asynchronous and synchronous students' scores on pre- and post-knowledge tests?

The pre- and post-tests of knowledge included various questions about course content. These items were developed by the authors and reviewed by an external expert in program evaluation. The highest possible score on these tests was 30 points. Interestingly, average scores on the pre-test were the same for both sections ($\bar{x} = 20.2$). However, post-test scores were slightly higher in the asynchronous section ($\bar{x} = 26.4$) when compared to the synchronous section ($\bar{x} = 24.6$). Results of an independent samples t-test showed no significant difference between the mean scores of the synchronous ($M = -5.55$, $SD = 3.77$) knowledge scores and asynchronous ($M = -5.507$, $SD = 3.93$) knowledge scores $t(97) = -6.06$, $p = .546$. These results suggest students' scores on knowledge tests did not differ from asynchronous and synchronous courses.

RQ2: Does synchronous learning in an online environment elevate social and cognitive presence?

Descriptive statistics for the CoI items used in this study are presented in Table 2. Overall, when reviewing the results of the descriptive statistics, the mean results were all above 3.75, indicating limited dispersment of data. This is not ideal, as there could be issues or concerns with item quality. Item quality is important for the accuracy of manually entered data,

completeness of the data, and the ability to identify errors in reliability (Fox et al., 1994). The mean ratings of the CoI ranged 3.75–4.60 out of 5, with cognitive presence receiving the highest mean, followed by social presence. Of the responses for the 21-item survey, Q50 (*I was able to form distinct impressions of some course participants*) had the lowest mean of 3.75 (SD= .873). The highest mean was Q42 (*I can apply the knowledge created in this course to my work or other organizations I am involved in*), with a mean of 4.60 (SD= .605). When reviewing all student responses on the CoI, cognitive presence responses collectively yielded a mean of 4.35 (SD= .509), while social presence resulted in a mean of 4.18 (SD=.574).

Table 1

Descriptive Statistics for CoI Items

| Scale Item | N | Min | Max | Mean | S Error | SD |
|---------------------------------|----------|------------|------------|-------------|----------------|-----------|
| <i>Cognitive Presence Total</i> | 99 | 2.45 | | 4.35 | .051 | .509 |
| Q31 | 99 | 2 | | 4.46 | .072 | .719 |
| Q32 | 99 | 2 | | 4.51 | .068 | .677 |
| Q33 | 99 | 2 | | 4.40 | .073 | .727 |
| Q34 | 99 | 1 | | 4.16 | .081 | .804 |
| Q35 | 99 | 2 | | 4.32 | .072 | .712 |
| Q36 | 99 | 2 | | 4.01 | .094 | .931 |
| Q37 | 99 | 2 | | 4.26 | .068 | .679 |
| Q38 | 99 | 2 | | 4.41 | .070 | .700 |
| Q39 | 99 | 2 | | 4.40 | .068 | .684 |
| Q40 | 99 | 1 | | 4.45 | .070 | .689 |
| Q41 | 99 | 2 | | 4.40 | .069 | .638 |
| Q42 | 99 | 3 | | 4.60 | .061 | .605 |
| <i>Social Presence Total</i> | 99 | 2.70 | | 4.18 | .058 | .574 |
| Q43 | 99 | 2 | | 4.45 | .074 | .732 |
| Q44 | 99 | 2 | | 4.36 | .079 | .788 |
| Q45 | 99 | 2 | | 4.40 | .079 | .781 |
| Q46 | 99 | 1 | | 3.98 | .091 | .903 |
| Q47 | 99 | 2 | | 4.27 | .076 | .754 |
| Q48 | 99 | 2 | | 4.09 | .084 | .834 |
| Q49 | 99 | 2 | | 3.95 | .095 | .941 |
| Q50 | 99 | 2 | | 3.75 | .088 | .873 |
| Q51 | 99 | 1 | | 3.91 | .102 | 1.011 |

Cronbach's alpha was used to test each scale for internal consistency and reliability. Both scales showed high levels of internal consistencies (Cronbach's alpha was .897 for cognitive presence and .879 for social presence), indicating how closely related the items are as a group and indicating reliability (consistency) of the items.

Table 2*CoI Scale Reliability Statistics*

| Variable | N | Mean | SD | S Error | Cronbach's α |
|---------------------------------|----------|-------------|-----------|----------------|---------------------------------------|
| <i>Cognitive Presence Total</i> | 97 | 47.75 | 5.64 | | .897 |
| Synchronous | 59 | 4.26 | .530 | .069 | |
| Asynchronous | 40 | 4.47 | .454 | .072 | |
| <i>Social Presence Total</i> | 98 | 41.78 | 5.77 | | .879 |
| Synchronous | 59 | 4.19 | .611 | .079 | |
| Asynchronous | 40 | 4.15 | .522 | .082 | |

The group statistics among the key variables of cognitive and social presence and the differences between the variables are displayed in Table 3. There was a significant difference between the cognitive presence scores for synchronous ($M=4.26$, $SD=.529$) and asynchronous ($M=4.47$, $SD=.454$) conditions, and in the independent samples t-test (Table 3) $t(97)=-2.07$, $p=.041$. These results suggest that asynchronous learning environments do have an effect on cognitive presence for graduate-level online learners. Specifically, our results suggest that when graduate students learn in an asynchronous format, they have a higher cognitive presence.

To explore this further, two separate independent t-tests (see Table 4) were utilized to compare cognitive and social presence scores, respectively, between participants completing the course in synchronous and asynchronous modalities. The scale scores for cognitive and social presences were calculated from the CoI survey. Social presence was not significant as a predictor in either the asynchronous courses or synchronous courses. A Levene's Test for Equality of Variances was performed, and results indicated that for cognitive presence $t(97)=2.067$, $p<.041$ was significant, thus indicating that asynchronous courses have a much higher cognitive presence than the synchronous. Additionally, the social presence showed non significance ($t(97)=.330$, $p>.742$), meaning there was no difference in the asynchronous or synchronous courses as it related to social presence.

Table 3*Independent Samples T-Test of Synchronous vs. Asynchronous Modalities*

| Variable | F | t | df | Sig |
|--------------------|----------|----------|-----------|------------|
| Cognitive Presence | -.364 | -2.067 | 97 | .041* |
| Social Presence | .262 | .330 | 97 | .742 |

* $p < .05$

After reviewing the above results of the t-tests by scale, further analysis was conducted to investigate which specific cognitive presence questions between participants completing the course in synchronous and asynchronous modalities showed significant differences. The cognitive presence questions that showed significant results include: Q32 (*Course activities engaged me in the topic*) $t(96)=-2.032$, $p<.045$; Q40 (*I can describe ways to apply the*

knowledge created in this course) $t(97) = -2.366, p < .042$; and Q41 (I have developed solutions that can be applied in practice) $t(97) = -2.241, p < .027$ indicating significance at the .05 level.

Table 4

Independent Samples T-Test of Cognitive Presence Items of Significance

| Variable | F | t | df | Sig |
|----------|-------|--------|----|-------|
| Q32 | 8.018 | -2.032 | 96 | .045* |
| Q40 | 2.366 | -2.062 | 97 | .042* |
| Q41 | .504 | -2.241 | 97 | .027* |

* $p < .05$

RQ3: Does the use of different online teaching approaches (asynchronous vs. synchronous) impact students' assessment of the instructor of each course?

This study utilized items from the university's standard course evaluation form administered at the end of each course to address this research question. This survey is administered centrally by the university's Office of Institutional Research. Items were rated on a 1-5 Likert scale. The items included were:

- Q1: The instructor's teaching was...(rated from poor to excellent)
- Q2: Difficult concepts were explained in a helpful manner.
- Q3: Judging by presentations and answers to questions, the instructor displayed a clear understanding of course topics.
- Q4: The instructor found alternative ways of explaining material when students didn't understand.

Overall descriptive statistics for these items are presented in Table 5.

Table 5

Independent Samples T-Test of Cognitive Presence Items of Significance

| Variable | N | Min | Max | Mean | S Error | SD |
|---------------|----|------|-----|------|---------|------|
| Q1 | 60 | 2 | 5 | 4.63 | .101 | .780 |
| Q2 | 60 | 2 | 5 | 4.48 | .115 | .892 |
| Q3 | 60 | 2 | 5 | 4.70 | .090 | .696 |
| Q4 | 60 | 2 | 5 | 4.47 | .099 | .769 |
| Overall Score | 60 | 2.45 | 5 | 4.57 | .087 | .672 |

As this research investigated how ratings of the instructor in synchronous and asynchronous approaches might differ, an examination of the descriptive statistics of instructor rating items by course modality was performed. These data are presented in Table 6.

Table 6*Synchronous and Asynchronous Instructor Ratings*

| Item | N | | Mean | | SD | | S Error | |
|---------|-------|--------|-------|--------|-------|--------|---------|--------|
| | Synch | Asynch | Synch | Asynch | Synch | Asynch | Synch | Asynch |
| Q1 | 28 | 32 | 4.32 | 4.91 | 1.02 | .296 | .193 | .052 |
| Q2 | 28 | 32 | 4.14 | 4.78 | 1.08 | .553 | .204 | .098 |
| Q3 | 28 | 32 | 4.46 | 4.91 | .922 | .296 | .174 | .052 |
| Q4 | 28 | 32 | 4.18 | 4.72 | .905 | .523 | .171 | .092 |
| Overall | 28 | 32 | 4.27 | 4.82 | .811 | .373 | .153 | .066 |

In general, students in the asynchronous courses rated the instructor more highly than students in the synchronous courses rated their instructor. Question 3 (*The instructor displayed a clear understanding of course topics*) received the highest mean score in both synchronous and asynchronous modalities. The lower standard deviations of items from the asynchronous class also indicated that there was less dispersal of the responses. To determine whether statistically significant differences existed between the synchronous and asynchronous courses, a t-test was utilized. These results are presented in Table 7.

Table 7*Independent Samples T-Test of Synchronous vs. Asynchronous Instructor Items*

| Variable | F | t | df | Sig |
|----------|-------|-------|----|-------|
| Q1 | 34.02 | -3.10 | 58 | .001* |
| Q2 | 12.92 | -2.94 | 58 | .001* |
| Q3 | 26.99 | -2.57 | 58 | .001* |
| Q4 | 3.27 | -2.88 | 58 | .076 |
| Overall | 11.69 | -3.45 | 58 | .001* |

* $p < .05$

The overall mean for the teaching presence questions evaluated indicates a significantly higher mean for asynchronous courses ($M = 4.82$, $SD = .373$) than for synchronous ($M = 4.91$, $SD = .296$), $t(58) = 26.9$, $p < .001$, $d = .34$). The asynchronous mean was significantly higher for Q1 (*general teacher rating*) ($M = 4.82$, $SD = .373$) than for synchronous ($M = 4.27$, $SD = .811$), $t(58) = 3.40$, $p < .001$, $d = .34$, and Q2 (*difficult concepts explained*) also showed a higher mean in asynchronous course evaluations ($M = 4.78$, $SD = .553$), $t(58) = 12.9$, $p < .001$ than those student evaluations in synchronous courses ($M = 4.14$, $SD = 1.08$). In addition, when students were assessed regarding understanding Q3 (*Instructor helped with clear understanding in the course*), the asynchronous course evaluations were significant ($M = 4.91$, $SD = .296$), $t(58) = 12.9$, $p < .001$ (Table 7). There was no significant difference in student evaluation means of Q4 (*teachers offering alternative ways to explain materials*) between synchronous and asynchronous courses $t(58) = -.288$, $p = .076$.

Discussion

The purpose of this study was to investigate how two different online teaching approaches (asynchronous vs. synchronous) impact graduate student learning, social and cognitive presence, and the evaluation of the teacher in these classroom environments. This research showed that the student has to work harder in an asynchronous learning environment and that student investment in the learning process is more prevalent. Those students who are not interested or invested in the learning process may not be as successful in developing a cognitive commitment to asynchronous learning. Online learning may be more effective at the graduate level, where students have a stronger investment that is not always visible in undergraduate online courses (Mason, 2018).

With the first research question, we sought to understand how synchronous vs. asynchronous delivery methodology impacted student learning. Though the pre-and post-test approach may have only measured information recall and retention (rather than other forms of learning like synthesis or application), results indicated that while there was learning growth from pre- to post-tests, no significant difference in student learning existed between the two modalities. It is important to reiterate that students self-selected the course modality; thus, it is possible that students who selected the asynchronous course understood the more self-directed nature of an asynchronous offering (Zhu et al., 2020).

The second research question examined how social presence and cognitive presence differed between the course delivery modalities. Social presence is defined as “the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities” (Garrison et al., 2009, p. 2). Results indicated that social presence did not differ between course modalities and were both relatively high. For the synchronous course, this could be due to the interactive nature of the webinar sessions, which utilized breakout groups, question and answer sessions, group chats, class discussions, and other active learning strategies (Finelli et al., 2018). In those ways, students were able to connect with peers and instructors and build social relationships. In the asynchronous course, students also reported being highly “socially present” in the class. Strategies encouraging social presence in these particular asynchronous courses included student blogs and wikis, discussion boards, and group work supported by the instructor and enabled through technology. These kinds of strategies encouraged students to connect with peers even though the course never met in person. Additionally, the asynchronous course was not a fully self-paced course, as some asynchronous courses tend to be. That is, students were required to interact with peers and complete modules, discussions, and other interactive content on a weekly basis. This may have aided in building social presence in the classroom.

Along with social presence, cognitive presence of students was investigated. Cognitive presence is defined by the intellectual effort put in by students to engage in course materials, think critically about new information, and identify and solve complex problems (Garrison et al., 2001; Garrison, 2009). Interestingly, cognitive presence *did* differ between the course modalities, with students in the asynchronous course reporting higher levels of cognitive presence. Three items on the cognitive presence scale were more highly rated than others: Q31 (*Topics discussed increased my interest in this course*), Q32 (*Course activities engaged me in the topic of program evaluation*), and Q42 (*I can apply the knowledge created in this course to my work or other organizations I am involved in*). After review, these three areas in particular may be important to consider when developing content for online graduate learning: Student interest, student

engagement, and perception of receiving applicable knowledge in the online course. Past research has shown that something inherent happens in asynchronous classes where students post more detailed reflections, are often more thoughtful in their discussions, and think more critically in these online environments (Vaughan & Garrison, 2005). Additionally, this could reflect the graduate student's interest in the quality of the course content, as asynchronous discussions can offer deeper understanding of others' ideas, more time to reflect on the content, and more detailed responses over time (Meyer, 2005).

It is important to note that each of these asynchronous courses was highly interactive in nature. That said, course design contributes to higher levels of cognitive presence in asynchronous courses. Unlike some asynchronous courses, which simply require reading and testing, these particular asynchronous classes were specifically designed to be more interactive, including structured modules that led students through curated readings, videos, interactive activities (both graded and ungraded), and scaffolded projects (Garrison & Cleveland-Innes, 2005). Previous evidence suggests that intentionally designed course activities increase cognitive presence (Akyol & Garrison, 2011; Midkiff & DaSilva, 2005; Sadaf & Olesova, 2017), and this may have played a role in the results of this research.

It is important to note that these considerations do not exist in isolation (Garrison et al., 2001; Shea, 2009), as the role of the instructor is essential in developing both social and cognitive presence in the online classroom. While specific strategies to engage students socially and cognitively may differ by course and instructor, this study noted a variety of differentiators in teaching. Several specific activities have been supported by previous research as being highly impactful for student learning and engagement (e.g., Martin et al., 2020). Engagement strategies common to both the synchronous modality and the asynchronous modality included communication in the course, such as sending a minimum of two announcements per week to the students. The purpose of these announcements was to encourage students as well as to notify them of upcoming deadlines and milestones. In these announcements, the instructor also highlighted specific student work (i.e., "pats on the back") and discussed the work in student groups. According to Shea and colleagues (2006), "students are likely to report a better sense of learning community when instructors are reinforcing student contributions, injecting their own knowledge, and confirming student understanding" (pg 4). It should be noted that group work for both of these courses was optional. For some assignments, students could choose to work together or choose to work alone. Providing students with this small amount of autonomy and choice may have also increased their cognitive presence and investment in the course. Both courses also included individual tests and quizzes as knowledge checks to evaluate student learning outcomes.

One of the biggest differences in instructor engagement in the synchronous versus asynchronous courses was participation in discussion forums. These were only utilized in the asynchronous course. However, instructors' high visibility and continual engagement with students in these forums throughout the course reinforced their presence, expertise, and support of students. It is important to note, however, that two different instructors taught these courses.

Limitations

This study had several limitations. First, the small sample size limited the ability to perform a question-by-question analysis of both the cognitive and social presence questions. The self-selection of the course was also a possible limitation of the study. Future research should consider a sample size larger than 300. We also recognize that students' ability to self-select into

the synchronous or asynchronous modality may impact their relative success in and satisfaction with the course. Additionally, it is important to note that instructors have different styles and approaches. This factor might have had considerable impact; indeed, many factors may be impacted by different instructors even if the materials and topics are the same. However, as this was an action research study, the realities of course scheduling and staffing issues necessitated different instructors for these courses. Nevertheless, we hope these findings will be useful in designing online courses.

Future research could look at student social and cognitive engagement in a weekly format, alternating from synchronous to asynchronous to measure student perception of the differences in engagement in course components (Moskal et al., 2015). Additionally, a more in-depth analysis of the CoI framework using the four phases of the practical inquiry cycle (triggering events, exploration, integration, and resolution) could have been utilized by operationalizing specific assignments and interactions in the varying courses to identify key differences and similarities (Garrison et al., 2001; Garrison & Anderson, 2003; Vaughn & Garrison, 2005).

This research did not use the teaching presence portion of the CoI instrument due to the number of teaching evaluations already presented to this population of students. However, it is recommended that those using the CoI instrument in the future use this tool or other teaching presence frameworks to measure teaching presence. It is important to recognize that individual students responded specifically to teacher involvement in the synchronous and asynchronous courses.

Another important caveat is that this study took place as the COVID-19 pandemic began to disrupt daily life globally. While no shift in modality was necessary for these courses (they were already offered online), other factors may have affected the study that we cannot fully account for, including student stress and anxiety, instructor stress and anxiety, shifting priorities, job loss, and many other issues. Therefore, the results of this study, while informative, may not be indicative of a “normal” semester or operating environment.

Conclusion

This evaluation will help determine the future evolution of course curriculum development and may also assist other higher education institutions in understanding whether weekly webinars are valuable learning tools. A recent meta-analysis indicated that online synchronous learning could, in fact, result in slightly better learning outcomes when compared to asynchronous online and in-person courses (Ebner & Gegenfurtner, 2019). Our results suggest this is not always the case. This study may offer valuable implications to higher education programs still navigating the digital transformation. Given the student sample used in this study (working adults), this study may also, by extension, help advance Human Resource Development (HRD) practice by illuminating learning preferences and practices in an online environment. As more and more work is completed remotely, the potential to advance our knowledge of how best employee training can be carried out could benefit from this study’s findings. Researchers in this study recognize, however, that the purpose of this study likely addresses the needs of HRD educators rather than HRD practitioners. Though data analysis is ongoing, our preliminary findings suggest that learning may be equally effective in both types of instruction, but that a high degree of instructor preparation and interaction are necessary for both modalities.

Declarations

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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<https://doi.org/10.1007/s11423-020-09747-8>

Appendix A

Community of Inquiry (CoI) Questionnaire

Cognitive Presence

- Q31: Topics discussed increased my interest in the course.
- Q32: Course activities engaged me in the topic.
- Q33: I felt motivated to explore the topic of program evaluation.
- Q34: I utilized a variety of information sources to explore the topic in this course.
- Q35: Brainstorming and finding relevant information helped me resolve content related questions.
- Q36: Online discussions were valuable in helping me appreciate different perspectives.
- Q37: Combining new information helped me answer questions raised in course activities.
- Q38: Learning activities helped me construct explanations/solutions.
- Q39: Reflection on course content and discussions helped me understand fundamental concepts in this class.
- Q40: I can describe ways to apply the knowledge created in this course.
- Q41: I have developed solutions that can be applied in practice.
- Q42: I can apply the knowledge created in this course to my work or other organizations I am involved in.

Social Presence

- Q43: I felt comfortable conversing through the online medium.
- Q44: I felt comfortable participating in the course discussions.
- Q45: I felt comfortable interacting with other course participants.
- Q46: I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
- Q47: I felt that my point of view was acknowledged by other course participants.
- Q48: Online discussions help me to develop a sense of collaboration.
- Q49: Getting to know other course participants gave me a sense of belonging in the course.
- Q50: I was able to form distinct impressions of some course participants.
- Q51: Online or web-based communication is an excellent medium for social interaction.

Appendix B

Teaching Presence Related Course Evaluation Items

- Q1: The Instructor's teaching was (Poor=1, Below Average to Excellent= 5)
- Q2: Difficult concepts were explained in a helpful manner. (Strongly Disagree=1 to Strongly Agree=5)
- Q3: Judging by presentations and answers to questions, the instructor displayed a clear understanding of course topics. (Strongly Disagree=1 to Strongly Agree=5)
- Q4: The instructor found alternative ways of explaining material when students didn't understand. (Strongly Disagree=1 to Strongly Agree=5)