

Exploring the role of environmental features on student experience in the university classroom with the Community of Inquiry framework

Heather R. Kennedy
University of Northern Iowa

Gloria E. Stafford
University of Northern Iowa

An *active learning* classroom design recognizes the importance of students becoming engaged in their own learning. Using a mixed-methods approach, this study compared student-reported data (n = 219) and used the *community of inquiry* framework to evaluate the impact of environmental features on students' experience. Students occupied traditional or active-learning classrooms, but the same course content was delivered by the same instructor. Findings indicate a preference for seating at tables versus fixed desks, appropriate personal space and sightlines to the teacher and projector screens, and gratification for forming social connections (i.e., social presence).

The scholarly investigations into the impact of the classroom environment on student engagement and learning is not surprising. In the early twentieth century, Lewin proposed that the environment is as important as the individual in assessing and understanding behaviors (Lewin, 1936; Walsh et al, 1992).

A body of scholarship has since emerged which focused specifically on classroom environments and the strategies used within. A recent meta-analysis concluded the use of active-learning (AL) strategies increases student performance (Freeman et al, 2014). An atmosphere of active learning supports activities beyond the mere acts of teaching as telling and learning as listening (Harpaz, 2005). Classroom re-design projects have utilized spatial arrangements which facilitate interactions between people and encourage lively conversations to occur (Beichner et al, 2007). Doyle (2008) concluded that the creation of physical spaces which allow learners to actively engage in activities—including individual and collaborative work, and group discussions—can be the single most important intervention to optimize student learning. However, methodological limitations of many studies have made it difficult to draw distinct conclusions regarding the impact of the physical classroom environment on student outcomes. For example, some studies made changes to both the physical classroom and the course design and content delivery (i.e., incorporation of AL strategies).

The start of the twenty-first century saw the emergence of scholarship focused on the digital classroom environment, largely motivated by the increasing presence of online courses in higher education. The Community of Inquiry (CoI) framework, proposed by Garrison, et al., (2000), initially explored whether learners could build connectedness and have the same level of commitment to learning without being physically present in the same space. It sought to identify the core components of a quality educational experience, and whether online course delivery could rival traditional face-to-face contexts in producing these critical dimensions of the learning transaction. Three key elements of a quality education transaction were identified: cognitive, social, and teaching presence.

It appears very few studies to date have explored the role of the classroom environment within the CoI framework. It also appears valuable to explore the role of the physical environment in relation to the critical components of a quality learning experience, in addition to performance-based outcomes. Thus, this study aimed to identify the extent to which environmental conditions impacted students' experience, and whether findings suggest an augmentation of environmental components in the CoI model.

Background

Community of Inquiry (CoI) Framework

The Community of Inquiry (CoI) framework conceptualizes the complex and dynamic interactions within online learning endeavors based on the premise that higher-level learning thrives when learners are part of a social community, and in turn, encourages critical reflection and discourse (Garrison et al., 2009). From a constructivist

Heather R. Kennedy is now an Associate Professor of Family Science at the University of Nebraska Kearney.

Gloria E. Stafford is an Assistant Professor of Interior Design at the University of Northern Iowa.

perspective, it posits that three core elements are essential to online teaching and learning transaction which include: cognitive presence, social presence, and teaching presence (Garrison et al, 2009).

Cognitive presence—the construction of knowledge and meaning—is seen as the most essential to success in higher education (Garrison et al, 2000). Curiosity brings students into the classroom initially, then the inquiry process proceeds through exploration and discourse, analysis and synthesis, and finally reflection, understanding, and application (Garrison et al, 2009). Students construct meaning through discussion and reflection to arrive at knowledge formation (Garrison, 2011; Stover & Ziswiler, 2017).

Social presence involves the interaction among peer students to support discourse and learning. Critical thinking is facilitated through the interchange of ideas and perspectives (Garrison, 2011; Stover & Ziswiler, 2017). In order to do this, learners must have a sense that they can openly and safely communicate with the group (Garrison, 2007). Thus, social expression, communication, and group cohesion supports a learning environment which, in turn, builds critical thinking and higher-level learning outcomes (Garrison et al, 2000, Garrison & Akyol, 2013; Kozan & Caskurlu, 2018).

Teaching presence involves the design of course content, the facilitation of course activities, and the delivery of feedback so learners achieve meaningful outcomes (Garrison et al, 2009). Knowledge-building interaction and discourse are influenced through the instructor's leadership (Garrison, 2007) and must be purposeful and focused in order to optimize collaboration and reflection in the classroom (Garrison et al., 2009).

Originally, the CoI framework was developed to explore online higher education environments—to see if they could build similar levels of connectedness (social presence) and learning (cognitive presence) without face-to-face interaction and physical proximity (Garrison, et al., 2009). Since its inception over 20 years ago, the framework has advanced a wide array of research and teaching efforts (Stover & Ziswiler, 2017).

Ultimately, the three presences are interdependent and interconnected (Garrison et al., 2009). Scholarship has found that teaching presence bridges social and cognitive presence and is connected to levels of student satisfaction (Kozan & Caskurlu, 2018), students' level of perceived learning, and an academic sense of community (Garrison, 2007; Garrison, 2011). More recently, some scholars have suggested that the CoI framework is not all-encompassing, and that some critical dimensions in the learning transaction exist outside of the three core presences (Kozan & Caskurlu, 2018). These additional dimensions have focused on the student such as:

autonomy presence (Lam, 2015), learning presence (Shea & Bidjerano, 2012; Wertz & Purzer, 2021), and emotional presence (Stenbom et al., 2016). Others have focused on instructor social presence which takes into consideration the instructor's social behavior in the classroom (Pollard et al., 2014).

Although conceptualized as a framework for assessing the then emerging virtual classroom, the CoI has been applied to in-person classroom settings as well (Lee & Kim, 2018; Stover & Ziswiler, 2017). Regardless of the specific educational setting, social, cognitive, and teaching presence can enhance or inhibit the quality of sense-making experiences for learners. Therefore, its usefulness as an explanatory framework includes not only online learning, but also hybrid or flipped models, along with traditional in-person settings. This may be particularly true for a classroom setting that has been deliberately designed to maximize student learning.

Active Learning Environments

As online education was growing, there was also movement toward more active-learning approaches in higher education. The favored approach has become one where students carry more responsibility for their own learning, as greater student engagement is understood to be key to student success (Bolden et al, 2019). However, many college buildings are decades old, and include lecture hall spaces which were designed to accommodate the “sage on the stage” approach to teaching (King, 1993). Forward-facing, fixed rows of desks focused student attention on the teacher at the front of the classroom.

Active learning (AL) has been defined as “anything course-related that all students in a class session are called upon to do other than simply watching, listening, and taking notes” (Felder & Brent, 2009, p.2). A paradigmatic shift from the teacher-centered lecture model towards more student-centered teaching, where “the one who does the work does the learning” (Doyle, 2011, p.1) has driven changes to prototypical classroom layouts (Bolden et al, 2019). Static, unmovable seating facing forward, and where students may not be seated together is not conducive to student interaction and active engagement.

Scholars have explored the role of the physical environment in increasing active learning in higher education. Often, AL classrooms include movable round tables and chairs seating six to nine students—in lieu of individual desks facing forward—to better enable teamwork and collaboration (Park & Choi, 2014). They may also include multiple projectors and screens, laptops and wireless internet, and portable or electronic whiteboards for brainstorming and diagramming (Park & Choi, 2014). Najmabada (2017) posited that the circular table is the single

most feature with the greatest impact in AL classrooms. Students can move and pivot in chairs with casters - repositioning themselves for the activity at hand. Projecting course content onto screens at both the front and back of the room reduces negative effects—like distraction—created by the “Shadow Zone”; which is too much distance from the board (Park & Choi, 2014). In combination, all of these features make it difficult for students not to be engaged (Najmabadi, 2017).

Although the retrofitting of traditional classrooms into AL spaces is not inexpensive or easy to implement, many universities have installed AL environments - either as retrofits within traditional classrooms, or as newly outfitted spaces to increase student engagement and facilitate learning (Stover & Ziswiler, 2017). The movement towards more flexible and collaborative AL classrooms is based on the notion that such enhancements will better support and improve student outcomes (Perks et al, 2016). But research results paint a complex picture of the connection between the design of physical classrooms and the outcomes of teaching and learning.

One of the first studies conducted on the impact of an AL classroom environment on student outcomes was North Carolina State University’s Student-Centered Activities for Large Enrollment Undergraduate Programs (SCALE-UP). Results showed increased levels of student conceptual understanding, critical thinking skills, attitudes, and class attendance (Beichner et al, 2007). A similar study at the University of Iowa found when compared to a traditional classroom, students in AL classrooms reported more positive attitudes, more engagement, and higher grades (Van Horne et al., 2012). In addition to greater motivation, students in AL classrooms were also more likely to share ideas while also considering and integrating different perspectives offered by their peers (Park & Choi, 2014).

However, methodological limitations were evident in early studies. For example, moving to an AL classroom naturally prompted changes to course design and delivery (e.g., use of more active-learning strategies). Thus, scholars designed studies to examine the impact of the physical attributes of the classroom alone. Student outcomes were compared based on different classroom designs (i.e., standard and AL) while standardizing delivery (e.g., same course, teacher, and format).

Result from these studies found students in AL classrooms reported greater satisfaction (Hill & Epps, 2010) and attendance (Hao et al., 2021); as well as higher levels of engagement and flexibility (Cotner et al., 2013). They also outperformed peers in the traditional classrooms. More specifically, when using ACT scores as a predictor, students in AL classrooms earned significantly higher grades than expected (Brooks, 2011; Cotner et al., 2013). Vercellotti (2018)

found no significant difference in learning gains, yet in the AL, and not the traditional classroom, lower scoring students made larger learning gains from pre- to post-test. However, studies have also found no effect on student performance or grades (Hao et al., 2021; Hill & Epps, 2010), nor any significant difference with regard to student attitudes, confidence, or motivation for computer science courses (Hao et al., 2021).

To date, there appear discrepant findings on the matter. AL spaces do provide the opportunity to employ student-centered pedagogical approaches (Alstete & Beutell, 2017; Metzger & Langley, 2020). Certain student outcomes may be enhanced by a classroom designed to emphasize flexibility and collaboration. Yet, merely increasing the number of AL classrooms on a campus may not necessarily lead to the anticipated improvements in student outcomes. Some scholars have argued that teachers may not fully utilize the technologies and equipment (Radcliffe, 2009) and that the success of a redesigned room is dependent on how it is utilized for instruction and content delivery (Perks et al., 2016).

While from different perspectives, the CoI framework and re-designed AL classroom both focus on the role of the environment—whether online or face-to-face—in teaching and learning. Active learning classrooms intend to promote a community of inquiry by encouraging students to be more participatory; to increase discussion and collaboration. Yet, it appears minimal research has specifically explored the impacts of the classroom environment within the CoI framework.

Thus, additional research may shed light on the role the environment plays in direct relation to cognitive presence, social presence, and teaching presence—fundamental components in the process of inquiry. Further, it will also allow us to consider the extent to which the environment itself may need to be considered as a component in the CoI framework. Thus, the research questions which this study aimed to answer were:

1. What impact(s) do environmental conditions in the classroom (i.e., design, furniture, layout, equipment, AL features) have on student experience in a course?
2. How do student perceptions of the classroom environment relate to the CoI framework? The authors hypothesized that students in an AL classroom, versus a traditional classroom, would report greater social and cognitive presence.

Method

The CoI Framework (Garrison et al., 2000) guided this study.

Participants

In total, 219 students participated in the study. All participants were undergraduate students enrolled in Family Studies courses at a Midwestern university. The study was approved by the institutional review board (IRB) and all participants completed informed-consent forms. Some students were enrolled in a course, but excluded from the study, for either failing to complete an informed consent form ($n = 40$) or declining consent ($n = 15$). Participant class standing was as follows: first-year student ($n = 30$; 14%), sophomore ($n = 53$; 24%), junior ($n = 86$; 39%) and senior ($n = 50$; 23%). The majority declared a Family Service major or minor ($n = 132$; 60%). The mean course grade was 3.34 ($SD = .819$). Final grades were as follows: A ($n = 112$), B ($n = 75$), C ($n = 24$), D ($n = 4$) and F ($n = 2$).

Course Context and Procedure

The primary investigator (PI) was also the instructor for all the classes in the study. Three distinct courses were used; two are required for Family Service majors (i.e., *Strategies and Issues in Family Services* and *Interpersonal Relationship Dynamics*) and one course can enroll students from any major as it is part of the university's Liberal Arts core (i.e., *Human Identity and Relationships*). In total, 12 individual classes were used in this study.

Seven different classrooms were used for instruction and data collection. Classroom A—where roughly half ($n = 108$, 49.3%) of the study participants were enrolled over two semesters in 2019—was an AL classroom as defined by Park and Choi (2014). It contained six round tables—each with seven movable chairs (capacity 42), dual projectors and screens, and movable white-boards. The other six classrooms were considered "traditional" classrooms (see Stover & Ziswiller, 2017) accommodated the other participants ($n = 111$, 50.7%) during the fall 2020 and spring 2021 semesters. Two of these six (Classrooms B and C) had rectangular tables, and free-standing chairs facing the front of the room; capacities were 38 and 48 students. The remaining four traditional-style classrooms (Classrooms D, E, F, and G) were auditorium-style with fixed, tiered seats. Three were medium-sized (capacities 81, 122, and 128) and one was large (capacity 278). However, these six traditional classrooms were utilized during Covid, and the capacities were reduced to allow for 6' social distancing (see Figure 1.). Chairs were either removed or labeled as not available for use.

All traditional classrooms contained baseline technology such as a large screen and projector, desktop computer, and web camera. All six traditional classrooms were utilized for these courses—in lieu of the regularly-scheduled AL

classroom—to allow for 6' physical distancing per university safety protocol after the onset of the Covid-19 pandemic.

Data Collection

A concurrent, mixed-methods design was used for the study. Thus, qualitative and quantitative data were collected simultaneously; with the primary purpose of triangulation and complementarity (Greene et al., 1989). Further, the design reduced limitations of similar research such as, differing disciplines, content, and instructors (Bolden et al., 2019). The PI was the only instructor for all courses. While the classroom environment differed—AL or traditional—the courses taught across semesters remained the same. The instructor also maintained the same pedagogical approach, which focused on facilitating three types of interaction (i.e., learner to learner, learner to instructor, and learner to content) instrumental to learning (Bernard et al., 2009). These modes of interaction are also necessary for the CoI elements of social, cognitive, and teaching presence.

Electronic surveys (i.e., Google forms) were completed by students at the beginning and the end of the semester. Completion of the surveys was a low-value assignment in the course. Study participants received no compensation. The post-survey was comprised of 72 items. The focus of the current study included descriptive items, five open-ended questions (i.e., What was your experience like in our classroom?), and six items representing cognitive and social presence that were adapted from the CoI survey (Garrison et al., 2009). CoI item responses were on a 5-point, Likert-type scale ranging from 0 (i.e., extremely disagree) to 4 (i.e., extremely agree). In previous research, the CoI survey demonstrated strong reliability with $\alpha = .87$ (Garrison et al., 2009). Reliability was similar in the present study ($\alpha = .90$). See Appendix A for items.

Data Analysis

A database was prepared, cleaned, and quantitative analyses conducted using IBM SPSS Statistics (Version 24). MAXQDA Plus 2022 was used for qualitative data organization. The Thematic Analysis process (Braun & Clarke, 2006) was used to inductively and deductively analyze the qualitative data. Validation strategies included triangulation of qualitative and quantitative data (Merriam, 2009) and peer review (Creswell, 2007). After the PI developed a codebook for inductive and deductive codes and conducted several rounds of coding, the co-author reviewed the data. Any discrepancies were discussed in weekly meetings until authors reached agreement. For example, the code "view" was changed to "sightline" to reflect discipline terminology.

CLASSROOM ENVIRONMENT AND STUDENT OUTCOMES

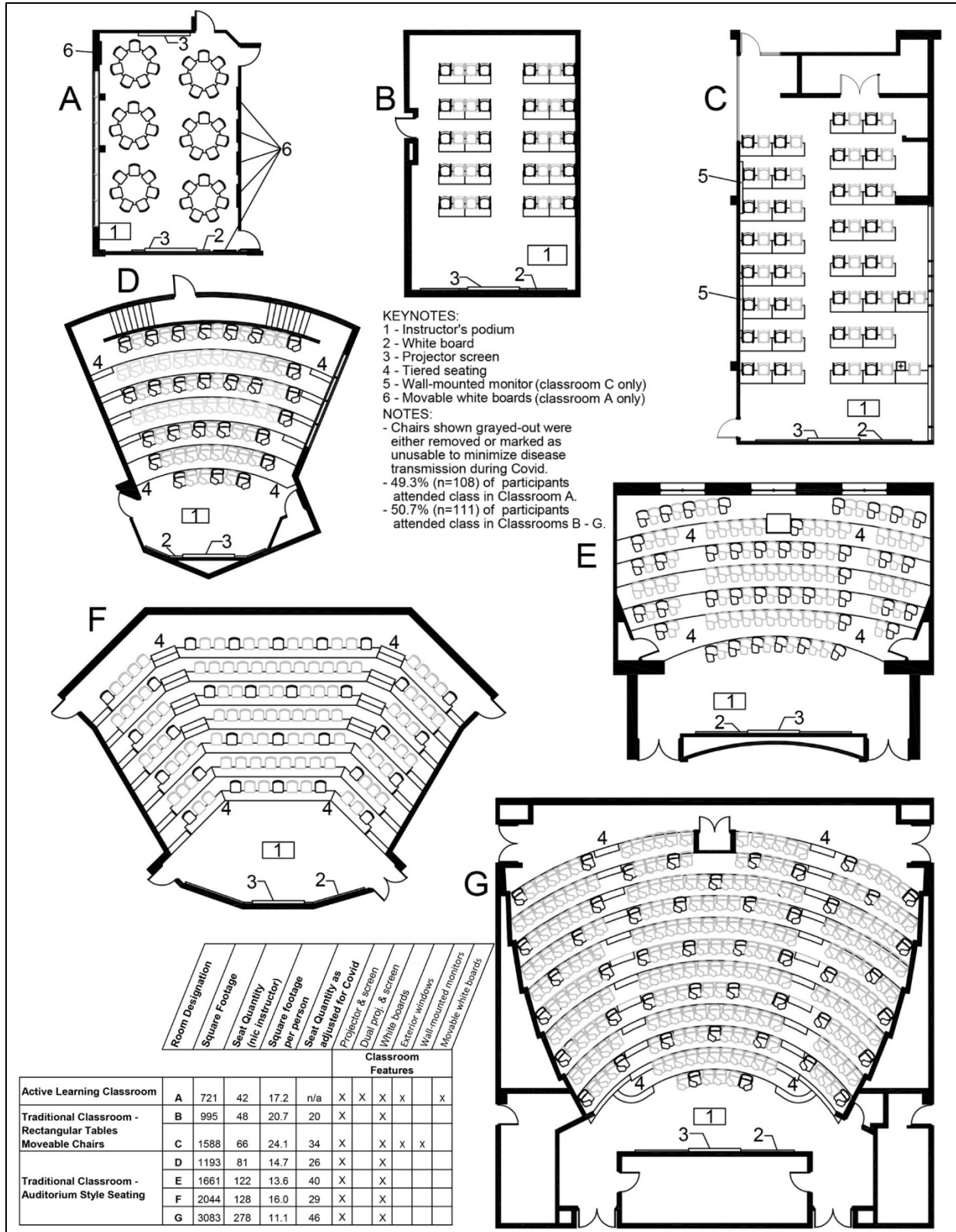


Figure 1.

Results

Our first research question asked: What impact(s) do environmental conditions in the classroom (design, furniture, layout, equipment, AL features) have on student experience in a course?

Satisfaction and Comfort

A major theme to emerge was the extent of participant *satisfaction* and/or *comfort* in the course. Overall, the majority of respondent surveys ($n = 197$) indicated at least some level of satisfaction. This satisfaction was reflected in various examples such as: engaging activities, peer discussions, or the classroom environment. Comments ranged from short phrases such as, “very good” to complete statements like: “It was a very positive and interactive environment. It was very engaging, and everyone came together to do group work” (#50). Several significant sub-themes provided additional detail regarding satisfaction and comfort. In addition, clear distinctions in participant experience in differing classrooms (i.e., AL vs. traditional) also emerged and provide additional insight into our research questions. Refer to Table 1 which includes frequencies and example quotes for each sub-theme.

Seating

Seating appeared a substantial environmental condition impacting student experience in the classroom. This was nearly always referenced in regard to seating at a “table.” It appeared in almost half the participant surveys ($n = 103$). Several participants in the AL classroom ($n = 82$), and some in a traditional ($n = 17$), described the table seating as beneficial and contributing to their satisfaction in the class. Comments ranged from simple statements such as, “Liked the circle tables” (participant #01) to more detailed accounts. Only three expressed clear discontent with seating in the AL classroom. Thus, almost all participants who referenced “table” seating identified it as a positive environmental factor.

Proximity

The physical space in the classroom (e.g., layout, seating) emerged as another significant environmental condition that impacted satisfaction and comfort. A large portion of codes occurred for *proximity* ($n = 141$) and in almost half the participant surveys ($n = 106$). Overall, it appeared that proximity in the classroom space had a stronger negative impact ($n = 72$) than positive ($n = 44$). While fewer participants in the AL classroom (vs. traditional) identified proximity as an environmental factor, most of them indicated the layout was “overcrowded,” lacked “personal

space”, and could be “uncomfortable.” However, a few noted the room felt “open,” that there was “space” on the table, and it was “easier” to talk to others. In contrast, several participants in traditional classrooms felt there was too much “space” or “distance”, which for some, made it difficult to “hear” and interact with others in the class. While not as frequent, some participants liked having their own or extra “space.”

Sightline

While often in relation to both seating and proximity, *sightline* emerged as was another noteworthy sub-theme. Approximately 28% of participants ($n = 62$) specifically described how the environment impacted their view, with participants in both the AL and traditional classrooms describing similar experiences with sightline. In short, aspects of the classroom made it either more or less difficult to “see” what was happening in the space. This most frequently referred to their view of the projector screen(s), the instructor, and/or other students.

Slightly more participants in the AL classroom ($n = 35$) reported sightline as a relevant environmental factor. Approximately half ($n = 15$) indicated they liked the “double screens” because they can see the “presentations” from “pretty much any angle.” However, the other half ($n = 20$) described the opposite—depending on seat location it could be “difficult to see” the “whiteboard/screen at times.” However, the majority of those in the traditional classrooms ($n = 19$) “liked” how the seating allowed them a “clear view” of the “board and PowerPoint,” the “professor,” and “all the students in the room.” A few ($n = 8$) noted disliking not seeing “other faces” or the “people behind me” and having difficulty seeing the “board.”

Other Design Features

While not as prevalent, participants brought attention to some additional classroom design features. Specifically, individual *chairs* were described as comfortable. A smaller *class size* (i.e., less students) was preferred by a few participants. *Lighting*, mostly the presence of windows, enhanced the space; with the exception of two participants who noted traditional classroom seemed “dark.” Room *temperature* was also mentioned.

Overall Classroom Experience

Another major theme to emerge was overall classroom experience. Analysis revealed 218 of the 219 participants could be designated into one of two categories (i.e., *positive* or *mixed*) based on the consistency or variability within descriptions of their experiences in the class. Refer to Table

2 which includes frequencies and example quotes for all themes and sub-themes.

In total, most of the participants ($n = 158$) described an overall *positive* class experience through consistency in their responses. For example, participant #95 commented, “I had a great experience in our classroom from meeting new people to what I learned from the course” and “I liked the classroom set up, it was a nice environment for my learning.” However, a couple of notable differences emerged between classrooms. In the AL classroom, the vast majority of participants (i.e., 87%) were in this category. Yet, for the traditional classrooms, only about half of the participants (i.e., 58%) were in this category. Further, their *positive* experience appeared influenced by different factors. For almost half of the participants in the traditional classroom (i.e., 29 of 64), central to their satisfaction was, simply, their physical presence in a classroom (i.e., being *face-to-face*). Whereas the source of satisfaction appeared to stem from direct *peer engagement* for the majority of participants in the AL classroom (i.e., 57 of 94).

There were several participants ($n = 60$) that had a more *mixed* class encounter, which was reflected by more variation in their descriptions. For example, participant #48 stated, “It was good. I enjoyed being a part of group discussions” and “The classroom itself is very uncomfortable no matter where you sit.” In this category, the majority of participants were from a traditional classroom (i.e., 76%). The drawbacks in their experiences varied, and while less notable, most related to the sub-themes discussed. For example, some described *proximity* as problematic (e.g., being too far away) or the environment as having no influence (i.e., *neutral*), yet enjoyed the course content.

Our second research question asked, how do student perceptions of the classroom environment relate to the CoI framework? Quantitative and qualitative data were analyzed and the results are presented below.

H1: Students in an AL classroom, versus a traditional classroom, will report greater social and cognitive presence.

As evident in Table 3, participants reported high levels of agreement that face-to-face classroom activities influenced their cognitive presence ($\bar{x} = 3.62$) and social presence ($\bar{x} = 3.45$); with 4.0 representing the maximum score of extremely agree. The results did not support our first hypothesis, that participants in an AL classroom would report greater social and cognitive presence than those in a traditional classroom.

Initial exploration of data found less than 2% appeared missing at random. Data was missing from one course where the CoI items were excluded from the post-survey ($n = 50$). Inspection of boxplots revealed only two outliers in the data, so they were retained in the analyses. The data was not normally distributed, as assessed by Shapiro-Wilk's test ($p = .00$). All variables had negative skewness values. The AL classroom values appeared to be outside the recommended limits for normality with a skewness of -3.399 (SE = .327). For the traditional classroom, skewness was -1.238 (SE = .237).

Thus, a Mann-Whitney U test was run to determine if there were differences in CoI score between the AL and traditional classroom. Distributions of the CoI scores by classroom were similar, as assessed by visual inspection. CoI score was not statistically significantly different between the AL classroom ($Mdn = 3.83$) and traditional classroom ($Mdn = 3.66$), $U = 2,950$, $z = .748$ $p = .454$. While not statistically significant, results partially trended in the predicted direction. The AL classroom reported higher social presence scores, but the traditional classroom reported higher cognitive presence scores (see Table 3).

Social and Cognitive Presence

While there was not a statistically significant difference on the CoI items between the AL and traditional classrooms, a clear difference emerged in the qualitative data. In total, almost three-quarters of participants from the AL classroom ($n = 80$) compared to less than half of participants in the traditional classroom ($n = 53$) articulated social and/or cognitive presence in their responses.

The defining characteristics of social presence are that learners experience a sense of comfort in expressing themselves and communicating, collaboration with their peers, and affective connection (Garrison & Vaughan, 2008).

Measure	AL			Traditional			Total Sample		
	n	M (SD)	Mdn	n	M (SD)	Mdn	n	M (SD)	Mdn
CoIcp	55	3.58 (.63)	3.75	105	3.63 (.49)	4.00	160	3.62 (.54)	4.00
CoIsp	55	3.51 (.73)	4.00	108	3.42 (.64)	3.50	163	3.45 (.67)	3.50
CoItotal	53	3.57 (.65)	3.83	104	3.56 (.48)	3.66	157	3.57 (.54)	3.66

Note. CoIcp = four items of cognitive presence; CoIsp = two items of social presence; CoItotal = CoIcp and CoIsp.

CLASSROOM ENVIRONMENT AND STUDENT OUTCOMES

Table 1. Frequencies and Example Quotes for Satisfaction and Comfort Theme		
Sub-Theme	Frequency (n) Example Quote	Frequency (n) Example Quote
	Active Learning (AL)	Traditional
Seating		
Positive	82	17
	"I think that the physical environment impacted my learning in a good way. I appreciated how the tables were set up instead of individual desks. It gave us a great opportunity to discuss topics more often in a group and interact with others. This is the only classroom that has this set up, and it brought a completely different vibe when in class. It felt more comfortable, and I didn't feel like I was in my own little bubble with barriers between me and the student next to me" (#58).	"I like how we were still in rows despite the fact that we could not be at circle tables. It still isn't the same and makes it feel a little more distant, but I definitely like it better than being super far away from everyone and not really being able to turn around at all and talk to people without have to yell across the room" (#197).
Negative	7	1
	"I prefer to work alone most of the time so the round tables made that a little more difficult" (#88).	I didn't like the tables all facing straight toward the board and that it was only two people per table....I would have preferred the tables to be laid out in a different way as well as it to be larger groups of students at a table.... (#205)
Proximity		
Positive	11	33
	"There was more space to put stuff on the table and it is easier to have a discussion with the other students" (#49).	"I liked that the classroom didn't feel super cramped and that we all had our own space" (#207).
Negative	28	44
	"The only thing I disliked about the round tables in the classroom was that it felt a little smaller and more congested/compact than other classrooms. I felt like we had less space and the tables were somewhat crowded" (#107)	"I disliked the distance I was from the professor and the front of the room" (#120).
Sightline		
Positive	15	19
	"I liked that there were two screens so that I was always able to follow along to material regardless of where I was sitting. I also like that the room was set up in a way that made it easier for the professor to move about the room and facilitate discussion as necessary" (#46).	"I liked the layout/set up of the room because it was always easy to see what was going on up front. It also made it easier to pay attention and not get distracted" (#119)
Negative	20	8
	"It was hard to see the white board, professor, and the note screen at different angles" (#53).	"Due to the screen being so far away, I was frustrated most of the time because I could not read everything in the power points and white board" (#137).
Other Design Features		
Chairs	1	9
	"I like the rolling chairs,...." (#63).	"I like that the seats are comfortable." (#154)
Lighting	2	8

CLASSROOM ENVIRONMENT AND STUDENT OUTCOMES

	“The room was so bright because of the windows so I was always able to stay awake” (#5).	...“the sunlight from the windows really livened up the room and made it more enjoyable for myself and peers” (#193).
Class Size	2	6
	“The class size is good” (#25).	“Since it is a big class, it could get overwhelming at times” (#142).
Temperature	0	2
		“It could be kind of warm when we first got there” (#202).

Table 2. Frequencies and Example Quotes for Overall Classroom Experience Theme		
Sub-Theme	Frequency (n) Example Quote	Frequency (n) Example Quote
Positive Overall Experience	94	64
	“I enjoyed the class” In a classroom setting it was easy to have discussions with the entire class, without our discussions I feel there was some course content that would not have been easily understood” (#38).	“Overall I enjoyed coming to class. There was a lot of good group discussions which was very cool because it has been difficult to find a class that can actually have discussions with other classmates....Everyone in the classroom was respectful and I felt like there was enough space in between everyone so everyone felt comfortable” (#123)
Face-to-Face	1	29
	“The classroom impacted my learning a lot because I learn more when I am face to face with the teacher physically learning the material. Also hearing about others face to face options as well” (#73).	“It was my only in person class and I felt more engaged to learn in this class than my online classes” (#156)
Peer Engagement	57	2
	“All of the class mates at my table were really nice and it was easy to collaborate and learn with them” (#98).	“Collaborating in groups improved my learning experience” (#171).
Mixed Overall Experience	14	46
	“I was slightly stressed when coming because I have a fear of public speaking and lots of participation in front of our peers is required....I enjoyed the circle table setting because it allowed me to get to know my classmates” (#47)	“It was very engaging and I enjoyed the activities to get us moving in the morning...I felt we were oddly spaced out which made group work less effective” (#212).
Proximity	3	19
	“The classroom felt very crowded. I often felt closed in” (#99).	“Did not really allow for that much collaboration with our groups because of the long tables, but it was pretty decent” (#189).
Neutral	4	8
	“I do not believe the classroom itself impacted my learning” (#45).	“It [physical environment] did not impact my learning” (#118).

Social presence was clearly identified for mostly AL participants ($n = 49$), compared to traditional classroom ($n = 6$). They described forming “relationships,” making “friends,” “collaborating,” and that the classroom felt “comfortable” and “helped with class discussion.” The depth and breadth of social presence descriptions from AL participants was unequivocal; as reflected by participant #81’s statement: “I like the set up and how it gave us the ability to invest in relationship with others. It also allowed us to work together as a team.”

While social presence is necessary to establish a learning community, cognitive presence is needed to meet educational goals and this includes intentional encounters which explore, apply, and connect information and ideas (Garrison & Vaughan, 2008). It is the core of educational endeavors. In contrast to social presence, cognitive presence was described by participants in both AL ($n = 28$) and traditional classrooms ($n = 46$). These descriptions focused on participants’ motivation and inquiry with the course content. It was most often reflected with the word “learn.” For example, participant #28 stated, “Good! I feel like I learned a lot in that room.” Similarly, participant #161 stated, “I liked my experience and felt challenged enough that it kept me learning and growing.” Further, participant #8 commented, “Makes me feel like I am not forced to learn, I am more enjoying what I am learning.”

Several additional participants, almost all from the AL classroom (i.e., $n = 21$ of 24), described characteristics of both social and cognitive presence together as reflected in the following statement by participant #105:

I definitely felt that the group setting environment helped me learn more especially when I was able to discuss with my group.... Also, the grouped tables helped me interact with other students and ask questions which then resulted in me learning more information.

Group Formation and Communication

Finally, a sub-theme emerged from these descriptions of social and cognitive presence that provided additional insight. The environmental factor of “tables” was cited as facilitating *group formation* and/or *communication* for 57 of these participants from the AL classroom.

Participants expressed they found it beneficial to sit at a table with the same people over the course of the semester. For example, participant #35 stated “I liked it a lot better, it made it easier to talk in groups instead of moving desks around.” Similarly, participant #6 stated, “I like that we didn’t have to move our desks all the time to work in groups, and that our unofficial, habitual seating patterns allowed me to work with the same members time and again.” This was also described as helping to form “relationships” and/or

increasing their sense of “connection” with others. For example, participant #24 “[Liked] Having students at tables to talk with. At individual desks, it is harder to form relationships.” Participant #58 explained:

I liked that around 5-8 people were all sitting together at one table. When students sit by themselves at their own individual desks, it seems like there is some unwritten rule stating that no one should interact or make new connections. When everyone sits at a table together, it is breaking that barrier.

It appeared to improve participants’ *communication* with others. They described the tables as making it “easier” to communicate, “encourages discussions,” “allowed for more conversation,” “express ideas,” and hearing the “opinions” of others. For example, participant #80 commented, “I liked the round tables--created good communication among my group. Similarly, participant #29 explained,

The classroom is set up in a way that encourages group discussion. It allowed for us to share out more than we would if we sat alone. I liked how it was round tables because I was able to talk to anyone and have eye contact when speaking. It was easier for discussions and everyone felt included.”

In turn, it appeared participants may also have been more actively engaged with the course—socially and cognitively. Participant #69 summarizes the experience as follows:

My experience in the classroom was all around positive. I enjoyed the passion of my professor as well as my other classmates I got to know. The physical environment of the classroom made it comfortable to share ideas in small groups and as a whole classroom. I always felt that even when I was not totally sure my answers were the right ones, being able to handle the feedback and improve upon concepts of confusion really helped me out a lot. I liked that I never felt alone when it came to understanding topics we discussed throughout the course of class. To me the idea of having a table over an individual desk made it more comfortable when it came to engaging with classmates and collaboratively working together as opposed to being in an individual desk.

A few students even described some positive change as a learner. Participant #34 stated, “I think that the classroom allowed me to feel more confident about sharing my opinions.” Similarly, participant #3 commented, “I had a good experience in this classroom. Sitting with a group helped me feel more comfortable to speak and participate,

when usually in a traditional classroom I tend to sit in the back row and avoid conversation.”

Teaching Presence

To sustain learners’ social and cognitive presence, effective teaching presence is required and includes the design (e.g., structure, organization) and delivery (e.g., activities, discourse) of the course curriculum (Garrison & Vaughan, 2008). Notably, teaching presence was articulated by a large portion of total participants (i.e., 74%) and across individuals in both AL ($n = 85$) and traditional ($n = 78$) classrooms. Teaching presence was reflected in two primary sub-themes.

Climate

For participants in both classrooms, teaching presence was often described in relation to the emotional *climate*—or the tone—in the classroom. This was often attributed to the instructor. Participants expressed having a positive experience, more specifically, because the instructor was “very open” and “accepting” of students. They felt “welcome to give [their] opinion” and that it was a “judgement free zone.” Relatedly, some participants expressed the instructor kept their “interest” and felt the environment was “informative” and “educational.” Participant #211 summarizes it as follows:

The experience in our classroom was a positive one. It was a stimulating environment where I felt comfortable enough to share and participate if I chose to do so. I didn’t feel forced to participate and never felt uncomfortable in any way.

“Interactive and Engaging”

In addition to the classroom atmosphere, this theme reflected the design and delivery of the curriculum; the implementation of active-learning strategies. Participants described their satisfaction as a result of the class being “interactive” and “engaging.” Further, they expressed liking the “activities,” “hands on type of learning” and “group discussions.” Finally, some explained that they “look forward to coming to class” and that class was not “boring” because of the activities and interaction. Participant #162 describes it as follows: “I very much enjoyed this class. The class was always upbeat and discussion took place on a regular basis. I also enjoyed breaking out into small groups and conversing with my classmates.” Participant #58 commented similarly:

I would say that my experience in our classroom was very positive. I interacted with peers more often than I did or

have in other classrooms. I liked how we were very discussion based and how it was encouraged to express our ideas throughout the semester.

Discussion

The results of this study lend important take-aways to the current body of literature. To date, the majority of research has focused on performance-based outcomes impacted by the classroom environment. However, this study used the CoI framework to explore environmental influences on three components (i.e., social, cognitive, and teaching presence) recognized as fundamental to a quality learning endeavor. To our knowledge, only a few other studies have implemented the CoI framework (Lee & Kim, 2018; Stover & Ziswiler, 2017; Yilmaz, 2017). This study also improves on methodological limitations of previous research such as those that conflated AL teaching strategies with AL classrooms (Stover & Ziswiler, 2017), used different instructors (Boulden et al., 2019), or had small sample sizes (Vercellotti, 2018; Allsop et al., 2020).

In the current study, students in the AL classroom reported greater social presence than those in traditional classrooms, though not statistically significant. Similarly, Stover and Ziswiler (2017) found social presence increased, though not significantly, when a lecture-based course transitioned from a traditional to AL classroom. They found that social presence increased significantly when an instructor moved to an AL classroom and increased teaching presence—thus concluding that AL strategies were more influential than the classroom. However, our mixed methods findings provide additional insight and lend support to the notion that instructor strategies, as well as specific classroom conditions, impact student outcomes.

The CoI framework has established that teaching presence facilitates social and cognitive presence. Teaching presence includes course design and organization, instruction, and supporting discussion. Our qualitative findings clearly revealed the important role of the instructor. Across both traditional and AL classrooms, students described that the instructor created a positive emotional climate where students felt safe to engage in the process of inquiry, along with satisfaction from an interactive and engaging class. Thus, the instructor fostered social presence similarly in all classrooms, which may have influenced the non-significant differences on quantitative measures. These findings may also provide additional explanation to prior research. It may be that social presence increased significantly for one class in Stover and Ziswiler (2017) because teaching presence was enhanced via the adoption of more engaging pedagogy.

A new component—instructor social presence—has been proposed for the CoI framework. Instructor social presence extends teaching presence and reflects expressions of caring,

encouragement to share, and fostering a sense of unity (Pollard et al., 2014). Taken together, we believe our findings add support for the recommendation that instructor social presence be considered as an additional component in the CoI framework (Pollard et al., 2014).

Although results indicated non-significant differences between classrooms, social presence was slightly higher for students in the AL classroom, and this was similar to the non-significant increase in social presence after moving from a traditional to AL classroom (Stover & Ziswiler, 2017). Our qualitative findings revealed unique influences of specific environmental conditions in the classroom in relation to social presence. Seating was the most prominent feature in the classroom. The round tables were referenced as a positive influence by more than seventy-five percent of students in the AL classroom. This supports earlier research findings that seating is an influential factor (Hill & Epps, 2010).

Further, we found table seating facilitated group formation and communication. This provides support from the student perspective for recent research findings. Our students perceived the pre-determined table seating as more convenient than re-arranging individual desks, which aligns with teacher observations about the ease of group formation after moving into an AL classroom (Zimmerman et al., 2018). More importantly, our students described being compelled to interact with peers over the duration of the semester. This resulted in rich descriptions of social presence such as, forming relationships, making friends, and collaborating like a “team.” This supports recent findings by Young et al. (2021) which noted teachers’ perceptions that certain furniture (i.e., tables and chairs) conveys specific messages (i.e., interaction) and thus students’ behaviors change and there is increased engagement. Taken together, these findings provide support for scholars’ conclusions that AL environments facilitate collaboration (Park & Choi, 2014) and the circular table may be the single most essential feature in a classroom (Najmabada, 2017).

The current study was feasible due to the Covid-19 pandemic and the resulting changes required in higher education classroom environments. Given some data was collected during the 2020-2021 academic year, it is also important to note unique classroom conditions which may have influenced student perceptions. To achieve social distancing requirements, students in the traditional classrooms sat further apart than would have been required under normal circumstances, or if the rooms had been used to their capacity. Figure #1 illustrates classroom seat usage. The increased social distancing may have enhanced students’ perception of safety and thus satisfaction with the environment, whereas for others it may have decreased satisfaction—regarding proximity for example. Also,

student satisfaction was positively impacted by simply returning to face-to-face class(es) after a period of online interface—despite the increased social distancing in traditional classrooms. The courses included in this study may have been the students only face-to-face class since many courses remained online during the 2020-2021 academic year. Physical constraints in the AL classroom were also reflected in the qualitative data. Seating in the AL classroom allowed only 17 square feet per person, which is denser than ideal, given the standard for education classrooms is 20 square feet per person, per the International Building Code (see Occupant Load Factor Table 1004.5 Maximum floor area allowances per occupant) (ICC, 2021).

A strength of this study was that influential environmental features emerged from the qualitative data. To gain further understanding, we encourage future research to allow students to rank order various environmental factors (e.g., tables, chairs, windows, lighting, etc.). As higher education emerges from the Covid-19 pandemic, future studies would benefit from exploring the extent to which this new “pandemic” variable influences student experience in the classroom.

In conclusion, our qualitative and quantitative results provide support for the unique roles of the physical classroom environment, as well as instructor strategies—such as instructor social presence. Some scholars have suggested it is more important to focus on implementing specific active-learning strategies—rather than classroom design—to achieve particular objectives (Metzger & Langley, 2020). We suggest it is also relevant to examine how components of the classroom environment may enhance—or distract from—implementation of active-learning strategies. It may be most effective to consider both the environment and the strategies in relation to specific student outcomes.

References

- Allsop, J., Piatt, J., Young, S. J., Nelson, E. J., & Knapp, D. (2020). Examining the benefits associated with implementing an active learning classroom among undergraduate students. *International Journal of Teaching and Learning in Higher Education*, 32(3), 418-426.
- Alstete, J. W., & Beutell, N. J. (2018). Designing learning spaces for management education: A mixed methods research approach. *Management Education*, 37(2), 201-211.
- Beichner, R., Saul, J.M., Abbott, D. S., Morse, J.J., Deardorff, D. L., Allain, R. J., Bonham, S. W., Dancy, M.H., & Risley, J.S. (2007). The student-centered activities for large

- enrollment and undergraduate programs (SCALE-UP) project. In E. F. Redish & P.J. Cooney (Eds.), *Research-Based Reform of University Physics*, (pp.1-42). American Association of Physics Teachers.
- Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, 79(3), 1243–1289.
- Bolden, E. C., III, Oestreich, T. M., Kenney, M. J., & Yuhnke, B. T., Jr. (2019). Location, location, location: A comparison of student experience in a lecture hall to a small classroom using similar techniques. *Active Learning in Higher Education*, 20(2), 139-152.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Brooks, D. C. (2011), Space matters: The impact of formal learning environments on student learning. *British Journal of Educational Technology*, 42(5), 719-726.
- Cotner, S., Loper, J., Walker, J.D., & Brooks, D.C. (2013). “It’s not you, it’s the room” - Are the high-tech, active learning classrooms worth it? *Journal of College Science Teaching*, 42(6), 82-88.
- Creswell, J. W. (2007). *Qualitative inquiry and research design choosing among five approaches*. SAGE Publications.
- Doyle, T. (2008). *Helping students learn in a learner-centered environment: A Guide to Facilitating Learning in Higher Education*. Stylus Publications.
- Doyle, T. (2011). *Learner-centered teaching: Putting the research on learning into practice*. Stylus Publishing.
- Felder, R. M., & Brent, R. (2009). Active learning: An introduction. *ASQ Higher Education Brief*, 2(4), 1-5.
- Freeman, S. Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy Proceedings of the National Academy of Sciences in the United States of America*, 111(23), 8410-8415. doi: 10.1073/pnas.131903111
- Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, 11(1), 61-72.
- Garrison, D. R. (2011). *E-learning in the 21st century: A framework for research and practice, 2nd edition*. Routledge.
- Garrison, D. R., & Akyol, Z. (2013). Towards the development of a metacognition construct for communities of inquiry, *The Internet and Higher Education*, 17, 84-89.
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education*, 2(2-3), 87-105.
- Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2009). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *Internet and Higher Education*,
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Identifying the purposes for mixed methods designs. In V. L. Plano Clark & J. W. Creswell (Eds.), *The mixed methods reader* (pp. 121-148). SAGE Publications. (Reprinted from *Educational Evaluation and Policy Analysis*, 11, pp. 255-274).
- Hao, Q., Barnes, B., & Jing, M. (2021). Quantifying the effects of active learning environments: Separating physical learning classrooms from pedagogical approaches. *Learning Environments Research*, 14, 109-122.
- Harpaz, Y. (2005). Teaching and learning in a community of thinking. *Journal of Curriculum and Supervision*, 20(2), 136-157.
- Hill, M.C., & Epps, K.K. (2010). The impact of physical classroom environment on student satisfaction and student evaluation of teaching in the university environment. *Academy of Educational Leadership Journal*, 14(4), 65-79.
- International Codes Council (ICC). (2021) 2021 International Building Code, https://codes.iccsafe.org/content/IBC2021P1/chapter-10-means-of-egress#IBC2021P1_Ch10_Sec1004
- King, A. (1993). From sage on the stage to guide on the side. *College teaching*, 41(1), 30-35.

- Kozan, K., & Caskurlu, S. (2018). On the Nth presence for the Community of Inquiry framework. *Computers & Education*, 122, 104-118.
- Lam, J. Y. C. (2015). Autonomy presence in the extended community of inquiry. *International Journal of Continuing Education and Lifelong Learning*, 8(1), 39-61.
- Lee, Y. H., & Kim, K-J. (2018). Enhancement of student perceptions of learner-centeredness and community of inquiry in flipped classrooms. *BMC Medical Education*, 18, 242. <https://doi.org/10.1186/s12909-018-1347-3>
- Lewin, K. (1936). *Principles of topical psychology*. McGraw Hill.
- Merriam, S.B. (2009). *Qualitative Research A Guide to Design and Implementation*. John Wiley & Sons.
- Metzger, K.J., & Langley, D. (2020). The room is not enough: Student engagement in active learning classrooms. *College Teaching*, 68(3), 150-160.
- Najmabadi, S. (29 June 2017). Does redesigning classrooms make a difference to students? *The Chronicle of Higher Education*. <http://www.chronicle.com/article/Does-Redesigning-Classrooms/240491?CID=ADCHEEMFY17STEE3>
- Park, E. L., & Choi, B. K. (2014). Transformation of classroom spaces: Traditional versus active learning in colleges, *Higher Education*, 68(5), 749-771.
- Perks, T., Orr, D., & Alomari, E. (2017). Classroom redesign to facilitate student learning: A case study of change to a university campus. *Journal of the Scholarship of Teaching and Learning*, 16(1), 53-68.
- Pollard, H., Minor, M., & Swanson, A. (2014). Instructor social presence within the community of inquiry framework and its impact on classroom community and the learning environment. *Online Journal of Distance Learning Administration*, 17(2).
- Radcliffe, D. (2009). A pedagogy-space-technology framework for designing and evaluating learning places. In D. Radcliffe, H. Wilson, D. Powell, & B. Tibbetts (Eds), *Learning spaces in higher education: Positive outcomes by design. Proceedings of the Next Generation Learning Spaces 2008 Colloquium* (pp. 11-16). University of Queensland and the Australian Learning and Teaching Council. <http://www.uq.edu.au/nextgenHaoerationlearningspace/proceedings>
- Shea, P., & Bidjerano, T. (2012). Learning presence as a moderator in the community of inquiry model. *Computers & Education*, 59(2), 316-326.
- Stenbom, S., Hrastinski, S, & Cleveland-Innes, M. (2016). Emotional presence in a relationship of inquiry: The case of one-to-one online math coaching. *Online Learning*, 20(1), 1-16.
- Stover, S., & Ziswiler, K. (2017). Impact of active learning environments on community of inquiry, *International Journal of Teaching and Learning in Higher Education*, 29(3), 458-470.
- Van Horne, S., Murniati, C., Gaffney, J. D. H., & Jesse, M. (2012). Promoting active learning in technology-infused TILE classrooms at the University of Iowa, *Journal of Learning Spaces*, 1(2).
- Vercellotti, M. L. (2018). Do interactive learning spaces increase student achievement? A comparison of classroom context. *Active Learning in Higher Education*, 19(3), 197-210. <https://doi.org/10.1177/1469787417735606>
- Walsh, W. B., Price, R. H., & Craik, K. H. (1992). Person-environment psychology: An introduction. In W. B. Walsh, K. H. Craik, & R. H. Price (Eds.), *Person-environment psychology: Models and perspectives* (pp. vii-xi). Lawrence Erlbaum Associates.
- Wertz, R. E. H., & Purzer, Ş. (2021). Learning presence within the Community of Inquiry framework: An alternate measurement survey for a four-factor model. *The Internet and Higher Education*. <http://doi.org/10/1016/j.iheduc.2021.100832>
- Yilmaz, F. G. K (2017). Predictors of Community of Inquiry in a flipped classroom model. *Journal of Educational Technology Systems*, 46(1), 87-102. <https://doi.org/10.1177/0047239516686047>
- Young, B., Hynes, W., & Hynes, M. (2021). Promoting engagement in active-learning classroom design. *Journal of Learning Spaces*, 10(3), 13-27.
- Zimmermann, P. A., Pierce, R. L., Stallings, L., & Largent, D. (2018). Classroom interaction redefined: Multidisciplinary perspectives on moving beyond traditional classroom spaces to promote student engagement. *Journal of Learning Spaces*, 7(1), 45-61.

Appendix A

Survey Items	
Variable	Survey Item
Quantitative	
Social Presence	Face-to-face classroom activities increased my comfort in participating in discussions with others (e.g., peers, professor).
	Face-to-face classroom activities helped me develop a sense of collaboration.
Cognitive Presence	Face-to-face classroom activities helped me understand fundamental concepts within the class.
	Face-to-face classroom activities were valuable in helping me appreciate different perspectives.
	Face-to-face classroom activities helped me resolve questions and construct solutions related to class content.
	Face-to-face classroom activities helped me feel motivated to learn.
Qualitative	
	What was your experience like in our classroom?
	How did the physical environment (i.e., classroom) impact your learning in this class?
	Compared to a traditional classroom (i.e., individual desks), what did you like about our classroom?
	Compared to a traditional classroom (i.e., individual desks), what did you dislike about our classroom?
	Do you have any other thoughts, feelings, input, suggestions you would like to share about your experience in the class?