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Impact of Active Learning Environments on Community of Inquiry

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Colleges and universities are beginning to invest in active learning (AL) classrooms in an effort to replace the traditional lecture style pedagogy that is frequently used by many professors in higher education (Eagan et al., 2014). This is a quantitative research study conducted at a medium-sized Midwestern university. Students were given the Community of Inquiry (CoI) Survey in three different classes. The research study compared students' perceptions of Teaching Presence (TP), Social Presence (SP), and Cognitive Presence (CP) differences from classes first taught in a traditional auditorium lecture-style format, then taught in an AL classroom. This study shows that it is not the physical structure of AL classrooms that had an impact on students' levels of TP, SP, and CP, but the instructional design of these classes that had an impact in these areas. The study also shows that when implementing AL classrooms, instructors need to make intentional design decisions to keep the levels of TP at high levels.

National attrition rates are alarmingly high in public higher education with only 55% of students successfully completing their degree within six years (U.S. Department of Education, 2015). One contributing factor to the high rate of attrition is the common practice of herding students into large enrollment introductory courses taught in auditorium style classrooms with a strong preponderance of instructor lecture (Downs & Wilson, 2015). Large class size is associated with students' perception of course quality and student retention. Westerlund (2008) found that students have a negative perception of the course quality in larger classes, with 17% less likely to give a top score for course evaluations and 30% less likely to give a top score for the instructor evaluation. Schreiner (2009) found that large lecture classes result in lower student retention. Many students view these introductory courses as a painful hurdle that must be cleared before being able to move on to more useful and interesting courses (Ulbig & Notman, 2012). As higher education continues to have tighter budgets, the size of classrooms will continue to rise (Kiley, 2011). There is an inextricably intertwined use of lecture as a teaching pedagogy as class sizes increase (McKeachie, 1980) where the education philosophy for most instructors is "learning is listening [and] teaching is telling" (Harpaz, 2005, p. 137).

Kuh and O'Donnell (2013) have identified high-impact practices in undergraduate education to ensure quality education as designing classes with collaborative learning that permit students to work together to solve problems. While developing classes that include community and collaboration can help to achieve deep and meaningful learning, this can be challenging to implement in large classes (Lipman, 2003; Ramsden, 2003). Higher education introductory classes are frequently large-enrollment classes that are taught in large, stadium-style auditoriums, an environment not conducive to student participation (Baldwin, 2009). Large lecture auditoriums can discourage student participation because the large size of the rooms exceeds the distance between instructor and students that is comfortable for social interactions (Hall, 1966). The auditoriums normally include seats that are situated close together in fixed rows, which makes it difficult to have students converse with each other. Therefore, many of the large lecture rooms remain impersonal and have little participation (Vorvoreanu, Bowen, & Laux, 2012). With little student participation, instructors cannot properly gauge students' levels of understanding and often make incorrect assumptions of students' level of comprehension (Richards & Velasquez, 2014). This makes it difficult for instructors to revise instruction for any remedial lessons that are needed which could have negative ramifications on cognitive learning. The purpose of this article is to examine large classes first taught in a lecture-style format and then taught in a class redesigned using active learning strategies to measure the impact on students' levels of community in a community of inquiry (CoI).

Literature Review

Bruner (1986) suggested that effective learning requires that students need to be actively involved in developing their own learning and also need a learning community that shares a common culture. Seixas (1993) referred to a collaborative learning environment as an environment where the instructor is responsible for designing a classroom where authority is shared with students in the classroom to create a Community of Inquiry (CoI). Students assume more responsibility for their own learning in a CoI classroom by working together as a community to discuss multiple viewpoints to reach an eventual conclusion as a "community of thinking" (Harpaz, 2005, p. 136). Instructors incorporating the CoI teaching methodology aim to

create environments where students' learning can be transformed into critical thinking and deeper levels of understanding (Splitter, 2011).

In an effort to increase classrooms that have higher levels of CoI, many universities are implementing active learning (AL) environments. The AL classroom design recognizes the importance of getting students to become more actively involved in their education, as well as assume more responsibility for their education. Instructors designing classes for AL environments move away from knowledge transmission using lecture pedagogy to designing classes where students work as a community of inquiry (Lipman, 2003). Active Learning can be 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). Other names for AL classrooms include Student-Centered Active Learning Environment for Undergraduate Programs (SCALE-UP), Technology Enabled Active Learning (TEAL), Teaching and Learning Spaces Working Group (TLSWG), and many others. While there are differences between models, the AL classrooms are similar in the fact that the learning spaces are designed to have more active student participation, include higher levels of collaborative learning, and require students to assume more responsibility of their own learning. AL classrooms also shift the role of the faculty from relaying information to becoming coach and facilitator (Park & Choi, 2014). Most AL classrooms continue to be large enrollment, but they move away from the fixed stadium style auditorium to a more flexible room where students sit at tables seating 6 to 9, making collaboration and team work easier to implement (Park & Choi, 2014). AL classrooms will frequently equip students with technology such as laptop computers that allow instructors to implement AL strategies such as entrance quizzes to hold students accountable for homework readings, real-time polling to encourage active participation or peer instruction, and case studies.

Implementing AL classrooms is not an easy or inexpensive endeavor. Higher education administrators undertake a huge investment by building new classrooms (and maybe even new buildings), equipping the rooms (multiple projectors, electronic whiteboards, round desks, chairs, desk microphones), purchasing the technologies (lap tops for students, classroom management software, projector for teacher, projector for groups), and installing the equipment (adding extra internet and electronic capabilities, adding security, locking down the laptop computers).

Implementing AL classrooms is also a challenge for college faculty. Faculty need to go through extensive training to ensure they can utilize the technologies that are installed in the new AL classrooms. However, it is easy for faculty to become so consumed in mastering the technology that they focus exclusively on the technology to make an impact on students' learning (Valenti, 2002). It is critical for faculty go through an extensive course redesign to make sure that pedagogy and technology are considered in tandem (Brown, 2005). Radcliffe (2009) refers to this as the Pedagogy-Space-Technology (PST) framework as it is important to consider all three elements when instructors are designing their courses for the AL classroom. Radcliffe (2009) suggests faculty adopt an instructional design process that considers pedagogy (what are my learning objectives), space (how can I use this space to help meet my learning objectives), and technology (what technologies can I use to meet my learning objectives).

Garrison and Vaughan (2008) define an academic community of inquiry (CoI) as a group of students "whose connection is that of academic purpose and interest who work collaboratively toward intended learning goals and outcomes" (p. 17). The three interdependent elements of a CoI framework include teaching presence, social presence, and cognitive presence (Garrison, 2011). Teaching presence (TP) is defined as the design, facilitation, and direction of a class to ensure students achieve meaningful and worthwhile learning outcomes while working within a Community of Inquiry (Garrison, 2011). Social presence (SP) is defined as students' ability to relate to their classmates, to have trust in their ability to communicate with classmates, and to form personal and effective relationships within the class (Garrison, 2011). Cognitive presence (CP) is defined as students' ability to construct meaning through discussion and reflection while working in a community of inquiry (Garrison, 2011).

In a traditional lecture-based class taught in an auditorium classroom, the instructor is the primary focus of all the students in the classroom. Students become passive learners in that they watch their instructors deliver their lecture and the students may or may not take notes throughout class. This environment requires the instructor to do the bulk of the work to prepare for class with students having little preparation expectations. These roles change dramatically in an AL classroom. Students become active learners as they are required to become problem solvers and contributors in class activities. Instructors continue to be active participants, but assuming more of a supporting role while students are completing their activities (Bracewell, LeMaistre, Lajoie, & Breuleux, 2008). The instructors' role for class preparation remains high, but most of this takes place outside of class time in class preparation, so students do not see their instructors' preparation (Pundak, Herscovitz, Shacham, & Wiser-Biton, 2009). Students' own class preparation needs to increase since they are frequently assessed with

entrance quizzes. In the lecture-format classroom, instructors are the sole source of knowledge and authority. However, in the new AL classroom students become contributors to knowledge and authority (MacGregor, 1990).

While the new AL classroom may have potential to have a positive impact on students' learning, not all students are embracing the change from passive to active learning (Brookfield, 2015). College classrooms have become institutionalized such that students have clear expectations: the students' responsibility is to complete assignments, come to class, study and learn the course material. However, students view the paid instructor as having the responsibility to be active and allow the student customer to be a passive listener (Howard & Baird, 2000). Even though the research may show that AL classrooms result in high levels of student learning (Freeman et al., 2014), many students are intractable and stay rooted in their comfortable "passive" forms of learning (Doyle, 2008). A frequent motivation of students to take a course is simply to pass a course, and therefore, students expect their instructors to provide the answers they need to pass the course examinations (Modell, 1996). If students are required to take a more active role in developing their own knowledge, this would contradict their current expectations. Students resist adopting more active forms of learning because students do not like to take learning risks. Active learning requires students to put forth more work and effort, and students' mind-sets about passive learning are fixed due to years of previous passive learning experiences (Doyle, 2008). Howard and Baird (2000) found that almost all students believe that it is the responsibility of the instructor to be knowledgeable on the subject matter, and it is the students' responsibility to take notes. They also found that some of the students were concerned when talkative students took time away from the instructor as they felt the instructor was the sole source on knowledge, and they wanted to make sure they were getting all the information they could while in class.

Freire (1970) wrote in his seminal book *Pedagogy of the Oppressed* that the traditional lecture-style approach to education was like a "banking" approach to education where instructors made deposits of information to students' brains, which he compared to empty bank accounts. Freire felt that this type of pedagogy resulted in instructors controlling students' thinking and inhibited their creative power. Freire espoused that this type of pedagogy resulted in a dehumanizing educational experience that stimulated oppressive practices and attitudes in society. Freire called for instructors to move toward more active learning pedagogies where class participants can communicate and become actively involved in their knowledge construction. The hypotheses being examined for this research study are:

H1: Teaching in an active learning classroom will have a positive impact on students' perception of Teaching Presence (TP).
H2: Teaching in an active learning classroom will have a positive impact on students' perception of Social Presence- Interaction (SP-I).
H3: Teaching in an active learning classroom will have a positive impact on students' perception of Social Presence- Participation (SP-P).
H4: Teaching in an active learning classroom will have a positive impact on students' perception of Cognitive Presence (CP).

Method

Participants

Participants in this study were undergraduate students enrolled in a medium sized Midwestern university who were enrolled in classes with enrollment over 70 (see Table 1). Students identified as female (n = 268), male (n = 139), and the fewest identified as other (n = 2). Students' ages ranged from 18-24 (n = 341), 25-30 (n = 29), 31-40 (n = 18), 41-50 (n = 9), and 50+ (n = 4). Students identified their race as Caucasian (n = 310), Other (n = 37), Black/ African American (n = 30), Asian (n = 21), Hispanic/ Latino (n = 10), and American Indian/ Alaska native (n = 2). Students identified their academic classification as Sophomore (n = 134), Junior (n = 95), First year (n = 92), and Senior (n = 73). Only 6.3% (n = 25) identified themselves as an international or foreign national.

Procedure

A hard copy survey Scantron was given in class during the last week of the semester. Due to student absenteeism or unwillingness to participate in the research study, there was a 70% response rate from students in these classes. The survey was administered by a researcher other than their instructor to ensure their results remained anonymous and had no impact on their final grade. Data analysis was performed in SPSS. Exploratory factor analysis (EFA) was used to describe and summarize the items in the survey by grouping them together into correlated measures (Tabachnick & Fidell, 2013). EFA was selected to verify the CoI three factor framework (TP, SP, and CP). The sample size of 417 meets the criteria of at least 5 to 10 participants per item or at least 300 participants (Tabachnick & Fidell, 2013). In addition to the survey, one of the researchers observed a class taught during the 2015 Spring term

Table 1
Student Descriptive Data

Class	Enrollment (Day 1)	Enrollment (Last day)	Total Responses	Participation %
		CLASS 1		
1-Spring	100	99	49	49%
1-Fall	87	72	52	72%
		CLASS 2		
2-Spring	80	72	45	63%
2-Fall-E*	100	84	46	55%
2-Fall-L**	100	87	50	57%
		CLASS 3		
3-Spring	77	74	70	95%
3-Fall	108	106	105	99%
		TOTAL		
Total	652	594	417	70%

*E = Early class. **L = Late class

and the 2015 Fall term for each of the instructors. Interviews were also conducted with each of the instructors after the Spring and Fall terms.

Materials

The CoI framework was used in many qualitative studies in an effort to examine the level of community of inquiry and the three interdependent sub-scales of TP, SP, and CP in online and blended learning classes (Garrison, Anderson, & Archer, 2010). In an effort to develop an assessment measurement with more common methodologies and methods, work began on the CoI survey (Swan et al., 2008). The CoI survey was developed to become a valid and reliable measure to test all the components of the CoI framework (Arbaugh et al., 2008).

The 34 self-report items from the Community of Inquiry (CoI) (Swan et al, 2008) was slightly modified so that the survey was appropriate for an AL environment (see Appendix A1). Participants responded to questions such as, "Class discussions help me to develop a sense of collaboration" using a Likert-type scale ranging from 1 = "Strongly disagree," 2 = "Disagree," 3 = "Neutral," 4 = "Agree," and 5 = "Strongly agree." The CoI Survey questionnaire was originally developed as a tool to measure the Community of Inquiry (CoI) framework in online and blended learning settings. The CoI survey was selected for this research study in an attempt to measure the students' perceptions of changes in the three factors of TP, SP, and CP (Swan, et al., 2008) between the traditional lectures and the AL teaching environment. The original CoI researchers conducted a confirmatory factor analysis to validate the three-factor design of the CoI Survey (Arbaugh et al., 2008). The results from the PCA were consistent with the design of the survey that supported the three-factor model with questions 1-13 (TP), questions 14-22 (SP), and questions 23-34 (CP) loading for each factor. Cronbach's Alpha yielded a high degree of internal consistency for each factor; TP (α = .94), SP (α = .91), and CP (α = .95) (Arbaugh et al., 2008).

Instructor and Class Overview

Classes taught during the 2015 Spring term were conducted in a traditional auditorium classroom. These classrooms were equipped with fixed student seating, and the instructor lectured from a podium in the front of the class. Class 1 was 99% instructor lecture while Class 2 and Class 3 were about 85% lecture with occasional class discussions or case studies interspersed. The three faculty in this study applied to be part of a university teaching and learning circle to provide help and support in redesigning their course from a traditional lecture to an AL classroom. These faculty attended six months of training in the university teaching and learning center to learn how to design and teach in an AL classroom. The instructors' classes were moved to the new AL classrooms during the 2015 Fall term. In the AL classes, students sat at round tables where every participant had their own laptop. While each AL classroom was equipped with a teacher podium, all of these teachers chose to walk through the classroom while teaching. The instructor for Class 1 chose to implement a complete overhaul of her lecture pedagogy to move to an AL pedagogy that included much less lecture, case studies, group work, daily in-class electronic quizzes, student discussion, and polling questions. The Class 1 instructor went from 99% lecture in the Spring to 40% lecture in the Fall. While the Class 1 instructor added active learning strategies when teaching in the AL classroom, she interspersed short mini-lectures to provide students with course

Table 2
Class Design Changes from 2015 Spring to 2015 Fall

Class	Lecture Amount	AL Amount	Design Change	Group work	Case Studies	Student Discussion	Quiz & Polling
				CLASS 1			
1-Spring	99%	1%	90%	No	No	No	Yes
1-Fall	40%	60%		Yes	Yes	Yes	Yes
				CLASS 2			
2-Spring	85%	15%		Yes	No	Yes	No
2-Fall-A	80%	20%	10%	Yes	No	Yes	No
2-Fall-B	80%	20%		Yes	No	Yes	No
				CLASS 3			
3-Spring	85%	15%	90%	Yes	Yes	Yes	Yes
3-Fall	10%	90%		Yes	Yes	Yes	Yes

Table 3
CoI Survey Item Groupings After Factor Analysis

Teaching Presence TP	Social Presence Interaction SP-I	Social Presence Participation SP-P	Cognitive Presence CP
Q1	Q14	Q17	Q32
Q2	Q15	Q18	Q33
Q3	Q16		Q34
Q4			
Q5			
Q6			
Q8			
Q9			
Q13			

information, misconception realignments, or tutorials on course skills. Class 2 had one section in the Spring and then two sections in the Fall, with one being taught earlier in the day (Class 2-E) and one being taught later in the day (Class 2-L). The instructor for Class 2 (E and L) took advantage of the laptop computers to upload content, but changed little of his original class design from the previous Spring. The instructor went from about 85% lecture in the Spring to about 80% lecture in the Fall (Table 2). The instructor for Class 3 completely revised her course for the AL classroom so that students watched video lectures before coming to class and then spent the entire class period completing active learning strategies such as case studies and application quizzes where students were graded from responses provided by an audience response system.

Results

The factorability of the 34 items included in the CoI survey were examined using several recognized criteria. Of the 34 items in the survey, 24 demonstrated a correlation of at least .3, which suggests factorability with the population sample (N = 417) (Tabachnick & Fidell, 2013). Tests to determine factorability such as the Kaiser-Meyer-Olkin (KMO) and the Bartlett's test of sphericity were given. The KMO measure of sampling adequacy was .95, which Hutcheson and Sofroniou (1999) considered a "marvelous" value, and Bartlett's test of sphericity was significant (p = .000), indicating the factor model is appropriate. Of the 34 items, 31 had communalities above .4, suggesting that each item in the survey shared some common variance with the other items (Costello & Osborne, 2005). Given these indicators, a factor analysis was conducted.

Exploratory factor analysis (EFA) with principal axis factoring and varimax rotation was used to identify the underlying relationships between the survey items (Norris & Lecavalier, 2010). The number of factors were selected based on eigenvalues of 1.00 or higher (Gorsuch, 1983). Principal axis factoring assumes all variables have been measured with some degree of error (Kim & Mueller, 1978). Varimax (orthogonal) rotation attempts to minimize the number of variables that have high factor loadings, thus interpretability of factors can be enhanced. Any items that did not have a

Table 4
Descriptive Statistics for the Four Sub-Scale Factors (N = 417)

	No. of items	M	SD	Skewness	Kurtosis	Alpha
Teaching Presence	9	3.76	.77	-.263	-.477	.91
Social Presence: Interaction	3	3.79	.80	-.59	.65	.71
Social Presence: Participation	2	3.37	1.09	-.332	-.552	.88
Cognitive Presence: Application	3	3.56	.94	-.648	.152	.86

primary factor load of .4 or above were removed to ensure adequate item communalities (Costello & Osborne, 2005). Items with higher than a .32 cross-loading were removed to follow guidelines for the minimum loading of an item (Tabachnick & Fidell, 2001) (see Appendix B1). After removing those items that did not meet the specified criteria, the data resulted in four factors (see Table 3). There was one additional extracted factor than the original factors proposed by Garrison, Anderson, and Archer (2000), therefore, the names of the extracted factors were modified to: Teaching Presence (TP), Social Presence – Interaction (SP-I), Social Presence – Participation (SP-P), and Cognitive Presence (CP).

Internal consistency for each of the four scales was examined using Cronbach's alpha (Cronbach, 1951). Per George and Mallery's (2016) guidelines, the alphas for each subscales showed a strong internal consistency (Table 4). Composite scores were created for each of the four factors. Descriptive statistics are presented in Table 4. The four factor sub-scales were used to compare the three classes using descriptive statistics. An independent samples *t*-test was performed to determine if each class had statistically different sub-scale scores when instructors moved from the traditional auditorium classroom to the AL classroom. Distributions were sufficiently normal to perform a *t*-test (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010).

Hypothesis #1: Teaching Presence (TP)

The first hypothesis states the move from traditional lecture to an AL classroom will impact students' perceptions of TP. All four classes taught in the active learning classroom had lower TP scores compared to those taught in the traditional, auditorium classroom (see Appendix C1). To test the hypothesis that students' perceptions of TP in the AL classroom were associated with statistically significant differences, an independent samples *t*-test was performed. Equal variances were not assumed. Class 2-L was associated with a statistically significant decrease, $t(92.606) = 1.99$, $p = .05$ and Class 3 was also associated with a statistically significant TP decrease, $t(144.274) = 4.753$, $p = .000$. Further, Cohen's effect size value for Class 2-L ($d = ..40$) suggested moderate practical significance, and Class 3 ($d = ..74$) suggested large practical significance (Cohen, 1992). Therefore, the AL classroom negatively impacted students TP scores for Class 2-L and Class 3.

Hypothesis #2: Social Presence - Interaction (SP-I)

The second hypothesis states the move from traditional lecture to an AL classroom will impact students' perceptions of Social Presence- Interaction (SP-I). Three of the four classes examined (Class 1, Class 2-E, and Class-2-L) resulted in numerically higher SP-I scores than those classes taught in the traditional auditorium classroom. One class (Class 3) realized a decrease in the SP-I score when moving to the AL classroom (see Appendix C1). An independent samples *t*-test showed that only Class 1 was associated with a statistically significant SP-I increase, $t(98.42) = -3.773$, $p = .000$. Cohen's effect size value for Class 1 ($d = .74$) suggested a large practical significance (Cohen, 1992). Therefore, the AL classroom had a positive impact on SP-I for Class 1.

Hypothesis #3: Social Presence – Participation (SP-P)

The third hypothesis states the move from traditional lecture to an AL classroom will impact students' perceptions of Social Presence- Participation (SP-P). Three of the four classes examined (Class 1, Class 2-E, and Class-2-L) resulted in a numerically higher SP-P scores than those classes taught in the traditional auditorium classroom (see Appendix C1). One class (Class 3) realized a decrease in the SP-P score when moving to the AL classroom (see Appendix C). An independent samples *t*-test showed that only one of the classes (Class 3) was statistically significantly lower SP-P after being taught in the AL environment ($p = < .05$). Cohen's effect size value for Class 3 ($d = .37$) suggested a moderate practical significance (Cohen, 1992). Therefore, the AL classroom had a negative impact on students' perceptions of SP-P for Class 3.

Hypothesis #4: Cognitive Presence (CP)

The fourth hypothesis states the move from traditional lecture to an AL classroom will have an impact on students' perceptions of Cognitive Presence (CP). Two of the four classes examined (Class 1 and

Class 2-E) realized a CP score increase and two of the classes (Class 2-L and Class 3) a decrease in the CP score when moving to the AL classroom (see Appendix C1). An independent samples *t*-test showed that none of the score changes were significantly different from traditional auditorium to the AL classroom. Therefore, it cannot be assumed that the AL classroom had any impact on students' perceptions of CP.

Discussion

Colleges and universities are beginning to invest in AL classrooms in an effort to replace the traditional lecture style pedagogy that is frequently used by many professors in higher education (Eagan et al., 2014). Research has found that students in a traditional lecture style classroom will fail 1.5 times more often than students attending classes taught using active learning techniques. The same study also found that AL teaching can improve exam scores by 6% (Freeman et al., 2014). Active learning classrooms require students to take more responsibility for their own learning through interaction and collaborative learning activities instead of passively listening to instructor lectures. To take advantage of the improved results in student learning and interactive/collaborative learning pedagogies, many universities are now building or converting classrooms to AL classrooms (Rimer, 2009).

While the open design of the AL classroom can enhance active learning strategies, this research paper shows it is not the physical structure of the classroom that enhances TP, but the instructional design of the class. Students reported that the levels of TP decreased when moving to an AL classroom since the instructor is no longer the focus of attention by lecturing in the front of the room. While instructors do just as much work in an AL classroom (if not more), much of that work is behind-the-scenes as they are planning group activities, case studies, and other active learning activities; therefore, students may not perceive as much presence of the instructor in AL classrooms. The new AL design may enhance students' role, but it may come at the cost of reducing the presence of the instructor to the student. As Radcliffe (2009) suggests, instructors need to make intentional instructional design choices in the three areas of pedagogy, space, and technology to keep TP high in AL classrooms. Instructors need to include activities such as mini-lectures, learning of student names, and instructional tutorials to scaffold students' skills.

Students perceptions of TP in AL classrooms may be reduced when students feel as if there are too many active learning activities where they only work with other students and do not have opportunities to hear from the instructor. Students will become frustrated if the instructor is not actively involved to help clear up any misconceptions to help bring learning to higher levels, and to provide tutorials for new skills and development. Instructors redesigning their class to include more AL strategies need to make sure that instructor lecture and feedback is still an important part of the day to day activities.

The survey questions for the SP-I factor pertained to students' ability to get to know others by forming distinct impressions. It would seem logical that sitting at round tables where six students are looking at each other would automatically yield higher levels of SP-I than an environment where students are sitting in an auditorium-style classroom with fixed seats that look forward. However, not all the classes realized an increase in SP-I. Three of the four classes realized higher levels of SP-I when moving to the AL classroom, but only Class 1 significant higher ($p < .01$). The instructor for Class 1 redesigned the majority of her class from an almost entirely lecture based pedagogy to a highly interactive classroom where students worked together to solve case studies and problems. Students in Class 1 reported higher levels of SP-I at significant levels; therefore, this is likely due to the efforts of her instructional design changes. The instructor for Class 2 changed little of his curriculum design when moving to the new AL classroom and did not have any significant changes in levels of SP-I. This demonstrates that it is not likely the physical layout of the classroom that causes changes in SP-I. The instructor for Class 3 redesigned her class so that the entire class worked together with little instructor involvement; however, students in the redesigned class reported lower SP-1. On the surface, this seems illogical as the students were asked to do more work together and yet reported lower levels of SP-I. However, it could be plausible that students are resisting active learning strategies where they are required to work together and need to rely on each other to figure out solutions. It is difficult to wean students from depending on their instructors. It is possible that students do not value the input of other students and want to return to teaching methodologies where instructors provide them the content so they know the answers to the tests. Students may resist being force to take a more active role in their education and feel as if the instructor did not teach and that they learned it themselves (Weimer, 2014).

While physical structure of the auditorium-style classrooms from the Spring 2015 term made it difficult to include AL activities, the instructors for Class 2 and Class 3 were able to find a way to include some group discussions during their Spring term. Therefore, their SP-I scores were relatively high before switching to the AL classroom. This suggests it is not the physical structure of the AL classroom that impacts students' perception of SP-I, but it is the instructional design.

None of the classes had changes in CP at a

significant level. This finding might suggest to instructors that when moving to the AL classroom it is important to include frequent assessment activities and not strictly focus on cooperative and collaborative group activities. Including frequent assessment activities such as quizzes at the beginning of class and polling questions that are factored into students' final grades might make levels of CP increase. This again shows it is not the structural design of the AL classroom that has an impact on students' levels of CP, but the instructional design choices of the instructor.

Study Limitations and Further Areas of Study

This study used the Community of Inquiry (CoI) survey (Swan et al., 2008) to measure students' perceptions of TP, SP, and CP when moving from a traditional auditorium lecture class to an AL class. After conducting the factor analysis on the CoI Survey, there were only 17 of the 34 questions that met the guidelines for an Exploratory Factory Analysis. In addition, instead of the three factors originally identified in the CoI Survey, there were four factors (TP, SP-I, SP-P, and CP). Since the CoI Survey was originally used in online and blended-learning classes, several of the questions needed to be slightly modified to be appropriate for a face-to-face teaching environment.

This study measured the impact of instructor's course redesign from an auditorium-style classroom to an AL classroom. Another further area of study would be to measure the impact of CoI on instructors implementing active learning strategies into their existing auditorium-style classrooms. While the fixed-seat format of the auditorium-style classroom could be a challenge to implementing group and collaborative learning methodologies, creative instructors can utilize many active learning strategies. Instructors can implement active learning strategies into any classroom they are assigned to teach.

This study only reports on the quantitative feedback from students, and, therefore, qualitative feedback research could add more information on the students' thoughts and feelings to explain some of their responses. While there was an adequate number of student responses for this study (N = 417), the survey was conducted on only one institution and could be expanded to other institutions to validate findings. Another area of future research could be an investigation of the decrease of student retention when students moved to the AL classroom. Retention dropped from 95% in the 2015 Spring term to 88% in the Fall term. It is important to find out why students dropped out of the courses at a higher rate in the new AL classrooms. Future research might also investigate whether a particular student population dropped the class at higher rates, and which factors made them choose to leave the AL classroom.

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Appendix A

Table A1
CoI survey with revised questions

	Teaching Presence
1.	*The instructor clearly communicated important course topics.
2.	*The instructor clearly communicated important course goals.
3.	*The instructor provided clear instructions on how to participate in course learning activities.
4.	*The instructor clearly communicated important due dates/time frames for learning activities.
5.	*The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
6.	*The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
7.	The instructor helped to keep course participants engaged and participating in productive dialogue.
8.	*The instructor helped keep the course participants on task in a way that helped me to learn.
9.	*The instructor encouraged course participants to explore new concepts in this course.
10.	Instructor actions reinforced the development of a sense of community among course participants.
11.	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
12.	The instructor provided feedback that helped me understand my strengths and weaknesses.
13.	*The instructor provided feedback in a timely fashion.
	Social Presence
14.	*Getting to know other course participants gave me a sense of belonging in the course.
15.	*I was able to form distinct impressions of some course participants. **Revised:** I was able to form distinct impressions (ideas, feelings, or opinions) of some course participants.
16.	*Online or web-based communication is an excellent medium for social interaction. **Revised:** Class Discussions are an excellent tool for social interaction.
17.	*I felt comfortable conversing through the online medium. **Revised:** I felt comfortable talking during class.
18.	*I felt comfortable participating in the course discussions.
19.	I felt comfortable interacting with other course participants.
20.	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
21.	I felt that my point of view was acknowledged by other course participants.
22.	Online discussions help me to develop a sense of collaboration. **Revised:** Class discussions help me to develop a sense of collaboration.
	Cognitive Presence
23.	Problems posed increased my interest in course issues. **Revised:** Course problems and activities increased my interest in course issues.
24.	Course activities piqued my curiosity.
25.	I felt motivated to explore content related questions.
26.	I utilized a variety of information sources to explore problems posed in this course.
27.	Brainstorming and finding relevant information helped me resolve content related questions.
28.	Online discussions were valuable in helping me appreciate different perspectives. **Revised:** Class discussions were valuable in helping me appreciate different perspectives.
29.	Combining new information helped me answer questions raised in course activities. **Revised:** Applying new information helped me answer questions raised in course activities.
30.	Learning activities helped me construct explanations/solutions.
31.	Reflection on course content and discussions helped me understand fundamental concepts in this class.
32.	*I can describe ways to test and apply the knowledge created in this course.
33.	*I have developed solutions to course problems that can be applied in practice.
34.	*I can apply the knowledge created in this course to my work or other non-class related activities.

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree
*Questions remaining after factor analysis

Appendix B

Table B1
Factor loadings based on a Principal Axis Factoring Analysis with Varimax rotation

	1	2	3	4	5
Q1	.799	.020	.053	.054	.219
Q5	.798	.103	.082	.150	.166
Q6	.782	.103	.073	.156	.267
Q2	.764	.071	.119	.093	.140
Q3	.751	.101	.079	.061	.060
Q11	.693	.108	.162	.118	.367
Q8	.675	.103	.177	.142	.314
Q4	.600	.015	.106	.108	-.010
Q9	.591	.178	.209	.143	.110
Q7	.523	.228	.214	.172	.332
Q12	.523	.324	.087	.171	.162
Q31	.476	.264	.346	.137	.441
Q23	.469	.220	.304	.203	.442
Q10	.427	.405	.158	.188	.214
Q13	.423	.219	.141	.064	.047
Q14	-.034	.687	.260	.255	.083
Q15	.141	.609	.225	.131	.132
Q22	.165	.532	.176	.333	.307
Q16	.289	.490	-.012	.294	.294
Q27	.277	.389	.322	.162	.366
Q33	.154	.257	.776	.088	.065
Q32	.219	.144	.734	.144	.166
Q34	.101	.177	.728	.112	.142
Q25	.313	.137	.523	.144	.476
Q18	.279	.102	.057	.787	.282
Q17	.316	.067	.032	.714	.248
Q19	.044	.412	.207	.702	-.061
Q20	.096	.350	.174	.620	-.019
Q21	.112	.474	.210	.529	.030
Q30	.452	.310	.171	.097	.540
Q24	.451	.153	.379	.102	.505
Q29	.305	.406	.288	.101	.444
Q28	.376	.411	.099	.203	.416
Q26	.323	.279	.274	.100	.337

Appendix C

AL class design impact on students' perception of TP, SP-I, SP-P, and CP using t-test

	2015 Spring			2015 Fall				
	N	*M*	*SD*	*N*	*M*	*SD*	*p*	*d*
Teaching Presence								
Class 1	49	4.08	.60	52	3.98	.67	.415	.16
Class 2-E	45	4.30	.75	46	4.01	.70	.062	.40
Class 2-L	45	4.30	.75	50	3.99	.79	.050*	.40
Class 3	70	3.61	.62	105	3.16	.60	.000**	.74
Social Presence- I								
Class 1	49	3.30	.79	52	3.88	.77	.000**	.74
Class 2-E	45	3.79	.90	46	3.90	.85	.526	.13
Class 2-L	45	3.79	.90	50	3.99	.83	.262	.23
Class 3	70	3.91	.66	105	3.74	.75	.113	.23
Social Presence - P								
Class 1	49	3.40	.87	52	3.70	1.02	.112	.32
Class 2-E	45	3.49	1.08	46	3.56	1.15	.780	.06
Class 2-L	45	3.49	1.08	50	3.76	1.00	.209	.26
Class 3	70	3.31	1.04	105	2.91	1.13	.019*	.37
Cognitive Presence								
Class 1	49	3.33	.95	52	3.41	.96	.687	.08
Class 2-E	45	3.38	1.10	46	3.41	1.17	.906	.03
Class 2-L	45	3.38	1.10	50	3.29	1.09	.709	.08
Class 3	70	3.93	.67	105	3.78	.69	.139	.22

*Significant at $p \leq .05$ level; **Significant at an $\leq .0001$ level
E = Early class; L = Late class