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The goal of this study was to contribute to research on active learning by addressing the problem of disentangling the effects of classroom architecture, student characteristics, and pedagogical design as they relate to student achievement. The study utilized a quasi-experimental design where data was collected on student perceptions of their classroom, their experience in the course, and the pedagogy of the instructor, then analyzed with respect to the course grade. Results indicate that neither student perceptions of the classroom spaces nor the spaces themselves had an impact on course grade, but the pedagogy employed by the instructor and student experiences did.

Disentangling Health Care Professional Education

Despite a growing body of research, disentangling the effects of classroom architecture, student characteristics, and pedagogical design as they relate to student outcomes has proven challenging. In the health professions field where this study is grounded, there is a paucity of research on this topic (Waltz et al., 2014). New clinicians need to master relevant content knowledge and be able to apply it across a range of situations and in different contexts while concurrently training to solve problems, think critically and analytically, communicate effectively in verbal and written mediums, and work well as a member of an interprofessional team so that they can meet the demands of clinical practice upon graduation. Active learning classroom architecture and active learning pedagogy have been developed as a bridge between classroom and professional spaces. Ideally, the instructor is able to capitalize on both the architecture and pedagogy to create opportunities for applying knowledge in interactive situations that mirror many aspects of future workplaces. This allows students to engage more deeply with the content, with their classmates, and with their instructors (Finkelstein et al., 2016; Rands and Gansemer-Topf, 2017). However, understanding how to balance and prioritize these resources creates a challenge for instructors who must utilize a classroom space to prepare students for work in a professional space.

To that end, the goal of this study was to disentangle the effects of classroom architecture, student characteristics, and pedagogical design as they relate to student achievement. The study utilized a quasi-experimental design where the same pedagogy, instructor, and course were compared across two different student cohorts in two different classroom spaces. The design allowed researchers to isolate the impact of teaching in an Active Learning Classroom (ALC) by comparing data across two different spaces during two different semesters while controlling for factors of pedagogy, instructor, and course content. After testing for assumptions regarding similarities between the student populations, the aim was to isolate the effect of the different classrooms on student outcomes. This study attempted to link specific behaviors and conditions to academic achievement by exploring two main research questions:

1. What differences do students report related to the classroom, their experiences, and the pedagogy between a traditional classroom and an active learning classroom?
2. What relationships, if any, are observed between student reported data and final course grade?

Active Learning Classrooms, Active Learning Pedagogy, and Student Experiences

One challenge that researchers in the education outcomes area face is that both the design of the classroom space and the pedagogy of the instructor utilizing the space require

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significant effort and attention to ensure fidelity before making claims related to student performance and classroom effectiveness (Van Horne et al., 2012). To facilitate the development of professional knowledge in students, researchers are challenged to disentangle the multiple factors related to student learning in active learning spaces and utilizing active learning pedagogy. The heterogeneity in the research findings to date underscores this point and the need for continuing research. Whether ALCs improve student performance is still unclear, with some research showing that they do (Baepler et al., 2014) and some showing that they do not (Stoltzfus and Libarkin, 2016). These differences in outcomes suggest that there are unobserved and confounding factors that are not accounted for in the research design and subsequent analyses. Much of the previous active learning pedagogical research looks at subsets of the student experience such as the classroom design (Park and Choi, 2014), the curriculum (Lucieer et al., 2016), specific teaching strategies (Versteeg et al., 2019), or student engagement (Rands and Gansemer-Topf, 2017).

There has been only limited work, however, examining how the effects of classroom architecture, student characteristics, and pedagogical design might interact, and even less work examining these factors and interactions in health care professional education. As noted by Stoltzfus and Libarkin (2016), it is imperative that future studies investigate which aspects of instructional pedagogy and learning spaces increase student learning.

This study proposes a triad of factors to disentangle as they relate to student achievement (Figure 1): the physical space where learning and instruction take place, in this study the ALC; the pedagogy employed by the instructor, specifically active learning pedagogy; and the student experiences in the course. None of these factors operate in isolation, so it seems logical to study their interactions on student achievement in order to gain better precision.

Active Learning Classrooms (ALCs)

The first component of the triad, ALCs, are architecturally designed to foster interactive and collaborative student-centered learning experiences, minimize barriers between teacher and student, and maximize evidence-based educational practices (Baepler et al., 2014; Carpenter and Pease, 2013; Metzger, 2015; Pundak and Rozner, 2008). However, classrooms designed specifically for active learning are a relatively new concept and are expensive to build or modify, so instructors are frequently unable to access these spaces or must request and then wait for a space to become available. In some cases, instructors are simply assigned to classroom spaces rather than being able to select them. For those instructors who are working in an active learning-designed classroom, they may be unable to control the layout, technology, or design of the room. Despite these challenges, ALCs have been found to be preferred by instructors (Alexander et al., 2008), encourage interaction between students and instructors, and facilitate active student participation and engagement (Finkelstein et al., 2016; Rands and Gansemer-Topf, 2017). Moreover, ALCs are extremely beneficial for collaborative projects and therefore may be particularly advantageous for educating future health care providers.

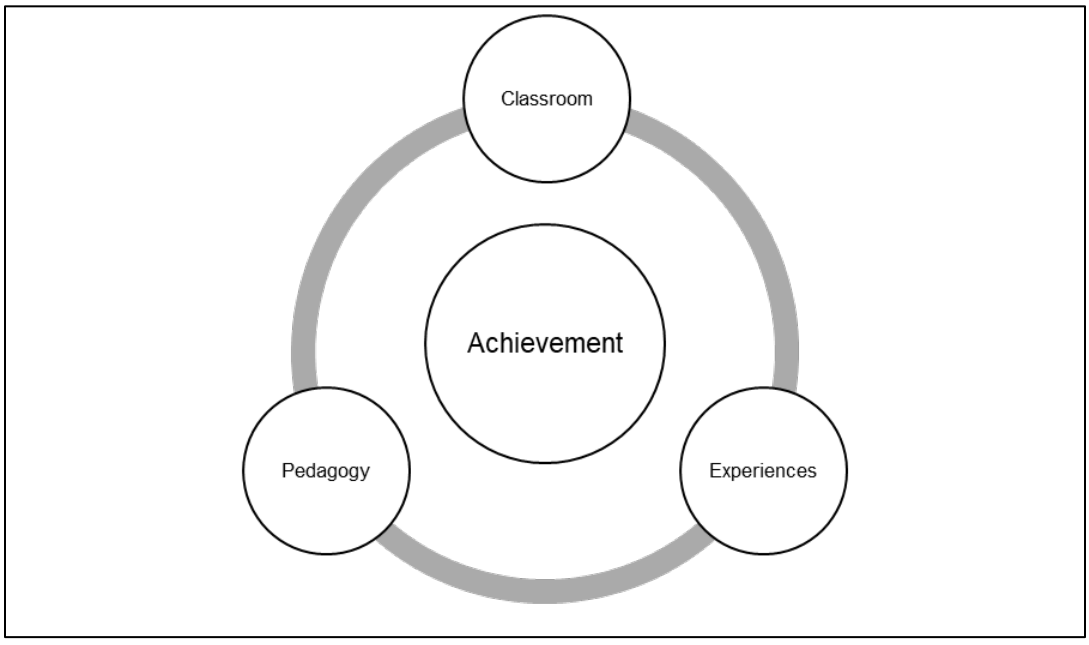

Figure 1. 'Triad' of factors on student achievement

Active Learning Pedagogy

While the physical space an instructor uses may be out of their control, how they utilize that space is not. Being assigned to teach in an active learning space does not guarantee active learning pedagogy will be utilized. An instructor has significant latitude in how they deploy active learning pedagogy (the second part of the triad) in their classroom, regardless of the space where they have been assigned to teach. Active learning pedagogy provides students with opportunities to practice application and analysis of foundational knowledge in different contexts in addition to facilitating development of professional skills related to teamwork, independent learning, problem-solving, critical thinking, and communicating (Anderson et al., 2005; Freeman et al., 2014; Kember and Leung, 2005). These benefits have also been documented in health professions education (Alkhasawneh et al., 2008; Bland et al., 2011; Clark et al., 2008; DeBourgh, 2008; McLafferty et al., 2010; Theroux and Pearce, 2006).

The design of ALCs specifically facilitates the implementation of active learning pedagogy because it gives the instructor many options for how they can foster interactive and collaborative student-centered learning experiences. Active learning pedagogy is defined as "any instructional method that engages students in the learning process" (Prince, 2004). While there are many active learning techniques that can be implemented by educators, broadly speaking, active learning asks students to actively engage (seek out) with the content to learn, for example by solving a complex problem in a group. This contrasts with passive learning (take in) where a student receives content by learning through pedagogies such as a traditional lecture or reading for memorization. Numerous studies have reported the benefits of using active learning techniques compared with traditional lectures such as decreased failure rates (Freeman et al., 2014), improved performance on tests (Deslauriers et al., 2011; Hake, 1998), improved short- and long-term retention (Di Vesta and Smith, 1979; Ruhl et al., 1987), as well as improved understanding of concepts (Laws et al., 1999; Redish et al., 1997).

Student Experiences

The third element of the triad is how students engage in and experience their learning as it relates to the pedagogy employed and spaces in which this takes place. Students form perceptions about doing active learning (Machemer and Crawford, 2007) and about the classroom where the active learning is happening (Park and Choi, 2014). Those perceptions are influenced by what students see as being most helpful with respect to their performance in the course (Machemer and Crawford, 2007). Collaborative learning (CL) is one way of facilitating active learning and stems from social constructivism. A fundamental tenet of constructivism is that a student does not enter the classroom as a blank slate, but rather with a unique intersectionality of background and experience (Palincsar, 1998). Students learn new ideas based on their prior knowledge and experiences; therefore, learning is unique to the individual learner. CL emphasizes that teachers and learners are active participants in the educational process and collaboration should occur in small, mixed-ability learning groups (Whipple, 1987). Research has shown that one of the best ways to improve one's understanding of information is to teach the material to a peer (Topping, 1996). CL has been found to result in positive learning outcomes for the peer doing the teaching in addition to the peer receiving the instruction (Chi et al., 1989, 2004; Renkl, 1997). Studies examining CL as a way to train clinical skills have yielded mixed results; there is a scarcity of research regarding the impact of CL in the health professions for mastering foundational knowledge.

Research Design and Context

This course was taught in a communication sciences and disorders graduate department of a public university during the first year of the Master of Arts in Speech-Language Pathology program. The course was focused on swallowing and dysphagia. It used a flipped class design with an emphasis on collaborative learning and was implemented over two consecutive fall semesters. Students met for an hour and 20 minutes twice per week for 15 weeks.

The course was taught in two different classroom spaces. One was a traditional classroom with three large tables and chairs, (Figure 2) and a single main screen at the front of the room. Each table had a wall-mounted whiteboard for brainstorming. Although the seating at the tables allowed for some interaction during discussions, the tables had computer equipment on them that limited the usable workspace available to each student and obscured the sightlines for students sitting across from each other. Students rarely used the available computer equipment, preferring instead to use their own laptops. The other space was an ALC with more flexible seating and increased technology (Figure 3). The ALC had small tables for teams of 6-8 students, each with a nearby LCD screen that could be connected to a student's laptop. Each table also had a wall-mounted whiteboard nearby for brainstorming. Microphones and acoustic amplification allowed students and the instructor to easily hear anyone from anywhere in the room

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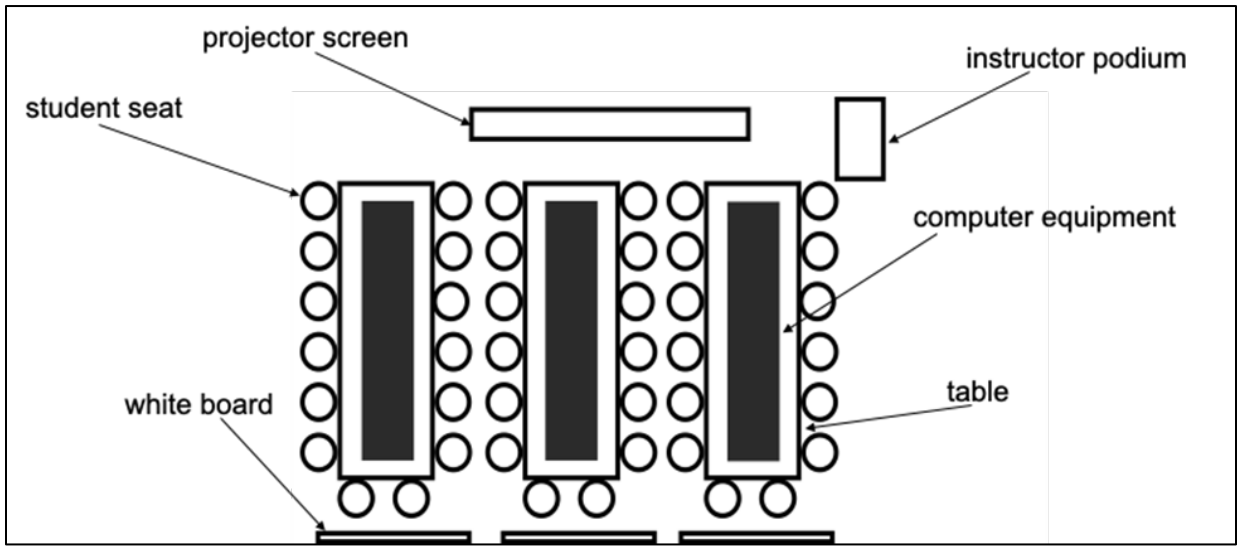

Figure 2. Diagram of the traditional classroom

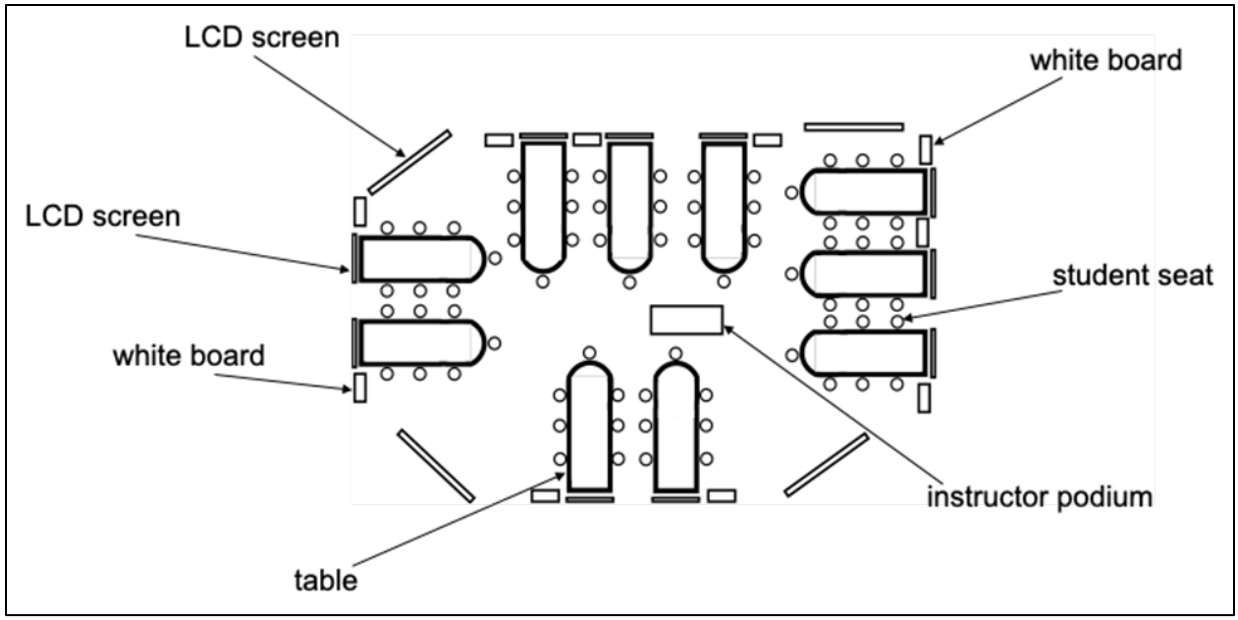

Figure 3. Diagram of the active learning classroom

Data Sources

Demographics

Three main data sources were collected for use in the analysis: student demographics, final course grades, and a student survey. Overall, there were 79 students in the sample, 39 from the first cohort in the traditional classroom and 40 from the second cohort in the active learning classroom. Student demographic information was collected to test whether there were any significant differences in demographics that are frequently cited with respect to differences in student outcomes. The demographic data contained information on gender (96% female), race/ethnicity (93% white), whether a student received a Pell Grant to approximate for family income (39%), if the student self-identified as a first-generation college student (33%), and the undergraduate GPA of the student to control for prior achievement.

Final Course Grades

Students completed individual exams and quizzes in addition to multiple team-based assignments. Three exams,

of which the third exam was a cumulative final, were administered in the course. During each of the 15 weeks of class, the students completed an in-class quiz covering the course materials for the week. Each student's average quiz grade was considered as a single outcome measure. To foster collaborative learning, students worked in the same teams for the duration of the course. Each team completed three problem-based learning (PBL) assignments that required students to identify and solve problems related to anatomy and physiology and apply foundational knowledge to clinical care. For details of the assignments, please see Affoo et al., 2020. Thus, the overall course grade for each student included scores on each of the three exams, the student's average quiz score, and the student's scores on each of the three projects.

Questionnaire

A student survey, administered at the end of the semester, was the final data source. The questionnaire asked students about the physical classroom, their experiences in the classroom, and the pedagogy of the instructor (see appendix for full questionnaire). This instrument was an adapted version of the Social Context and Active Learning (SCALE) survey developed and validated by the University of Minnesota team (Walker and Baepler, 2017). The survey contains Likert-style questions that ask students to agree or disagree with a given statement or to state how frequently something took place during the course (Never to More than once per class). The classroom and experiences questions were scored from one to five with a score of one representing strongly disagree and a score of five representing strongly agree. The pedagogy questions were scored from zero representing never to seven representing more than once per class. The questions were worded with a positive bias so that a higher score would be more desired (e.g.: "I learned something from my classmates"). There was one question that needed to be reverse coded to conform to this convention ("Sometimes I felt like my instructor and I were on opposing teams in the class").

Analysis

This research attempted to isolate the impact of teaching in an ALC by comparing data from the same course, using the same active learning pedagogy, taught by the same instructor in two different spaces during two semesters. Assuming the student populations are similar, this design would reduce the effects of an instructor, a pedagogical approach, and course content by attempting to isolate the effect of any differences to the different classrooms. In testing for differences in demographics using paired samples t-tests, no significant differences were found between the two student populations (traditional classroom versus ALC) along the lines of gender, receiving a Pell Grant, identifying as a first-generation college student, being from a non-white race/ethnicity, or by undergraduate GPA.

Next, the Likert scores of the student survey responses were totaled by student to create an overall score for each student. Given the common directionality of the survey questions, a higher score would indicate a more positive experience while a lower score would indicate a more negative experience. Subtotal scores were also created by the three different survey sections (classroom, experiences, pedagogy) by totaling each student's score within each section. There were two students with incomplete information, so their response totals were omitted.

After confirming that the two student populations were similar and that the total scores were tabulated, a paired sample t-test was computed to test for differences between the two student cohorts based on their total Likert score. The same process was repeated for each of the three sub-scores to see if students reported any differences along the lines of the classroom, their experiences, or instructor pedagogy. Any significant differences would help inform the initial research question.

The next step in the analysis was a simple linear regression to predict course grade, helping to inform the second research question. The regression accounted for whether a student was in the ALC or traditional classroom cohort, the demographics of the student, and the three sub-scores. Equation 1 below outlines the regression structure. Of interest in this particular analysis is whether any of the sub-scores significantly predicted final course grade and whether being in the active learning cohort significantly predicted course grade.

$$Course\ Grade_i = \beta_0 + \beta_1 X_i + \beta_2 X_i + \cdots + \beta_n X_i + \varepsilon_i$$

Equation 1.

Where β represents the demographic and survey factors of the i^{th} student and ε represents the student error terms.

Finally, if any of the three sub-scores was found to significantly predict final course grade from the regression model, it would be helpful to know which specific aspects of those sub-scores are most closely related to the final course grade. For example, if pedagogy is found to significantly predict course grade from the model, it would be helpful for instructors to understand what about their pedagogy is impacting course grade. To accomplish this, each question within a significant sub-score was correlated against final course grade to determine the direction and strength of the relationship.

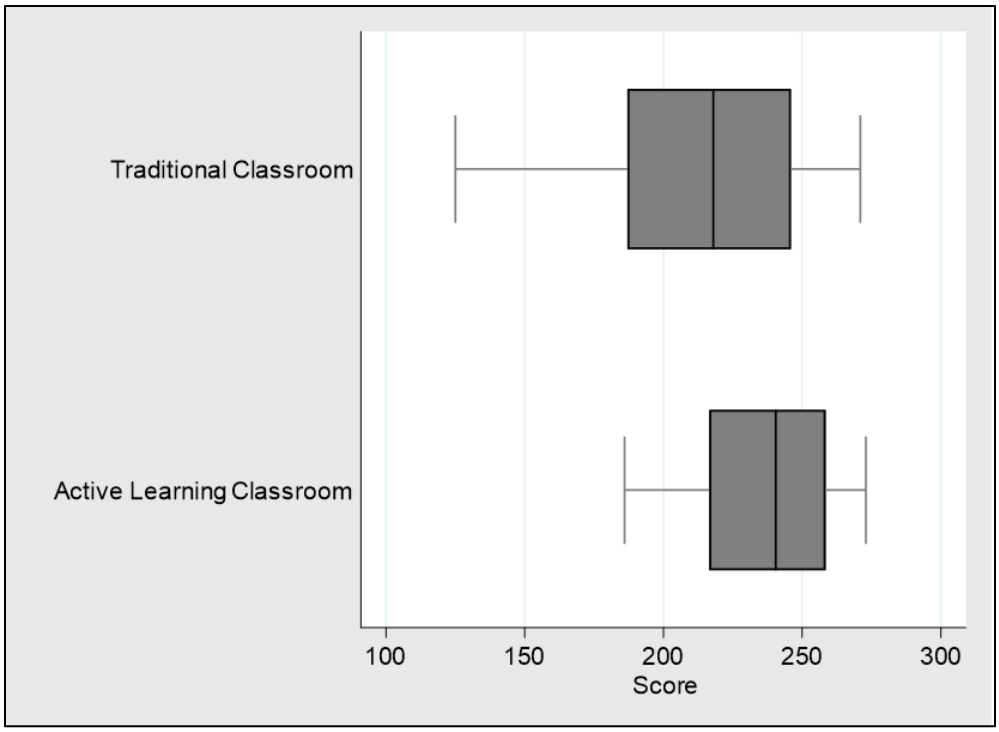

Figure 4. Box Plot of Total Score by Cohort

Results

When conducting the paired sample t-test between the two classroom cohorts based on total Likert score, the active learning classroom cohort scored 22 points higher (Table 1), a significant difference at .01. Also of note was that the traditional classroom cohort had a 37.9% higher standard deviation, suggesting a greater range of scores between the students in the traditional classroom compared to the active learning classroom students whose scores were more clustered together. Figure 4 confirms this difference with the traditional classroom students showing a much wider range of scores. The traditional classroom students also show a much lower score at the left (lower) tail of the box, but the upper tail appears similar for both cohorts.

Given the difference between the overall scores, the question becomes "where within the sub-scores did the traditional cohort score lower: the classroom, their experiences, the pedagogy, or some combination of the three?" Paired sample t-tests on the three sub-scores revealed that the students in both cohorts averaged similar scores with respect to their experiences and the pedagogy utilized. Where the two cohorts varied the most was in how they reported feeling about the classroom. The study design attempted to keep the experiences and pedagogy similar between the two cohorts; these results indicate the students did not report either of these factors varying significantly. This suggests that the study had an acceptable level of fidelity.

Next, the study sought to understand the relationship between the final course grade and (1) the classroom cohort, (2) the student self-reported scores, and (3) the student demographics. The regression model (Table 2) showed no impact of cohort on the final course grade, indicating that the classroom the students were in had no bearing on final course grade. Demographically, the model predicted about a 4.75% increase in the final course grade for every point increase in the student's undergraduate GPA, suggesting that higher achieving undergraduate students were more likely to perform better in the course holding all other factors constant. Despite differing by cohort, the Likert classroom score did not significantly predict final course grade. Conversely, experiences (<.001 significance) and pedagogy (.10 significance) did significantly predict final course grade. This suggests that students who had higher scores for their experiences in the course and the pedagogy they observed performed better independent of the cohort or their demographics.

The final step of the analysis sought to understand what specifically about the course experiences (Table 3a) and the pedagogy observed by students (Table 3b) were most related to their final course grade. To do this, each question that made up a sub-score was correlated against the final course grade. Only significant correlations were reported. The

Table 1: Score by Classroom Cohort

	Traditional Classroom (n=37)		Active Learning Classroom (n=40)		P-Value
Outcomes	Mean	SD	Mean	SD	
Total Score	214.2	36.4	236.3	24.8	0.01
Subscores					
Classroom Score	97.0	29.0	119.0	14.5	<.001
Experiences Score	117.2	12.6	117.3	11.8	NS
Pedagogy Score	75.4	11.5	73.6	15.4	NS

Notes: Two-sample t-test for differences; NS=Not Significant

Table 2: Regression Model Predicting Final Grade

Variable	Coefficient	Standard Error	T-Value	Significance
Male	-1.87	1.93	-0.97	
Non-White	-1.22	1.49	-0.82	
Pell Recipient	-1.25	0.77	-1.64	
First Generation	-0.72	0.74	0.98	
Undergraduate GPA	4.75	1.53	3.1	0.01
Classroom Score	0.01	0.02	0.41	
Experiences Score	0.13	0.04	3.36	<.001
Pedagogy Score	-0.06	0.03	-1.91	0.10
Active Learning Cohort	0.15	0.82	0.18	
Constant	61.95	6.93	8.94	<.001

Notes: R2 = 35%; F(9,52) = 3.97, p = <.001

Table 3a: Significant pairwise correlations between final course grade and student reported experiences		
Based on my experiences in this course…	Correlation	Significance
I could clearly explain new concepts I learned to others in class	0.46	<.001
I could explain my ideas in specific terms	0.42	<.001
I could help others in the class learn	0.38	<.001
The people sitting near me learned something from me in this class	0.35	0.01
I could explain my thought process from start to finish to others in class	0.33	0.01
I could use the terminology in the class correctly	0.31	0.01
I could persuade my classmates why my ideas were relevant to the problem we encountered in class	0.29	0.05
My instructor encouraged questions and comments from students	0.27	0.05
I felt comfortable asking for help from my classmates	0.25	0.05
The material covered by the tests and assignments in this class were presented and discussed in class or online	0.23	0.05
My instructor made class enjoyable	0.23	0.05

Table 3b: Significant pairwise correlations between final course grade and student reported teacher pedagogy		
How often the following activities occurred in this course…	Correlation	Significance
Discussed ideas from readings or course with other students during class	0.39	<.001
Helped explain course ideas or concepts to other students a course	0.38	<.001
The work of a group of students was displayed or projected to the whole class	-0.25	0.05
The work of an individual student was displayed or projected to the whole class	-0.25	0.05

questions were sorted by the strength of the correlation. In looking at the questions related to experiences, there is a dominance in questions related to working with peers as it relates to explaining or teaching others. In exploring the pedagogy questions that are significantly related to course grade, only four questions showed a significant relationship: two positively related and two negatively related. Similar to the experience's questions, the two positively related questions had to do with teaching and learning with peers. The two negatively related questions had to do with displaying student work in front of the class.

Discussion

Question 1 - What differences do students report related to the classroom, their experiences, and the pedagogy between a traditional classroom and an active learning classroom?

Students reported a less favorable perception of the traditional classroom compared to the ALC. The specific items with the greatest difference were along the lines of the classroom being able to generate "excitement," "active participation," or "engagement", for example. This finding is encouraging for those without access to active learning classrooms in that these perceptions did not seem to carry over to limiting performance in the course, as evidenced by the lack of significance of the classroom scores in the regression model. It also seems to indicate that students did not prefer a classroom space where they could simply blend in and passively exist with their peers.

Students did not report any significant differences with respect to their experiences or the pedagogy employed between the two classroom spaces. This is also encouraging in that, from the point of view of the student, it is possible for an instructor to implement active learning pedagogy and deliver a consistent student experience independent of the learning space. How these perceptions transfer to achievement in the course was the focus of the second research question.

Question 2 - What relationships, if any, are observed between student-reported data and final course grade?

The regression analysis suggests that the benefits of active learning appear to be driven by the pedagogy employed and student experiences in the course as opposed to the physical space, independent of student demographics. The relationship between student experiences and course grade was strong but the weaker instructor pedagogy relationship suggests that additional investigation may be needed to confirm or refute these initial findings.

When looking at the questions that examined specific aspects of the student experiences, a clear theme emerged where students who reported more positive experiences in collaborative learning activities earned a higher grade in the course. The three most strongly correlated questions related to this construct were: "I could explain my ideas in specific terms," "I could clearly explain new concepts I learned to others in class," and "I could help others in class learn." This finding is in line with previous research (Topping, 1996) indicating that a student truly understands the course content when they can impart it to someone else. The process of simplifying new content to its most fundamental elements and then scaffolding additional information at an appropriate pace for a new learner requires the person doing the teaching to utilize critical thinking and communication skills. In turn, this level of analysis and synthesis of the material creates greater retention in the individual doing the teaching. Given this, it is not surprising that students who reported being more adept at this had a higher overall grade in the course. This is largely a space-independent factor in that an instructor can create conditions where students are responsible for their own learning as well as that of their peers regardless of the physical classroom layout. This student-centered responsibility is one of the main tenants of active learning pedagogy. It fosters the critical thinking, problem-solving, self-efficacy, and communication skills that transfer beyond the classroom. In the health professions discipline that was the focus of this study, one goal is for students to be able to transfer these skills into clinical settings. This transfer is another focal point of future research.

Whereas the first finding indicates what an instructor should do, the second finding from the analysis related to pedagogy indicates what an instructor should not do. The negative association between student grades and the perceived frequency of displaying student work indicates that as the number of students who reported displaying student work increased, the achievement of the students decreased. The pedagogy questions are scaled for frequency so that a higher number means a student reported it happening more frequently in the course. The specific pedagogy questions that were significantly correlated with course grade were: "The work of a group of students was displayed or projected to the whole class" and "The work of an individual student was displayed or projected to the whole class." Students that reported more frequent whole class learning occurrences ended up with a lower grade in the course. In theory, all students would report this happening with equal frequency given they were all in the same class but in reality, the responses for how often these

events took place varied. While further data will be needed to test this explanation, one working hypothesis for this finding relates to student perceptions and the principle of negativity bias. This is the well documented notion that, all other factors being equal, negative thoughts and experiences have a greater impact on one's impression formation than positive ones do (Rozin and Royzman, 2001). A student who is more comfortable and has greater mastery of the content is not concerned with their answers being displayed in front of the class because they are less worried about being wrong in front of their peers. Conversely, a student with lower mastery of the content is likely to be more apprehensive about their answers being displayed in front of peers because of fear of being wrong. For example, assume whole class learning occurred five times during the course. To the students with greater mastery, this may not seem like a lot because they are usually correct and do not pay much attention to their answers on display, therefore scoring the frequency of this happening lower on the survey. On the other hand, for the students who are more likely to have incorrect answers, this can be unsettling and therefore consumes a great deal of their attention, to the point where these students report it happening more frequently. Work by Larkin and Pines (2003) found this effect to be particularly pronounced for women, who made up the majority of the sample in this study (N=76; 96%). The main take away for instructors here is to be mindful when putting student work on display in front of their peers. The classroom culture needs to be one of supporting each other and not of stigmatizing mistakes. In the case of these cohorts, it appears that some students felt comfortable with their work on display while others did not.

Demographics are also a frequent factor in student achievement. While the sample of students in the study did not have large differences along the lines of gender or race/ethnicity, a significant proportion of the sample identified as being a first-generation student or receiving a Pell Grant. Despite the limited sample size, the absence of observed achievement differences by historically underserved groups of students aligns with emerging research that active learning pedagogy can help to reduce achievement gaps (Theobald et al., 2020).

Limitations and Future Directions

The current dataset includes one set of comparative cohorts, which naturally limits the statistical power and generalizability of the findings. Adding additional cohorts in future years will help to improve the precision of these findings and help to further refine factors related to student outcomes. It should also be noted that while the study did test for demographic differences, the students are not randomly assigned to courses and so there is an unavoidable selection bias in place. As a result, none of the findings here can be interpreted in a causal manner. Due to the limited sample size, the choice was made to score the student self-reported responses as totals which assumes that all responses have equal weight. With a larger sample size, an exploratory factor analysis or structural equation model may be able to more causally determine the specific questions that are impacting student achievement beyond the correlational analysis undertaken in this study.

These courses were also smaller enrollment courses so it would be informative to see if students report similar findings in larger enrollment courses and spaces. It would also be useful to test this analytical framework in another subject area to see if there is something unique about the course content that impacted the findings. This course was required for the student's graduate degree major where it would be assumed that they would have a greater level of investment in the course, compared to a general requirement course. Both Baepler, Walker, & Driessen (2014) and Stoltzfus & Libarkin (2016) conducted their research in undergraduate general biology courses, so understanding subject area and requirement differences will need to be extended to future research.

Conclusion

It is challenging for researchers and instructors to appreciate which of the many confounding aspects of active learning pedagogy and spaces are most critical to the development of students' professional knowledge in required degree courses. This study advances previous work by simultaneously accounting for active learning pedagogy and architecture as well as the effects of student perceptions on achievement. Instructors can leverage their instructional space by incorporating activities that support dynamic peer-to-peer instructional opportunities. Another instructional aspect that may facilitate student learning is creating a space where students feel comfortable sharing responses with peers. Independent of demographics, space, and instructor, students who were less comfortable with collaboration and whole class learning did not perform as well in the course. Creating conditions where students can not only learn the content but assume some responsibility for teaching their peers in a safe, collaborative space, overrides many other demographic, spatial, and experiential factors often associated with student performance. This enhanced education may help students meet the complex and dynamic post-graduation demands of clinical practice or in their chosen field.

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Appendix: Survey Questions

For this set of question, please indicate whether you *Strongly Agree, Agree, Neither Agree nor Disagree, Disagree*, or *Strongly Disagree* with the following statements. (If you do not know the answer to a question, please leave that question blank and go on to the next one.)

The CLASSROOM in which I am taking this course…

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	Increases my excitement to learn.	❍	❍	❍	❍	❍
2	Facilitates multiple types of learning activities.	❍	❍	❍	❍	❍
3	Helps me to develop professional skills that can be transferred to the real world.	❍	❍	❍	❍	❍
4	Promotes discussion.	❍	❍	❍	❍	❍
5	Encourages my active participation.	❍	❍	❍	❍	❍
6	Offers a physically comfortable learning environment.	❍	❍	❍	❍	❍
7	Makes me want to attend class regularly.	❍	❍	❍	❍	❍
8	Helps me to develop connections with my classmates.	❍	❍	❍	❍	❍
9	Enables me to communicate effectively.	❍	❍	❍	❍	❍
10	Helps me to develop confidence in presenting.	❍	❍	❍	❍	❍
11	Engages me in the learning process.	❍	❍	❍	❍	❍
12	Helps me develop confidence in writing.	❍	❍	❍	❍	❍

13	**Nurtures a variety of learning styles.**	❍	❍	❍	❍	❍
14	**Helps me develop connection with my instructor.**	❍	❍	❍	❍	❍
15	**Helps me to define issues or challenges and identify possible solutions.**	❍	❍	❍	❍	❍
16	**Prepares me to implement a solution to an issue or challenge.**	❍	❍	❍	❍	❍
17	**Helps me to examine how others gather and interpret data and assess the soundness of their conclusions.**	❍	❍	❍	❍	❍
18	**Deepens my understanding of a specific field of study.**	❍	❍	❍	❍	❍
19	**Assists me in understanding someone else's views by imagining how an issue looks from his or her perspective.**	❍	❍	❍	❍	❍
20	**Helps me to grow comfortable working with people from other cultures.**	❍	❍	❍	❍	❍
21	**Improves my confidence so that I can speak clearly and effectively.**	❍	❍	❍	❍	❍
22	**Encourages me to create or generate new ideas, products, or ways of understanding.**	❍	❍	❍	❍	❍
23	**Prompts me to incorporate ideas or concepts from different courses when completing assignments.**	❍	❍	❍	❍	❍
24	**Enabled the instructor to make intentional connections between theory and practice in this course.**	❍	❍	❍	❍	❍

25	**The instructor is effective in using the technology available in the classroom for instructional purposes.**	❍	❍	❍	❍	❍
26	**This classroom is an appropriate space in which to hold this particular course.**	❍	❍	❍	❍	❍
27	**The instructor is effective in using the classroom for instructional purposes.**	❍	❍	❍	❍	❍
28	**The in-class exercises for this course are enhanced by the features of this classroom.**	❍	❍	❍	❍	❍

For the next set of questions, please indicate whether you *Strongly Agree, Agree, Neither Agree nor Disagree, Disagree*, or *Strongly Disagree* with the following statements. (If you do not know the answer to a question, please leave that question blank and go on to the next one.)

Based on my experiences in this course…

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
29	**I learned something from my classmates.**	❍	❍	❍	❍	❍
30	**I can explain my ideas in specific terms.**	❍	❍	❍	❍	❍
31	**The material covered by the tests and assignments in this class were presented and discussed in class or online.**	❍	❍	❍	❍	❍
32	**The people sitting near me learned something from me in this class.**	❍	❍	❍	❍	❍
33	**The instructor knows my name.**	❍	❍	❍	❍	❍
34	**My instructor makes class enjoyable.**	❍	❍	❍	❍	❍
35	**I can clearly explain new concepts I learned to others in this class.**	❍	❍	❍	❍	❍
36	**The students sitting near me rely on each other for help learning class material.**	❍	❍	❍	❍	❍
37	**In general, people sitting near me in class worked well together on class assignments, questions, etc.**	❍	❍	❍	❍	❍
38	**The instructor seems to care about me.**	❍	❍	❍	❍	❍

39	**My instructor wants me to do well on the tests and assignments in this class.**	❍	❍	❍	❍	❍
40	**The instructor is acquainted with me.**	❍	❍	❍	❍	❍
41	**I can persuade my classmates why my ideas are relevant to the problems we encountered in this class.**	❍	❍	❍	❍	❍
42	**I know something personal about the people sitting near me in class.**	❍	❍	❍	❍	❍
43	**I feel comfortable asking for help from my classmates.**	❍	❍	❍	❍	❍
44	**I can use the terminology in this class correctly.**	❍	❍	❍	❍	❍
45	**Sometimes I feel like my instructor and I are on opposing teams in the class.**	❍	❍	❍	❍	❍
46	**I am acquainted with the instructor.**	❍	❍	❍	❍	❍
47	**I can explain my thought process from start to finish to others in class.**	❍	❍	❍	❍	❍
48	**I speak informally with the instructor before, during, or after class.**	❍	❍	❍	❍	❍
49	**I am acquainted with the students sitting near me in class.**	❍	❍	❍	❍	❍
50	**My instructor encourages questions and comments from students.**	❍	❍	❍	❍	❍

51	**I can help others in the class learn.**	❍	❍	❍	❍	❍
52	**During class, I often have a chance to discuss material with some of my classmates.**	❍	❍	❍	❍	❍
53	**The students sitting near me respect my opinions.**	❍	❍	❍	❍	❍
54	**Other students pointed out a helpful resource.**	❍	❍	❍	❍	❍
55	**Other students explained a concept to me.**	❍	❍	❍	❍	❍

For the next set of questions, please indicate how often the following activities occurred in this course. (If you do not know the answer to a question, please leave that question blank and go on to the next one.)

Based on my experiences in this course…

		More than once per class	About once per class	About once a week	Two or three times a month	About once a month	Two or three times a semester	About once a semester	Never
58	**Students worked in small groups (2-3) on an in-class learning activity.**	□	□	□	□	□	□	□	□
59	**Students worked in medium-sized groups (4-9) on an in-class learning activity.**	□	□	□	□	□	□	□	□
60	**The work of an individual student was displayed or projected to the whole class.**	□	□	□	□	□	□	□	□
61	**The work of a group of students was displayed or projected to the whole class.**	□	□	□	□	□	□	□	□
62	**The instructor consulted with individual students during an in-class learning activity.**	□	□	□	□	□	□	□	□
63	**The instructor consulted with groups of students during an in-class learning activity.**	□	□	□	□	□	□	□	□
64	**An in-class learning activity required students to use the internet to conduct research or locate information.**	□	□	□	□	□	□	□	□
65	**An in-class learning activity required students to explain course ideas or concepts to other students.**	□	□	□	□	□	□	□	□
66	**An in-class learning activity required students to visit a course management system (e.g. Moodle).**	□	□	□	□	□	□	□	□
67	**An in-class learning activity required students to use social media (e.g. Twitter, Facebook).**	□	□	□	□	□	□	□	□
68	**Played media with sound (e.g., DVD, CD)**	□	□	□	□	□	□	□	□

For the next set of questions, please indicate how often the following activities occurred in this course. (If you do not know the answer to a question, please leave that question blank and go on to the next one.)

Based on my experiences in this course…

		More than once per class	About once per class	About once a week	Two or three times a month	About once a month	Two or three times a semester	About once a semester	Never
69	**Asked questions during your class**	□	□	□	□	□	□	□	□
70	**Made a presentation in your class**	□	□	□	□	□	□	□	□
71	**Contributed to class discussions that occurred during your class**	□	□	□	□	□	□	□	□
72	**Helped explain course ideas or concepts to other students in your course**	□	□	□	□	□	□	□	□
73	**Came to your class without having completed readings or assignments**	□	□	□	□	□	□	□	□
74	**Discussed ideas from your readings or course with other students during class**	□	□	□	□	□	□	□	□
75	**Worked with other students on projects during your class**	□	□	□	□	□	□	□	□