Journal of the Scholarship of Teaching and Learning, Vol. 22, No. 1, March 2022, pp.31-17.
doi: 10.14434/josotl.v22i1.30735

Students' Perception of the Classroom Environment: A Comparison between Innovative and Traditional Classrooms

Chang Wan "Isaac" Woo, Toni S. Whitfield, Lori L. Britt, and Timothy C. Ball
James Madison University

Abstract: As advanced classroom technologies are developed, more higher education institutions are building innovative classrooms. Previous studies have focused on students' academic performances in innovative classrooms, but few compared students' experience between traditional and innovative classrooms. In comparing observations and self-reports of students taking similar classes in both traditional classrooms and innovative classrooms, we found that students in an innovative classroom were more satisfied with the classroom environment, sensed more community in innovative classrooms, and perceived these classrooms as more appropriate for their courses.

Keywords: Innovative classrooms, classroom environment, pedagogy, focus group, survey

Jeff Kinney, the American writer and cartoonist famous for the *Diary of a Wimpy Kid* book series, said that on the first day of school, "you got to be real careful where you sit. You walk into the classroom and just plunk your stuff down on any old desk, and the next thing you know the teacher is saying, 'I hope you all like where you're sitting, because these are your permanent seats'" (Catherman, 2017). That may be true in many classrooms in academia, but today there are many other options.

A public university in the eastern United States built eight Enhancing Pedagogy through Innovative Classrooms (EPIC) to promote agile, collaborative, engaging, evidence-based, evolving, learning-centered, and transformative teaching spaces for students and faculty. According to the university's website, EPIC spaces provide wall-to-ceiling writable surfaces, multiple projection points, and moveable teaching stations that instructors can arrange to create classrooms based on their pedagogical needs (James Madison University, n.d.). Our university is not the first to design and build innovative classroom spaces, and we will certainly not be the last.

As renovations and new construction allow, we see the benefits of designing classroom spaces that capitalize on collaborative learning. These spaces can help students develop the skills employers consistently rank as the most desirable (Hart, 2006). Recently, Chamorro-Premuzic and Frankiewicz (2019) reported that employers are looking for applicants who can communicate, collaborate, adapt, and problem-solve. These types of skills are harder to cultivate and nurture in classroom spaces that position the teacher at the front and students in desks facing a single white board or screen. This study explores how classroom spaces affect student perceptions of their learning. We offer a brief overview of innovative classrooms, active learning, and their potential outcomes before detailing our comparative study and discussing the results.

Innovative Classrooms and Active Learning

From 1997 to 2001, North Carolina State University (NC State) experimented with a classroom that had a round table, multiple white boards, and convenient places for laptop computers. This innovative classroom was called Student-Centered Active Learning Environment for Undergraduate Programs or SCALE-UP (Beichner, 2008). Since then, other colleges and universities have followed suit. The University of Minnesota developed the Active Learning Classrooms (ALC) (Cotner, Loper, Walker, & Brooks, 2013) and the Massachusetts Institute of Technology (MIT) developed the Technology-

Enabled Active Learning (TEAL) project (Dori & Belcher, 2005). The intention of many of these innovative classroom projects is to better promote cooperative work and learning.

Slavin (1991) noted that "all cooperative learning methods share the idea that students work together to learn and are responsible for one another's learning as well as their own" (p.73). When this cooperative learning happens, active learning occurs (Grabinger & Dunlap, 1995). Active learning is one of the key purposes of innovative classrooms, and student engagement has been one of the outcomes of active learning in previous studies (e.g., Beichner, Saul, Abbott, Morse, Deardorff, Allain, & Risley, 2007; Brooks, 2012; Cotner, Loper, Walker, & Brooks, 2013; Gibeault, 2015). Barkley (2010) also observed that a classroom environment in which students build a community of learners could create synergy through active learning and promote student engagement.

Monahan (2002) refers to this type of intentional design as built pedagogies, or the notion that our educational philosophy is implicit in our architectural design. Monahan explained that there is a spectrum between discipline and autonomy when designing a classroom. On the disciplinary side, classroom designs are less flexible. Desks are bolted to the ground, preventing certain movements and flows. On the autonomy side, instructors choose how to use a completely open space. Built pedagogy lies in the middle of this spectrum. With a built pedagogy, technology is embedded in the classroom design. How it is embedded is up to the instructors.

Using built pedagogy, innovative classrooms can offer a more flexible learning environment and utilize more adaptive technologies. Rands and Gansemer-Topf (2017) asserted that the innovative classroom environment supports student engagement by providing furniture that helps students work together more easily. More specifically, movable chairs lead students to work closely together in collaboration or discussion. Rands and Gansemer-Topf found that flexibility and openness were the key attributes of innovative classrooms. This flexible and open space provides for more instructor-student interactions and peer-to-peer interactions.

Taking a similar approach, Mishra and Koehler (2006) introduced the Technological Pedagogical Content Knowledge (TPACK) framework of multiple types of knowledge that need to be integrated to improve student learning. The TPACK model emphasizes instructors' active utilization of technological tools to enhance students' learning experiences. The fundamental goal of this framework is to build a learning space in which instructors have enough autonomy to utilize classroom spaces and technologies to stimulate students' better understanding of the subject matter.

Possible Outcomes of Active Learning Spaces

Active learning is a popular paradigm based on constructivist philosophy (Grabinger & Dunlap, 1995). The constructivist philosophy emphasizes collaborative learning that promotes "personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism" (Lebow, 1993, p.5). Learning happens when students understand concepts through social interaction that reflect their own culture and context. This collaboration promotes deeper learning (Vygotsky, 1978). While working with other students collaboratively, students are exposed to multiple perspectives (Dorittle & Hicks, 2003). Without active student-student interactions, classroom technologies are not very effective (Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel, 2009). Copridge, Uttamchandani & Birdwell (2021) interviewed faculty who used Active Learning Classrooms and found three themes of note. The themes of sightlines and instructor presence, better feedback and intimate conversations were identified as important ways to engage students in the learning by the simplicity of being able to be among the students instead of the traditional "teacher in front of the class" model. They found that better relationships were built, students were able to always see the instructor and hence could have more connection to the learning, their classmates and the instructor. Kolb and Kolb (2005) noted

that learning spaces need to be made for conversational learning in order to promote the thinking process. With that background, we posit two research questions:

> RQ1: What is the level of student interactivity in traditional classrooms and innovative classrooms?
> RQ2: How do students perceive the traditional classrooms and the innovative classrooms?

Psychosocial Environment

One of the possible outcomes produced by the class environment is psychosocial influence. Fraser, Treagust, and Dennis (1986) developed a measurement tool called the College and University Classroom Environment Inventory (CUCEI) scale to gauge students' psychosocial development based on classroom environment. Using general categories of human environments developed by Moos (1974), Fraser et al. divided this scale into seven dimensions: personalization, involvement, student cohesiveness, satisfaction, task orientation, innovation, and individualization. Fraser et al. used this scale to investigate different classroom environments among students and teachers in the U.S. and Australia. Because the innovative classroom is designed to improve cooperative work and student engagement, we posit a hypothesis here:

> H1: Students who take a class in an innovative classroom will rank the psychosocial environment higher than students who take a class in a traditional classroom.

Perception of Physical Learning Space

Perks, Orr, and Al-Omari (2016) wanted to assess students' perception of their learning space after they changed a classroom to be more interactive and promote a more student-centered pedagogy. The changes to the classroom included reducing the number of seats in the room, adding multiple whiteboards and screens, reducing the size of the instructor workstation, and changing the color of the classroom. As a result, Perks et al. found that students supported the changes in the classroom and perceived the classroom to be more comfortable and suitable for student engagement. In light of these findings, we posit the following research questions:

> RQ3: Are there differences in the level of attitude toward the classroom environment between students who take a class in a traditional classroom and those who take a class in an innovative classroom?
> RQ4: Are there differences in the level of perception of physical classroom features between students who take a class in a traditional classroom and those who take a class in an innovative classroom?
> RQ5: Does the perception of physical classroom features affect the level of attitude toward the classroom environment?
> RQ6: Do the perceptions of physical classroom features and attitude toward the classroom environment affect the perceptions of the psychosocial environment?

Methods

To answer the research questions and hypothesis, we conducted an online Qualtrics survey and held two focus group interviews at the end of the fall 2018 semester. In 2016, we conducted a pilot study in one course taught in both types of classroom spaces by the same instructor. The insights from that

study led to more varied data collection approaches and scaling up the project to include three classes. After obtaining IRB approval, we invited students from two sections each of three communication courses to participate (two 300-level organizational communication courses and one 300-level public relations course). The same instructor taught two sections of the public relations course, one in a traditional and the other in an innovative classroom. Different instructors taught the two organizational communication courses, one in a traditional classroom and the other in an innovative classroom. Students received extra credit to participate in the survey and the focus group interviews.

Description of Spaces

The traditional classrooms featured tile floors, cinder block walls, a fixed teaching station with projector and computer, a fixed screen, and a dry-erase white board at the front of the room. Room layouts varied in length and width; however, all of the classrooms had individual moveable one-piece desks arranged in rows. The buildings these classrooms are located in feature a mix of faculty offices and classrooms. These will be referred to as *traditional classrooms*.

The EPIC classrooms featured carpeted floors, writeable dry-erase walls, a movable teaching podium, computer access to a projector (via airplay or corded-connections to multiple floor boxes), multiple projectors and retractable screens that permitted student to see screens regardless of where they sat or which direction they faced. The furniture in the classroom consisted of rectangular tables on wheels and lightweight padded chairs on wheels. These classrooms are in a relatively new campus building that houses many student service offices (registrar, learning centers, and the student health center) as well as a food court, market, and coffee shop. These will be referred to as *innovative classrooms*.

Focus Group Interviews

Two focus group sessions queried students' sensemaking about their experiences in the two different spaces. A researcher who did not teach any of the classes led the one-hour focus groups. The sessions were audio recorded and transcribed, yielding 22 pages of single-spaced text. Three team members independently coded the transcripts using a generative coding approach. After the initial coding, the three coders met to discuss their findings and identify important themes that offered insight into the research questions and hypothesis.

Survey Measures

Psychosocial Environment. The CUCEI scale was used to measure psychosocial environment (Fraser et al., 1986). Each dimension consists of seven items measured with a 5-point Likert-type scale (1 – strongly disagree, 5 – strongly agree). Students were to answer the questions about the class in which they were taking the survey.

Personalization. Several of the statements designed to measure this dimension are "the teacher considers students' feelings" and "the teacher talks individually with students." Three questions were reverse scored. Internal consistency of this measurement was 0.83 after excluding one item.

Involvement. Items about involvement included "students put effort into what they do in class" and "students in this class pay attention to what others are saying." Four questions were reverse scored. Internal consistency of this dimension was 0.73 after excluding one item.

Student Cohesiveness. Examples of items to assess student cohesiveness included "the class is made up of individuals who don't know each other well (reversed)," and "Each student knows the other members of the class by their first names." Three items were reverse-scored, and internal consistency was 0.82.

Satisfaction. Sample items to measure satisfaction included "classes are boring (reversed)" and "after the class the students have a sense of satisfaction." Three items were reverse-scored and internal consistency was 0.90.

Task Orientation. Examples of the items that measured task orientation included "students know exactly what has to be done in our class," and "the group often gets sidetracked instead of sticking to the point (reversed)." Internal consistency was 0.77 after excluding one item.

Innovation. Items about innovation included "new and different ways of teaching are seldom used in this class (reversed)" and "the teacher thinks up innovative activities for students to do." Internal consistency was 0.71 after removing all three reversed questions. We ran statistical analyses on those three reversed questions separately.

Individualization. The items that measure individualization included "students are allowed to choose activities and how they will work" and "students have a say in how class time is spent." Internal consistency was 0.59. Because the internal consistency of this measure did not meet the acceptable level of coefficient (0.70), we ran statistical analyses for this measure separately.

Attitude toward the Classroom Environment. To measure students' attitude toward the classroom environment, we adopted questionnaires from a classroom study by Perks et al. (2016). We first asked, "Generally, how did you feel about this classroom as a learning space?" (1 – I hated it, 5 – I loved it). Four more items were presented as follows: The classroom in which I am taking this course "is an effective space to hold this particular course," "facilitates different types of teaching / learning activities," "offers a physically comfortable learning environment," and "facilitates student engagement in the learning process." Internal consistency of this measure was 0.91.

Satisfaction with Physical Classroom Features. The items used to measure the level of satisfaction with the physical features in classrooms (i.e., room configuration, sight lines, color of the walls, lightning, furniture, sound quality, and noise level) were also adopted from Perks et al. (2016). Internal consistency of this measure was 0.93.

Recording and Observing Course Sessions

Eight class sessions were video recorded, four in traditional classrooms and four in innovative classrooms. A coding protocol (see Table 1) focused on how students engaged in the space and showed agency in shaping the spaces. These categories emerged from the original research questions and from the pilot study data that highlighted the importance of considering not only the formal class session, but also the informal time before and after the class. Peer support emerged as a theme in the focus groups and we added the category after we analyzed the data. It was added to the coding protocol so that the team could consider how peer support was shown.

We added initial behaviors that might be indicators of each category to the instrument. Some were quantitative, requiring coders to indicate the number of times they observed a particular behavior, and others were qualitative, requiring a brief description of what we observed. Video recording and analysis of educational settings provides a way "for social scientists to observe phenomena that are too complex to be noticed by the naked eye" (Janík, Seidel & Najvar, 2009, p. 8). Taping and observing videos provides a way to categorize small behaviors, notice patterns, and draw inferences about those behaviors.

All team members coded the same video in order to better define how each behavior was described and to add additional indicators to several of the categories that emerged from group discussions. Once revisions were made, each class session was coded by two raters. Neither of the raters was the instructor for the class being coded. We compiled the data and the group discussed what they believed to be significant differences in the interactions and behaviors in the two types of classroom spaces.

Participants

Seventy-six students from the courses being explored participated in the survey: 28 (36.8%) were in a traditional classroom and 48 (63.2%) were in an innovative classroom. All participants were recruited from 300-level classes, where most students were juniors and seniors, with less than 20% of sophomore students. The focus groups included 8-10 students from each type of course: We conducted a focus group with students who took any of the classes in a traditional classroom and one with students who took their course in the innovative classroom. Each session lasted about an hour.

Table 1. Coding Protocol for Video Recordings of Four Classrooms.

Openings and Closings	How does the space the class is held in impact student pre-class and post-class interactions? *What might this tell us about some of the benefits and challenges of working in different types of learning spaces?*
Student Efficacy/Ownership of Space	How do students show ownership of the space through their manipulation and use of the space? *What can this tell us about student sense of their role as active, agentic learner or passive, receiving learner?*
Spatial Orientation of Students during learning	Where is the attention of students during learning? What draws their focus? *What can this tell us about where learning is happening?*
Use of Technology and Instructional Materials (Technology defined as flip charts, walls, computers, projectors, etc.)	How do students individually and/or collaboratively use personal technology or instructional materials? How do students, individually and/or collaboratively, used shared technology or instructional materials? *What might this tell us about students' abilities to structure collaboration?* *What might this tell us about what tools are helpful to support collaboration?*
Student Behaviors	How would we name the behaviors students are engaged in and categorize how these are being done? *What might this tell us about assumptions of student roles as learners?* *Do spaces that less resemble traditional classrooms enable students to escape traditional student expectations of roles?*
Student Peer Support	How do students relate to each other in the space? What differences might there be in these relationships and interactions in different teaching spaces? *What might this tell us about the spatial elements of creating a learning community?*

Results

Differences in Group Interaction related to Space

In order to interact in productive ways, students need to have a level of comfort with one another. To answer RQ1, we trained our observations on how students entered the classroom and whether they engaged with each other prior to the official class start. Many students spent this pre-class time on their phones, but in the innovative classrooms, students were also more likely to be talking to their peers.

In both types of classrooms, students seemed to go to a specific seat, although neither type of class assigned seats. This seems to reinforce the norm of territoriality, which is important because research has shown that "persons who possess a clearly delineated space feel secure about shared spaces" (Kaya & Burgess, 2007, p. 859).

The most noted interaction before class occurred in the innovative classroom spaces where students sat at tables together, often with members of their semester-long project teams. Even though project team members sat close to one another in the traditional classrooms, having to turn their bodies to speak with another student behind them or to either side of them seemed to impede this type of communication. The rows in the traditional classroom seemed to reinforce the behavior of coming in, sitting forward in their seat, and occupying themselves on their phones until class started.

Several of the recordings were of activities that required students to collaborate. Students were given instructions and provided with a task to complete as a group. The biggest difference seemed to be that groups in innovative classrooms began the collaborative activity by first talking together and then having one group member document their responses on the writable walls. Collaborating and writing comments on the walls seemed easier for the participants in these innovative classrooms because students could "claim" space nearest to their table.

In the traditional classroom, students had to move to a section of the wall on which the instructor had placed a piece of self-stick easel paper, which was not close to where the group was sitting. This had the effect of decreasing group collaboration. In both sessions, students received an activity handout to read individually. Then, students were instructed to collaborate and document their responses on the walls. In the traditional classroom, students who finished reading first would get up and start writing on the sheet without speaking with other members of their group. After some time, they did begin to talk, but that talk did not result in any or many changes to the sheet. This may be because in the innovative classrooms, the walls are closer to their tables and groups may not feel the urgency to claim the space and race to write words on the walls.

The innovative classrooms clearly allowed groups of students to collaborate more effectively but this did not yield only positive outcomes. The flexible seating allowed teams to sit and face one another, which hinted at the potentially distracting group norms at the tables. In the traditional classroom, students' attention was drawn to the front of the classroom because the desks faced the official "front" of the room.

Since the innovative classrooms do not have a designated "front of the room," the instructor was often speaking from the middle of the classroom among the tables. This created a challenge when the instructor wanted to lecture, promote group discussion, or give instructions. Research shows that classrooms with a traditional setup of desks in rows facing the instructor can increase students' ability to focus on the lesson and concentrate on their work (Budge, 2000). Nevertheless, this limitation can be addressed in more innovative spaces by establishing explicit classroom norms (students should adjust their chairs when the instructor or a speaker is presenting information). If we do not set this expectation and reinforce it until it becomes a norm, students will form their own norms of behavior and hence, create distractions.

Students in the innovative classrooms often established their own group norms, often communicating through nonverbal glances and looking together at notes or a computer screen while the instructor was addressing the whole class. Another group norm that was evident in the innovative classrooms included relying on one group member to contribute "for the table." This parallels the behavior in traditional classrooms of having several students who regularly contribute to discussion, but in the case of innovative classrooms, the groups have implicit expectations that one or two group members serve as elected spokespersons or contributors from their group.

Another norm observed in many of the innovative classroom spaces was the acceptability that group members could keep talking among themselves even when the instructor was debriefing a small group activity, or collaborate together even when engaged in individual tasks. In one recording, the setup of the innovative classroom mitigated this by having tables arranged so students sat on three sides of the table. The instructor created a temporary space in front of the room from which to lead full class discussions and deliver information without impeding the ability of groups to collaborate effectively. In this class, there was more tracking of the instructor as she moves through the room while she is addressing students. In addition, when students contribute there is a slight movement of heads and bodies toward the contributing student.

Students' Perceptions about Different Spaces

To answer RQ2, students in both types of classrooms in our focus group study were asked to describe the classroom spaces metaphorically and the metaphors students in traditional classrooms used included it feeling like jail, because they felt "boxed in, uncomfortable, no freedom." The space was also described as a locker room, "very claustrophobic, intruding on people's space." One student said that it felt like a hospital. "You had your own designated space. Very clean and white. The windows are oddly too high."

Contrastingly, students described the innovative spaces using metaphors that are more active. One said that it felt like a "high school cafeteria. We sat at half circle tables, but they were very close together, so it's just like you can like sit down at yours, but you can also turn around and talk to the people right behind you, or get up and walk like 5 feet and be sitting down at the next group." Another added, "I felt like I was coming together with other students not to have a discussion or a study session, but, talk about what we were going to learn, we were going to discuss it and maybe hear a few different perspectives." Another student commented that the interactions in class including hearing other perspectives felt like "a business meeting, almost like a staff meeting, just talking about what's going on."

In addition, students offered metaphors of home and family. "It is a sort homey feel in that classroom." It felt like a family, "the way you sit in the circular tables, it forced you to talk, because you're not going to sit right across the table from someone and not say a word to them. And we all just got really close and supported each other, I feel so close to everyone in that class." Another student commented that it felt like "we were sitting at the dinner table, talking about our lives, and talking about our day, like *how was school*? or *how's your project going*? And then asking each other personal questions, but then also going to help each other."

Psychosocial Environment and Community Building

After running an analysis of covariance (ANCOVA) to control for instructor difference, we found one difference between student groups. Overall, students who took a class in an innovative classroom showed a higher level of student cohesiveness (M = 3.81, SD = .75) than students who took a class in a traditional classroom (M = 3.41, SD = .60). However, after controlling the instructor difference,

there was no statistical difference. As Table 2 shows, for "students don't have much chance to get to know each other in this class," students in the traditional classroom agreed more (M = 2.71, SD = 1.33) than students in the innovative classroom (M = 1.83, SD = .75), F (1, 74) = 7.33, $p < 0.01$.

Table 2. Comparison Between Traditional and Innovative Classrooms on Student Cohesiveness.

Questions	Traditional (N = 28)		Innovative (N = 48)		F
	M	SD	M	SD	
Each student knows the other members of the class by their first names.	3.21	1.20	3.48	1.24	.00
Friendships are made among students in this class.	4.25	.65	4.40	.57	.00
Students in this class get to know each other well.	3.63	.79	4.04	.94	.07
The class is made up of individuals who don't know each other well.	2.68	1.12	2.65	1.04	.08
Students don't have much chance to get to know each other in this class.	2.71	1.33	1.83	.75	7.33*
It takes a long time to get to know everybody by his / her first name in this class.	3.07	1.18	2.52	1.26	.59
Students in this class aren't very interested in getting to know other students.	2.79	.88	2.23	.95	2.37
Student Cohesiveness	3.41	.60	3.81	.75	1.01

Note.1 – Strongly disagree, 5 – Strongly agree, $^{**}p < 0.01$, $^{*}p < 0.05$

From the focus group study findings, students in the innovative classrooms spent a lot of time talking about the types of relationships they formed during the class experiences. They agreed it was easier to collaborate with people when they were all sitting and facing each other, but the benefits went beyond efficiency. "We did a lot of discussion-based activities, and that was really nice because you were facing each other in this whole sort of circle table. We would not have gotten that if the desks were just in rows, because it makes it hard to really to collaborate with a big group of people. We all became friends, and it was just great to have discussions and talk freely with other people in the group."

This ability to collaborate may also have had some potential negative effects as well on the learning environment. "Even for activities that aren't meant to be interactive, or in a group, I think we ended up talking to each other just because we are facing each other … we make individual activities into group activities sometimes just because we are so used to participating and discussing things with each other." While this can be seen as detrimental to goals, it does positively contribute to group cohesion and may enhance learning.

Students noted that because interactivity was part of the culture of these spaces, "everybody was more compelled to participate. When we had presentations, people would more easily respond than just being called on or prodded. They were already in that space and mindset to be interacting, so when we gave presentations, they [their peers] were really receptive to it."

Those in the innovative spaces claimed this does not happen in traditional classrooms. "Every activity we would do, we would end up having some kind of discussion or even writing on the boards

created those discussions. In a traditional classroom, you're either sitting in rows, or in rows of desks, and you're just listening to the professor lecture, and you're not talking to the people next to you. I've been through a whole class just watching over a shoulder, I didn't even know the person's name next to me the entire semester, just cause that's all you would do, sit there and listen instead of interacting with each other." Students here are reflecting on the difficulty of forming a community in traditional classrooms.

Attitude toward the Classroom Environment

When asked how they felt about the classroom environment as it relates to RQ2, as Table 3 shows, students from the innovative classroom had more positive attitudes toward the classroom (M = 4.11, SD = .96) than students from the traditional classroom (M = 3.50, SD = .95). After controlling for instructor difference, though, this difference was not statistically significant. In addition, students from the innovative classroom thought that the classroom was an effective space (M = 4.06, SD = 1.00) and facilitated different types of teaching and activities (M = 4.15, SD = 1.03), F (1, 74) = 5.22, $p <$ 0.05. Students from the innovative classroom thought that the classroom was more comfortable (M = 4.08, SD = 1.16) and facilitated student engagement (M = 4.15, SD = 1.11).

Table 3. Comparison between Traditional and Innovative Classrooms on Attitude toward the Classroom.

Items	Traditional (N = 28)		Innovative (N = 48)		F
	M	SD	M	SD	
This classroom was an effective space to hold this particular course.	3.43	1.14	4.06	1.00	5.22*
This classroom facilitated different types of teaching / learning activities.	3.57	.92	4.15	1.03	3.10
This classroom offered a physically comfortable learning environment.	3.36	1.34	4.08	1.16	2.44
This classroom facilitated student engagement in the learning process.	3.59	.97	4.15	1.11	-2.16*
Attitude toward the Classroom	3.50	.95	4.11	.96	3.64

Note.1 – Strongly disagree, 5 – Strongly agree, $^{**}p < 0.01$, $^{*}p < 0.05$

The finding of raw differences in attitudes which were not statistically significant after factoring in instructor difference offers the insight that these spaces do not "do the work" of creating different attitudes towards the classroom. That requires a combination of a flexible space and an instructor who intentionally uses the space to achieve collaborative outcomes for students.

Satisfaction on Classroom Features

To answer RQ3, students from the innovative classroom liked the classroom features more (M = 3.21, SD = .79) than students from the traditional classroom (M = 3.92, SD = .82), F (1, 754) = 7.43, $p <$ 0.01. None of the physical features were ranked higher in the traditional classroom than in the innovative classroom. All features were ranked as more satisfactory in the innovative classroom, especially furniture (M = 4.13, SD = .87) and noise level (m = 4.13, sd = .82). By contrast, furniture

(M = 3.00, SD = 1.12) was one of the least-liked features in the traditional classroom, along with temperature (M = 2.57, SD = 1.23). (See Table 4)

Table 4. Comparison between Traditional and Innovative Classrooms on Perception of Physical Classroom Features.

Items	Traditional (N = 28)		Innovative (N = 48)		F
	M	SD	M	SD	
Room configuration	3.25	.97	3.92	1.09	4.83*
Sightlines	3.29	.71	3.58	1.11	.39
Color of the walls	3.39	.96	3.83	1.06	.95
Lighting	3.46	1.00	3.98	1.05	1.11
Temperature	2.57	1.23	3.81	1.16	8.98**
Furniture	3.00	1.12	4.13	.87	15.27***
Sound quality	3.33	1.00	3.96	1.01	9.11**
Noise level	3.43	1.00	4.13	.82	6.64*
Perception of Physical Classroom Features	3.21	.79	3.92	.82	7.43***

Note.1 – Strongly disagree, 5 – Strongly agree, ***$p < 0.001$, **$p < 0.01$, * $p < 0.05$

Student satisfaction with the logistical benefits of instructional tools and space in the innovative classrooms were also expressed through our focus group findings offering some insight into RQ4. Those who reflected on their experiences in the innovative classrooms noted the benefits of technological assets that do not exist in the traditional classroom (like "three screens that drop down, so you can see it from all angles of the classroom and follow along" and having a screen facing you when you present). "When you give presentations, you don't really want to be looking at the screen, but it's kind of nice because when we gave it we had one behind us that they could look at, and then we could still face the audience and glance at the other two when we needed to, instead of like turning away from it, so um, which was really nice."

Another asset frequently mentioned was flexibility. "We could change the room for when we did the press conference and change it for when we did this gallery walk showing our infographics, things like that. Students mentioned that they could have done these activities in a traditional classroom, but the flexibility "made it go smoother, I think." This flexibility also made the activities feel more authentic. Students commented on setting up the room for a press conference and using the technology to run the event. However, students also remarked that technology could also be a big challenge in these flexible spaces, and it did not often function as it should. However, they did note that this issue with the technology was something they will have to prepare for in their future careers.

Not all of the instructional tools the students mentioned were high-tech, however. They talked in detail about the benefit of being able to write on the walls, which they believe increased the value of reflective discussion and feedback. "At the beginning of the semester we each had to come up with

three words we'd use to describe ourselves in an interview, and what I really liked is we used the walls and would write the three words on the walls. Students noted that because the walls were dry erase, they could revise as they went. "We could edit ours as people went." As the instructor and peers offered feedback to one, others could use that feedback and "change yours as you went, since it was dry erase, it was just really helpful."

Those in the innovative classrooms also noted that the space felt more comfortable and relaxed for presenting to their peers. "For the last part of the semester, we had presentations where you and a partner teach the class, and it goes for the entire class period. I really like the space because it's more open instead of rows so there's a middle ground you can walk, then tables on the sides, so it's really nice cause you can feel more open, walk around, talk to different groups, and there's better places you can stand, there's a little podium we can put our computers on and like roll it around and move it. It's just a better presentation space than a typical classroom." Several students said the presentations felt more like a conversation "less of a like, lecture or speech when there's rows of people looking at you" and less intimidating in the innovative spaces. "When you have just a bunch of heads in rows staring at you, I just find that a little more intimidating, I feel more comfortable … it just has this little safe space where you can look if you really want to not stare into someone's eyes." Students in the innovative classrooms also overwhelmingly noted that they felt as if they had more support from their peers. "I wasn't as nervous as I would be in another class because I knew that they were all supporting me, and we respect each other and pay attention to each other more when we're lecturing than when we are in another class when you don't know the person. We don't typically zone out because we know the person and who they are, and we respect what they're doing and we're friends with them so we want to support them and make them feel good about what they're doing … I feel like it will be similar to a workplace where you get to know your coworkers really well, and you won't be intimidated to talk in front of them." It is interesting to note here that this sense of camaraderie may be from the very nature of the flexible space classrooms and how much easier it was to get to know their classmates.

To answer RQ5, students who were more satisfied with the classroom features had more favorable attitudes toward the physical classroom environment $\beta = .78$, $F(1,75) = 116.56$, $p < 0.001$, and it explained 61% of variances (See Table 5).

Table 5. Simple Regression Table between Satisfaction with Classroom Features and Attitude toward Physical Classroom Environment.

Items	Predictor Satisfaction with Physical Classroom Features				
	B	SE B	β	t	R^2
This classroom was an effective space to hold this particular course.	.84	.11	.67	7.86***	.45
This classroom facilitated different types of teaching / learning activities.	.77	.10	.66	7.49***	.42
This classroom offered a physically comfortable learning environment.	1.11	.11	.76	10.06***	.57
This classroom facilitated student engagement in the learning process.	.85	.11	.68	7.99***	.46
Attitude toward physical classroom environment	.89	.08	.78	10.80***	.61

Note.1 – Very dissatisfied, 5 – Very satisfied, ***$p < 0.001$

To address RQ6, we ran stepwise regression tests to see if any psychosocial environment was a significant predictor of attitude toward classroom environment and satisfaction on physical classroom features. As Table 7 shows, satisfaction was the biggest predictor, $\beta = .48$, $F(1,75) = 22.33$, $p < 0.001$, and explained 22.1% of variances. When personalization was added as a predictor, satisfaction became a bigger predictor, $\beta = .70$; personalization was the second predictor, but negatively correlated, $\beta = -.34$, $F(2,75) = 15.53$, $p < 0.001$, which explained 27.9% of the variances. Other psychosocial environment factors were not statistically significant predictors.

Table 6. Stepwise Regression Analysis Predicting Attitude toward Classroom Environment.

	Attitude toward Classroom Environment			
	Model 1 β	95% CI	Model 2 β	95% CI
Constant	1.43**	[.37, 2.48]	2.52***	[1.21, 3.83]
Satisfaction	.48***	[.37, .91]	.70***	[.59, 1.27]
Personalization			-.34*	[-.93, -.13]
R^2	.22		.28	
F	22.33***		15.53***	

Note. CI = Confidence interval, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Discussion

In this section, we offer some practical implications of the benefits and challenges of working in different types of learning spaces. We also consider how these comparisons can help us adapt more traditional classroom spaces to reap some of the learning and community development benefits of more flexible spaces.

An Innovative Classroom Space by Itself Cannot Address the Challenges

Our observations showed that many expected distracting behaviors of students such as being on phones, having side-conversations, or being on a laptop doing things that are not class-related do happen in both types of classroom spaces. In fact, as faculty observing the videos it was often shocking to see how blatant students were about engaging in negative behaviors that can be interpreted as disrespectful. It made us wonder how many of these behaviors occur that we do not even know about because we are focused on delivering content and facilitating activities.

If we want students to engage differently, in a highly-collaborative way, we need to have access to the types of spaces that support this, and when we do not, we need to be more intentional in transforming the spaces beyond putting desks in a circle. We have to support collaboration as much as possible.

More than that, faculty must also be explicit in showing them what real collaboration entails, what it looks like, and what types of improved outcomes they should be able to achieve when they collaborate. This narrative — and even modeling — must happen regardless of whether the space is ideally or less-than-ideally structured to support collaboration. The instructors who have taught in the flex space classrooms found themselves more likely to want to recreate this experience when they taught in traditional spaces. Having had the experience and benefit of using the flex space helped increase their creativity once they returned to regular classroom spaces.

According to Prince (2004), active learning is any instructional method that engages students in meaningful learning activities and requires them to think about what they are doing. This contrasts

with passive learning that commonly occurs in a teacher-centered environment in which students are passively listening to and receiving information from an instructor. The question to consider is this: Do we want students actively engaged in the learning process or do we want them to be impressed by the instructor? We are firmly in the former camp.

It is true that an active learning environment provides less of a platform for the instructor, but that is because in this kind of learning environment, the planning, teaching, and assessing of the course has to revolve around the needs and abilities of the students (Ball & Leppington, 2015). In this learning environment, the instructor becomes more of a learning facilitator than a lecturing "sage on the stage" designed to impress students. In effect, the instructor also becomes a learner.

Therefore, we must recognize that flexible space and ingenious use of environmental options do not matter if the teacher does not integrate them and maximize their potential. Just changing the seating arrangements and the access to multiple screens will not make much difference in student learning. Flexible spaces may be a lost chance for teaching innovation if the instructor does not consider how to adapt to the new space and be willing to make changes to how they teach the material. Anecdotal information from others not part of this study but who have taught in these innovative spaces and experienced no significant changes in their classes, mentioned that they did not really change their teaching style and hence underused the innovative space.

Shifting Roles; Balancing Control

This research highlights the need for instructors to be conscious of classroom set up and the impacts this may have on control and agency. It challenges the norm of keeping seats in rows, which not only hinders peer relational and community formation, but also may reduce student agency. The physical layout itself may be exerting technological control on students to perform passive roles. Research shows that classrooms with traditional setups of desks can increase students' ability to focus on the lesson and concentrate on their work (Budge, 2000), but these types of layouts also reinforce norms of the instructor being in control of learning.

More flexible spaces that allow agency for students to structure team spaces seem to result in the formation of small group communities and small group norms that may make it difficult or challenging to engage a whole class in discussion, hear instructions, cover concepts, or discuss upcoming assignments. However, we can also be intentional about how we set new norms of engagement in these courses and encourage students to play a role in shaping the space as productive, encouraging concertive control (Barker, 1993). In a system of concertive control, the cultural norm becomes one where "members are not only empowered to control their own behavior for the benefit of the organization, they are also encouraged to take responsibility for the actions of their peers" (Gossett, 2009, p. 710). In this case, the organization is the classroom and students are encouraged to take responsibility for shaping the collaborative environment and meeting learning goals.

While these spaces can erode traditional classroom norms, we need to continue to challenge whether these expectations of order and control are beneficial to student learning, particularly when we seek more agency by students. These spaces encourage us to think about what it would look like for instructors to radically share the burden of creating a learning environment with students. This may mean that instructors and students learn how to move seamlessly between roles as teacher and as learner. Instructors need to be able to give up the physical and symbolic head of the room to promote engagement of all participants in constructing learning.

Building Community; Strengthening Relationships

It is obvious from the student comments that community and connection were important to them. In some cases, the seating alone allowed them to feel "at home" and more comfortable and willing to break out of their traditional classroom norm of picking up their phone and disconnecting from the class. In addition, the very act of facing each other in the flex spaces might provide peer policing of the disconnected behaviors that they so easily take up once they are in a traditional classroom. The downside to this is it may also create in-groups that cause side conversations and distractions during class. Maximizing these perceived benefits of building relationships in the flexible space should be incorporated whenever possible while minimizing the distracting behaviors. Making those changes to how an instructor teaches will take effort but we believe that effort is minimal and overall rewarding.

Limitations

It is difficult to generalize the results of this study due to the small sample size of communication classes that are similar in nature, and which also consisted of more group work than lectures. Future studies that examine students' behaviors on more than just a few class days would add insight into what specifically is happening in these spaces to promote active learning, engagement, and student cohesiveness. In addition, as more college students are able to take classes in both traditional and innovative spaces, instructors may be able to encourage students to compare these experiences in ways that minimize the impact of any specific course content differences, focus more exclusively on the impacts of the space, and on built pedagogy. Furthermore, the difference that we found from different observations might be because of the classroom features. We found that there were significant differences on preferences of classroom features between traditional classrooms and innovative classrooms. Future studies should choose traditional classrooms that are relatively newly built or renovated to be able to highlight the differences in the classroom features and flexibility, not new rugs or paint on the walls. Lastly, research designs that also attempt to minimize teacher differences will be important, although challenging. Studying instructors' perceptions and practices of innovation would be a fruitful line of research. Do instructors need to already have a track record of innovation to successfully use innovative spaces, or is an openness to experimentation enough to help instructors capitalize on the collaborative and innovative potential of these specially-designed spaces?

Conclusion

All findings indicate that students liked the innovative classroom more than the traditional classroom and were more satisfied with the innovative classroom's features. However, satisfaction does not necessarily translate to student engagement and innovative teaching. Teaching in an innovative classroom does not make a course innovative. Of course, the innovative classroom can and should stimulate instructors to be more innovative and to consider a pedagogy that promotes more engaged learning. Nevertheless, students who took a class in an innovative space felt the classroom was right for the course and promoted student engagement, but there is anecdotal evidence that not all faculty who utilize the innovative space adapt their teaching. Therefore, the physical environment itself is not enough to improve students' learning. This may indicate that students want more freedom in learning, especially when they are in an innovative classroom space.

We believe it is important to continue this line of research so that we can effectively advocate with campus decision-makers about why we need more flexible, innovative classroom spaces. Having research data, particularly data focused on students' attitudes and perceptions of learning, will help us make the case that not only our content and our pedagogy, but also our teaching and learning spaces

affect student learning in important ways. Research on the impact of these spaces recently proved crucial on our campus when, due to space and programmatic pressures, these innovative classrooms were eliminated as the space was repurposed for academic counseling needs. However, school leaders recognized the value of these spaces from research studies such as this and are investing in the creation of at least one such room in an existing academic building for each of our colleges.

References

Ball, T. C., & Leppington, R. (2015). The VAST model for online instruction: Promoting significant learning experiences. *The Northwest Journal of Communication, 43*(1), 79-102.

Barker, J. R. (1993). Tightening the iron cage: Concertive control in self-managing teams. *Administrative Science Quarterly, 38*, 408-437. https://doi.org/10.2307/2393374

Barkley, E. F. (2010). *Student engagement techniques: A handbook for college faculty*. Jossey-Bass.

Beichner, R. J. (2008). *The SCALE-UP project: A student-centered active learning environment for undergraduate programs*. Retrieved December 13, 2021 from https://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse_072628.pdf

Beichner, R. J., Saul, J. M., Abbott, D. S., Morse, J. J., Deardorff, D. L., Allain, R. J., Risley, J. S. (2007). The student-centered activities for large enrollment undergraduate programs (SCALE-UP) project. In E. F. Redish & P. J. Cooney (Eds.), *Research-based reform of university physics* (Vol. 1, 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*, 1243-1289. https://doi.org/10.3102/0034654309333844

Brooks, D. C. (2012). Space and consequences: The impact of different formal learning spaces on instructor and student behavior. *Journal of Learning Spaces*, *1*(2). Retrieved December 13, 2021 from https://files.eric.ed.gov/fulltext/EJ1152694.pdf

Budge, D. (2000). Secret is in the seating. *Times Educational Supplement, No. 4396*, 26-27.

Catherman, J. (2017). *The manual to middle school: The 'do this, not that' survival guide for guys*. Revell Books.

Chamorro-Premuzic, T., & Frankiewicz, B. (2019, January 7). Does higher education still prepare people for jobs? *Harvard Business Review*. Retrieved December 13, 2021 from https://hbr.org/2019/01/does-higher-education-still-prepare-people-for-jobs

Copridge, K. W., Uttamchandani, S., & Birdwell, T. (2021). Faculty reflections of pedagogical transformation in active learning classrooms. *Innovative Higher Education, 46***,** 205–221. https://doi.org/10.1007/s10755-021-09544-y

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. https://www.jstor.org/stable/43632160

Dori, Y. J., & Belcher, J. (2005). How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts? *The Journal of the Learning Sciences, 14*(2), 243-279. https://doi.org/10.1207/s15327809jls1402_3

Dorittle, P. E., & Hicks, D. (2003). Constructivism as a theoretical foundation for the use of technology in social studies. *Theory and Research in Social Education, 31*(1), 72-104. https://doi.org/10.1080/00933104.2003.10473216

Fraser, B. J., Treagust, D. F., & Dennis, N. C. (1986). Development of an instrument for assessing classroom psychosocial environment at universities and colleges. *Studies in Higher Education, 11*(1), 43-54. https://doi.org/10.1080/03075078612331378451

Gibeault, M. J. (2015). Using iPads to facilitate library instruction sessions in a SCALE-UP classroom. *College & Undergraduate Libraries, 22*(2), 209-223. https://doi.org/10.1080/10691316.2014.924844

Gossett, L. M. (2009) Organizational control theory. In S. W. Littlejohn & K. A. Foss (Eds.), *Encyclopedia of communication theory* (pp. 706-710). Sage.

Grabinger, R. S., & Dunlap, J. C. (1995). Rich environments for active learning: A definition. *Research in Learning Technology*, *3*(2), 5-34. https://doi.org/10.3402/rlt.v3i2.9606

Hart, P. D. (2006). *How should college prepare students to succeed in today's global economy?* Retrieved December 13, 2021 from http://www.aacu.org/leap/documents/Re8097abcombined.pdf

James Madison University. (n.d.) *Enhancing pedagogy through innovative classrooms*. Retrieved December 15, 2021 from https://www.jmu.edu/epic/index.shtml

Janík, T., Seidel, T., & Najvar, P. (2009). Introduction: On the power of video studies in investigating teaching and learning. In T. Janík & T. Seidel (Eds.), *The power of video studies in investigating teaching and learning in the classroom* (pp. 7-19). Waxman Verlag.

Kaya, N., & Burgess, B. (2007). Territoriality seat preferences in different types of classroom arrangements. *Environment and Behaviour, 39*, 859-879. https://doi.org/10.1177/0013916506298798

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education, 4*(2), 193-212. https://doi.org/10.5465/AMLE.2005.17268566

Lebow, D. (1993). Constructivist values for instructional systems design: Five principles toward a new mindset. *Educational Technology Research and Development, 41*(3), 4-16. https://doi.org/10.1007/BF02297354

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teachers' knowledge. *Teachers College Record, 108*(6), 1017-1054. Retrieved December 13, 2021 from https://www.learntechlib.org/p/99246/

Monahan, T. (2002). Flexible space & built pedagogy: Emerging IT embodiments. *Invention, 4*(1), 1-19. Retrieved December 13, 2021 from https://publicsurveillance.com/papers/Built%20Pedagogy.pdf

Moos, R. H. (1974). *The social climate scales: An overview*. Consulting Psychologists Press.

Perks, T., Orr, D., & Al-Omari, E. (2016). Classroom re-design to facilitate student learning: A case study of changes to a University classroom. *Journal of the Scholarship of Teaching and Learning, 16*(1), 53-68. https://doi.org/10.14434/josotl.v16i1.19190

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education, 93*(3), 223-231. https://doi.org/10.1002/j.2168-9830.2004.tb00809.x

Rands, M. L., & Gansemer-Topf, A. M. (2017). The room itself is active: How classroom design impacts student engagement. *Journal of Learning Spaces, 6*(1), 26-33. Retrieved December 13, 2021 from http://libjournal.uncg.edu/jls/rt/captureCite/1286/1028

Slavin, R. E. (1991). Synthesis of research on cooperative learning. *Educational Leadership, 48*(5), 71-82.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.