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Student Perceptions of a 21st Century Learning Space

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Higher education institutions are increasingly building or remodeling classrooms to be flexible spaces that support learner-centered instruction. However, little is known about the actual impact of these spaces on student outcomes. Using a mixed method design, this study examined student perceptions of a flexible learning space on student learning and engagement as compared to traditional classrooms. Students reported that the flexible space enhanced their learning experience by supporting classroom engagement. This study demonstrates the importance of incorporating student perceptions when planning learning spaces and suggests a need for further studies on the complex relationships among space, student learning and motivation.

Higher education administrators overseeing instructional spaces in higher education have been slow to respond to the established view of teaching and learning as social, learner-centered processes (Vygotsky, 1978; Palinscar, 1986). This learner-centered view situates the learner as a member of a community that provides motivation and facilitates instruction while valuing the learners' incoming ideas and experiences. Instead, most classrooms are still designed for the teacher to be positioned in front of the classroom (Pearlman, 2010) and "providing" knowledge within a teacher-centered approach.

In contrast, learner-centered approaches place students/learners in the center of the teaching-learning process by providing them with opportunities to learn both independently and cooperatively with the teacher acting as a coach (Froyd & Simpson, 2008). The learner-centered framework "emphasizes the importance of supportive classroom environments that foster positive, caring relationships" (Meece, 2003, pp. 112). That is, it emphasizes meeting the learning and motivational needs of all learners in a supportive learning context. As such, it focuses on understanding of both individual learners and teaching/learning processes (Weiberger & McCombs, 2001, McCombs & Whisler, 1997).

McCombs and Whisler (1997) developed twelve principles for learner-centered environments. Chief among these are that: learners actively construct knowledge; social interactions influence this construction through communication and interpersonal relations; and learner motivation has a strong influence on learning outcomes. Learner-centered approaches can lead to improvement in college student academic achievement and attitudes as compared to more traditional teacher as knowledge provider models (Armbruster, et al., 2009; Derting & Ebert-May, 2010). Thus, a need for learning spaces that can support learner-centered instruction in a technology and information-rich 21st century environment exists.

Higher education institutions across the country are giving increasing attention to the construction of new learning spaces and renovation of existing ones as they strive to provide settings that support new uses of instructional technologies and learner-centered approaches, particularly for STEM (science, technology, engineering and mathematics) disciplines (AAU, 2013; Brown & Long, 2006; Long & Ehrmann, 2005; Narum, 2013; Scott-Webber, et al., 2000). Decisions concerning arranging and equipping spaces have significant economic, pedagogical, and scheduling implications. However, the design and development of new learning spaces is generally informed by user input provided to university planners, by what already exists at other institutions, and by industry post-occupancy surveys or interviews (Lippincott, 2009; Scott-Weber, et al. 2013; Temple, 2008; Brooks, 2011), rather than by research on the impact of learning space on teaching/learning processes and outcomes.

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This descriptive study examines a 21st century learning space from the students' perspective. Specifically, it focuses on student perceptions of the learning space and its influence on their learning and engagement. This work addresses the following research questions: a) to what extent do students perceive that a 21st century classroom influences the classroom climate and their learning and motivation in class? b) How does student perception of the classroom climate of a 21st century learning space compare to that of a traditional classroom? c) What are students' perceptions of benefits and challenges of learning in a 21st century classroom? The following sections offer a definition of 21st century learning spaces, a review of the relevant extant work, a description of this study's context and methods, and a discussion of the findings, implications and limitations of the study.

21st Century Learning Spaces

Learning needs space to take place; hence, learning space, whether digital or physical, is the most important contemporary infrastructure requirement for learning in the 21st century (Uduku, 2015). Unlike previous centuries that focused on building more learning spaces, the 21st century requires not more physical spaces but increased flexibility of available spaces (Uduku, 2015) making them "capable of continuously reconfiguring themselves" (Pearlman, 2010, p. 124). The Joint Information Systems Committee (JISC, 2009) described several attributes of 21st learning spaces. They are: flexible (able to accommodate both current and evolving pedagogies), future proofed (can be re-allocated and reconfigured), bold (look beyond tried and tested technologies and pedagogies), creative (energize and inspire learners and teachers), and supportive (develop the potential of all learners). Additionally, they are: enterprising (capable of supporting different purposes), able to motivate learners, able to promote learning as an activity, able to support collaborative as well as formal practice, and able to provide a personalized and inclusive environment. With specific regards to flexibility, Pearlman (2010) stated that, rather than individual student desks, 21st classrooms consist of worktables and rolling chairs that can be arranged as needed for collaborative and team projects, teacher-led workshops, design workshops, or seminars and student presentations. In addition, 21st century learning spaces offer students access to instructional and learning technologies that may include computers and connection to the internet. This integration of learning technologies does not necessarily require more physical space, but more flexible space (Uduku 2015).

The study described in this paper examines student perceptions of a flexible learning space in Purdue University's Hall for Discovery and Learning Research (HDLR). The HDLR was built in 2010 and includes flexible learning spaces and educational research technology that provide a sandbox for studying the effects of teaching innovation in a pilot setting (Narum, 2013). A detailed description of the flexible learning space is presented later in the methodology section of this paper.

Prior Research on Learning Space Influence on Learning Process

Research on how learning spaces influence learner behaviors and outcomes has been an area of interest over the last several decades, with seating arrangement being one focus of prolonged study. Research studies on classroom seating found that seating arrangement is related to students' on-task behavior. A review of empirical research from 1979 to 2007 on seating arrangement by Wannarka and Ruhl (2008) revealed that seating in rows could maximize the on-task behavior when students were doing individual work. On the other hand, interactive behaviors, such as asking questions (Marx, et al., 1999) or brainstorming, were enhanced by seating arranged in semi-circles or similar configurations that could facilitate communication. This research suggests that different seating arrangements may have different impacts on the learning process.

Recent course redesign efforts in STEM disciplines at the post-secondary levels have focused on creating spaces that foster collaboration and active learning. However, very few empirical studies have been conducted to examine the impact of space on teaching and learning processes and outcomes (Temple, 2008; Brooks, 2011). The Student-Centered Activities for Enrollment Undergraduate Programs (SCALE-UP) project of North Carolina State University aimed to establish a "highly collaborative, hands-on, computer-rich, interactive learning environment for large, introductory college courses" (Beichner, et al., 2007, pp. 1). For various courses, the project developed new pedagogy, curriculum, and classroom environments. SCALE-UP classrooms were equipped with lab equipment and at least one computer for each student group, an instructor station with a projector that could be seen from all seating areas, and adequate white boards. For a calculus-based introductory physics course, Beichner et al. (2007) reported improvement in student conceptual understanding, problem solving, attitudes, as well as success rates—especially for females and minorities. Similarly, the Technology-Enabled Active Learning (TEAL) project at Massachusetts Institute of Technology transformed a course to incorporate lectures, recitations, and desktop lab activities in a media-rich environment in order to promote students' visualization and understanding of the course content (Dori, et al., 2003). The TEAL classroom had 13 round tables with 9 students working in groups of 3 seated at each table. Each

triad had a laptop and projector screen. Program evaluation employed a quasi-experimental design using historic data for comparison. Students in the TEAL format had significantly better understanding of the complex phenomena covered in the course than their control group peers did.

These studies, however, were not focused primarily on learning space, but rather on innovative pedagogy that required innovative learning space. Moreover, these studies examined a particular pedagogical approach using a static arrangement of furniture. As such, they did not answer questions about the impact of the learning space on the learning process or student learning outcomes (Temple, 2008; Brooks, 2011). To this end, Brooks (2011) conducted a study aimed at comparing students' learning outcomes with space as the only variable. In this study, one instructor taught the same class to two groups of first semester first-year students: one group in a traditional classroom and the other in the Active Learning Classroom (ALC). The ALC was equipped with: round tables that could seat nine students, laptops on the tables that were connected with projectors, one instructor station with two large projector screens, and glass marker-boards around the room. Although in different spaces, the instructor attempted to keep the pedagogy the same. While students in the traditional classroom entered the study with significantly higher ACT scores, there was no significant difference between the achievement scores of the two groups at the end of the study.

Brooks' study attempted to find empirical evidence of a direct impact of space on learning outcomes. However, in follow-up classroom observations Brooks (2012) found that, though the instructor took care to teach the two courses in an identical manner, there were still significant differences in the observed pedagogy, specifically in the amount of lecture and instructor-student interaction time. Further, Brooks (2012) found that lecture was the significant predictor of students' high-level, on-task behavior in the traditional classroom, while group activities and classroom discussion were the significant predictors in the ALC. In terms of students' on-task behavior, the study did not find more engagement in the ALC. Rather, students in the traditional classroom were found to be more engaged.

Knowledge Gaps and Study Purpose

As previously described, the few available studies on the impact of learning spaces were not focused primarily on learning space, but rather on innovative pedagogy that required innovative learning space. Thus, these studies do not provide useful guidance regarding the direct impact of flexible spaces on student learning. Existing studies are further limited by their narrow definition of student learning as student standardized test scores (Beichner, et al., 2007; Dori, et al., 2003) and their failure to include broader measures of student learning, including student perceptions of how the physical environment contributes to or detracts from their learning, motivation, and classroom engagement. The current study seeks to understand students' perceptions of the influence of a 21st century learning space on classroom climate, learning, and motivation as compared to a traditional classroom. Additionally, this study examines student perceptions of benefits and challenges associated with these flexible spaces. While limited in scope, this study provides a starting point for considering student perceptions of the impact of furniture arrangement on learning, motivation, classroom dynamics, and climate.

Methods

This exploratory, mixed-method study examines students' experiences in a 21st century learning space. Data was collected from a purposeful sample of learners enrolled in an innovative cohort program that uses the same 21st century learning space for many different courses across the curriculum.

Setting

As previously mentioned, Purdue University's Hall for Discovery Learning and Research (HDLR), built in 2010, includes flexible learning spaces and educational research technology that serves as a sandbox for studying the effects of teaching innovation in a pilot setting (Narum, 2013). Many of the active learning spaces at Purdue University are based on innovations tested in this sandbox. HDLR spaces are 21st century learning spaces designed using a "black-box" theatre approach that provides opportunities for exploring and documenting how various kinds of spatial configurations and technological affordances influence learning. As described in *A Guide for Planning and Assessing Learning Spaces for 21st Century Learners* (Narum, 2013), the HDLR spaces meet the definition of 21st century learning space as they are flexible and reconfigurable, permit students and faculty to personalize their experiences, facilitate individual and collaborative learning, allow the use of technology, and can be reimagined to meet current and future needs.

This study was conducted in a learning studio in the HDLR that is equipped with 60 seats representing a variety of styles and functionalities, ranging from tables and chairs (high or low, round or square) to tablet chairs that are hard or soft, to sofas. We purposely selected to examine student learning in the HDLR flexible learning space for two reasons. First, the space is one of the research spaces located in the

Figure 1. Seating options in flexible classroom

HDLR, hence we had free access and control (or "ownership") of the space. Second, the learning space is one of the very few 21st century learning spaces that existed on the Purdue campus at the time the study began.

Figure 1 describes the available seating and includes a photo illustration. Figure 2 shows the default arrangement for furniture in this space. All furniture was movable to allow an almost endless variety of room configurations. Figure 3 captures the learning studio and furniture in use during a class.

Participants

The purposeful sample of participants consisted of 25 students enrolled in the Purdue Polytechnic Institute (PPI) experimental cohort program in the fall semester of 2014. The PPI experimental program is an initiative to transform a college within this large research intensive university using a highly student-centered approach. The PPI program uses a pedagogy that integrates humanities and technical studies and is explicitly intended to be learner-centered and instructor-facilitated. This approach necessitates flexible learning spaces. The PPI transformation process is described in Mili, Herrick & Froonickx (2016).

Study participants comprised the inaugural PPI experimental cohort. Unlike the general university student population, students in this cohort program complete almost all of their first year credits as a group using the various flexible spaces in the HDLR. This study focuses on student perceptions and use of a medium-sized classroom outfitted as a 21st century learning space.

Cohort students used the study classroom for a math course, a technology course that integrated English and

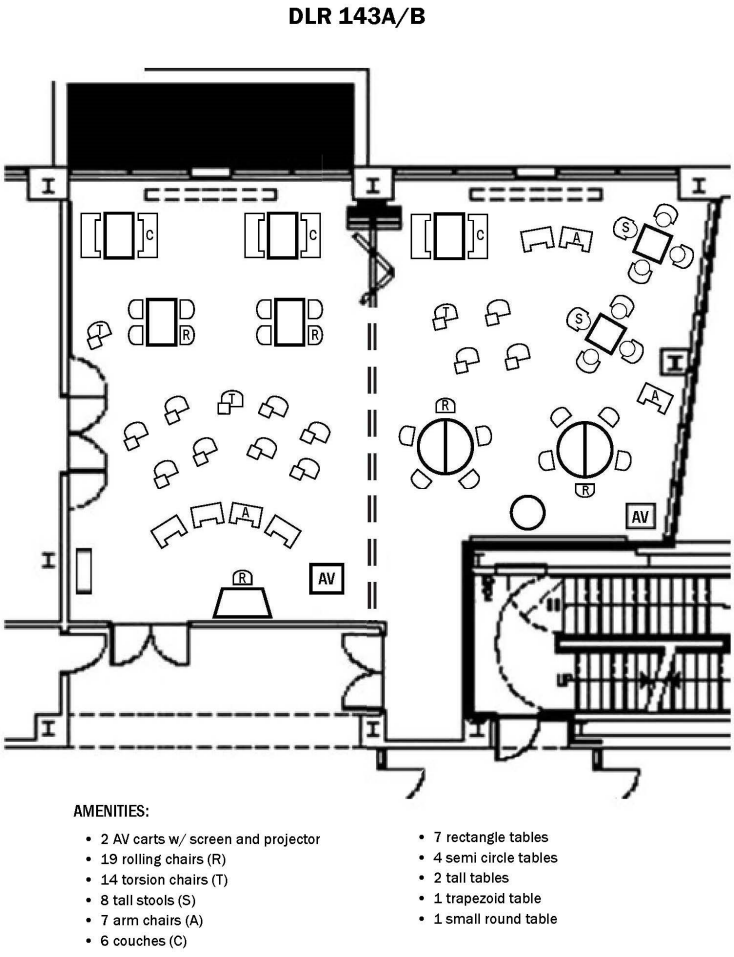

Figure 2. Default furniture arrangement in HDLR flexible learning studio

Figure 3. Classroom use of flexible furniture

Communications into the curriculum, and a seminar course. The diverse nature of the instructors, content, and delivery among these classes allowed students to reflect on the role of the learning space across a range of learning experiences. This population was chosen because they would be experiencing a wide variety of pedagogical approaches and instructors (from traditional lecture to extended problem-based learning sessions) in the same 21st century learning space.

Participants were 84% male and 80% were U.S. citizens. One-third of the students were enrolled in the Exploratory Studies program, while the remainder was enrolled in a major within the Purdue Polytechnic Institute. Participant experiences differed from the typical first year experience of students at this university in two very important ways. First, students were co-enrolled in multiple classes in the same classroom throughout the semester – spending an average of six hours together each day. Second, classes represented a wide range of pedagogies from completely interactive and self-directed to traditional lecture-based.

Data Sources

Data were obtained for this mixed method study from two sources, student surveys and focus groups. Students completed a survey consisting of attitudinal rating scales. The scales measured student perceptions of the impact of the 21st century learning space on the classroom climate, learning and motivation, as well as, comparisons of the space to their experiences in traditional classrooms. To examine the influence of flexibility on learning and motivation, students rated the impact of the learning space on their interest in attending class, individual learning, and motivation to learn in the class. With regards to classroom climate, the students rated the impact of the classroom furniture on four items: group work/collaborative learning, instructor-student interactions, student-student interactions, and physical comfort. Response categories for these items ranged from "No impact" =1 to "Very significant impact" = 5.

Students also indicated how the classroom compared to traditional classrooms (where seats are arranged in rows) generally and with regard to support of engagement and learning. Specifically, students indicated whether the flexible learning space was "worse than," "same as" or "better than" traditional classrooms. Items measuring engagement included: "opportunities for instructor-student interactions," "student physical comfort in class," and "opportunities for student-student interactions." Items measuring learning included: "personal work," "student interest in attending class" and "overall student learning."

Students participated in focus group sessions to solicit in-depth information regarding their experiences in the learning space. The focus group interviews explored student perceptions of the impact of the space on their learning and the perceived benefits and challenges of the 21st century learning space. 21 students completed the survey and 12 of those students participated in one of two focus group sessions offered. Participants' responses to the interview questions were transcribed verbatim.

Analyses

Participant responses to survey items were processed and analyzed using SPSS. Descriptive statistics (e.g., means and standard deviations) were used to summarize survey

findings. For each subscale, findings are presented in the order of the magnitude of the mean scores for the items. We used an inductive approach to qualitative data analysis where no preconceived theories were imposed on the data (Glaser, 1965). Specifically, the focus group data were analyzed using conventional content analysis to generate categories of perceptions reported by the students, and interpreting text by classifying, coding, and identifying themes (Hsieh & Shannon, 2005). Consistent with conventional content analysis recommendations, words, sentences, paragraphs, and comments in the focus group session transcripts were the units of analysis (Stemler, 2001).

Results

Student Perceptions of the Influence of 21st Century Learning Space on Classroom Climate, Learning and Motivation

Classroom climate. Table 1 summarizes students' responses to items regarding the impact of the 21st century learning space on classroom climate. Notably, all the items received mean scores greater than 3.00 out of a possible maximum of 5.00. The items with the highest impact ratings were: "Your physical comfort in the class" and "group work/collaborative learning in the class," with mean scores of 4.20 and 4.08, respectively. The item with lowest impact rating was "student-student interactions in the class," with a mean score of 3.88.

Learning and motivation. Table 2 presents students' responses to items regarding the impact of the 21st century learning space on learning. As with the engagement items, students gave all the learning items mean scores greater than 3.00 out of a possible maximum of 5.00. The items participants rated the highest were: "your interest in attending the class" and "overall learning in the class," with mean scores of 3.68 and 3.67, respectively. The item students rated the lowest was "your motivation to learn in the class," with a mean score of 3.32.

The focus group participants discussed their perceptions of the impact of the 21st century learning space on their learning. Specifically, students discussed the way in which the space moderated their learning and engagement. Three categories of responses emerged from the focus group analysis. Half of the comments suggested that the 21st century learning space positively impacted learning by increasing students' psychological comfort, 40% of comments suggested that intrinsic motivation was more important to learning than the physical space, and 10% of comments suggested a negative impact of space on learning caused by excessive physical comfort that made concentration difficult. Comment examples in each category can be found in Table 3.

Comparison to traditional classrooms. Overall, students categorized the 21st century learning space as better than traditional classrooms with regard to opportunities for engagement and overall student learning. Table 4 presents students' comparisons of the flexible learning space with traditional classrooms in terms of classroom engagement. Ninety percent and 88% of the students categorized the 21st century classroom as better than traditional classrooms in terms of opportunities for instructor-student interactions and student-student interactions, respectively. Ninety-two percent of the students categorized the 21st century classroom as better than traditional classrooms in terms of student physical comfort in class and group work/collaborative learning.

Table 5 presents students' comparisons of the 21st century and traditional classrooms in terms of learning and motivation. Eighty percent of the students rated the 21st century classroom as better than traditional classrooms in terms of overall learning. Students were divided in their perceptions of how the different classrooms compared in terms of opportunities for personal work, with 52% categorizing 21st century classroom as better and 48% categorizing it as being "the same" as traditional classrooms.

Focus group participants discussed their overall perceptions of the learning space, including what they liked and did not like about the furniture and the arrangements. Participants' responses to the questions yielded a total of 114 comments, of which 74% described perceived benefits and 26% referred to challenges associated with the furniture.

Benefits and Challenges of the 21st Century Learning Space

Benefits: The analysis revealed six categories of benefits of the learning space: adaptability, comfort, ease of use, instructor-student interactions, variety and concentration. Table 6 presents the categories, number of comments per category, and examples of verbatim comments:

Adaptability: About 35% of the comments (29 comments), described the room as *adaptable* for different class activities, including class discussions, lecture, and group work. Students also explained that the furniture made the room more customizable than traditional lecture halls.

Comfort: In 31% of the comments (26 comments), participants described the furniture as comfortable. They explained that the furniture allowed them to spread out while working and remain sitting for extended periods without feeling sore.

Ease of use: About 11% of the comments (9 comments) referenced the ease of use and accessibility of the furniture, including easy manipulation of chair settings and furniture arrangements.

Instructor-student interactions: About 11% of the comments (9 comments), referenced the room's facilitation of instructor-student interaction. Participants described instances where the furniture and layout allowed instructors or mentors to interact and work with students individually and in groups.

Variety: In about 9% of the comments (8 comments), participants stated that they appreciated the variety of the classroom furniture. They felt that they could choose the particular pieces of furniture that would be most useful to them and they could move if they became bored with a certain type of furniture.

Concentration: In about 4% of the comments (3 comments), participants noted that the room noticeably improved their concentration. They mentioned that the furniture provided a relaxing space where they felt they could focus on learning and study effectively.

Challenges: Six categories of challenges emerged from the data. Table 7 presents a summary of the categories, frequency counts, and examples of verbatim comments.

Too much furniture: Although students appreciated the opportunity to have access to a variety of furniture, they also complained (in 30% of their comments) that there might be too much furniture in the room. They explained that when the room was divided or when furniture wasn't properly organized, the space felt crowded.

Easily disorganized arrangement: Twenty percent of the comments regarding challenges referenced that the room could quickly become disorganized. Participants recalled how they (and students in other classes) would forget to push in chairs or would not arrange the furniture neatly such that the space would become "cluttered." Participants added that the disorganization was, at times, noticeable and off-putting.

Difficulty accessing electrical outlets: About 13% of the comments (4 comments), mentioned that the positioning of the furniture frequently made it difficult to access outlets. Participants added that the pieces of furniture were often positioned against outlets, blocking access; or furniture might be positioned too far from outlets, beyond the reach of computer power cords.

Too much comfort: Although participants enjoyed having comfortable furniture, they also complained (3 comments; 10%) that the furniture was too comfortable for the classroom. Specifically, they mentioned that, if they did not sleep well the night before, they would doze off on the armchairs or couches.

Insufficient tables: Two comments (6.7%) mentioned that while the room had enough chairs, it did not have enough tables. This suggested that one or two tables should be added to the space.

Discussion and Implications

Although descriptive, our study contributes to ongoing discussions concerning the importance of 21st century learning spaces for 21st century students. Our study goes beyond typical post-occupancy evaluations, to examine student perception of the differences between a 21st century learning space and traditional classrooms as well as the impact of a 21st century learning space on students' learning and motivation. An additional strength of this study is its use of students who experience a particular 21st century learning space for multiple courses (in diverse disciplines), multiple instructors, and multiple pedagogical approaches. This study suggests that students hold a positive perception of the impact of the learning space on both the learning climate and their learning and motivation. Over 90% of students felt that the 21st century learning space was better than a traditional classroom at supporting collaborative learning, instructor-student interactions, and student comfort. More than two-thirds of students felt that the 21st century learning space was better than a traditional classroom at supporting: student-student interactions, student learning, student interest in attending their courses, and motivation to learn. Students praised the adaptability of the learning space and its comfort, but cautioned that the abundance of flexible furniture could make the space feel crowded and disorganized and that some of the furniture did not support particular tasks (such as typing) which could be frustrating.

While exploratory in nature, our study has implications for university policy and practices with regard to learning space planning and assessment. In addition to considering space usage, capacity and comfort, designers of learning spaces should consider student perceptions of learning spaces when planning university learning spaces. Students can provide important insight into the ways in which a space supports or does not support their learning and motivation. Although our data was self-reported by students, triangulation of the survey and focus group interview data suggest that flexible learning spaces provide several clear advantages and as well as a few challenges when compared with traditional spaces. Student perceptions, such as those included in this study, can inform design space and selection of furniture by university administrators.

Our results identify fruitful avenues for future research. As suspected, the relationships among learning space, student learning, student motivation, pedagogy, and student characteristics appear to be complex. The learning space cannot, independently, change student motivation and learning. However, students reported a larger impact of the 21st century learning space on their motivation than on their learning. This result suggests that changes in motivation may play a mediating role in changes in student

learning when considering the impact of space on student outcomes. The limitations of this study do not allow for the exploration of these relationships. Additional studies could explore these relationships in greater detail with a larger, more representative sample of students.

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Tables

Table 1

Impact of 21st Century learning space on classroom climate

Items	Min.	Max.	Mean	SD
Your physical comfort in the class	2.00	5.00	4.20	0.91
Group work/collaborative learning in this class	2.00	5.00	4.08	0.86
Instructor-student interactions in this class	2.00	5.00	3.92	0.91
Student-student interactions in this class	2.00	5.00	3.88	0.88

Note: Min. =Minimum score; Max. = Maximum score; SD = Standard deviation.

Table 2

Impact of 21st Century learning space on classroom learning

Items	Min.	Max.	Mean	SD
Your interest in attending the class	1.00	5.00	3.68	1.11
Overall learning in this class	2.00	5.00	3.67	0.76
Individual learning in this class	1.00	5.00	3.60	1.15
Your motivation to learn in this class	1.00	5.00	3.32	1.15

Note: Min. =Minimum score; Max. = Maximum score; SD = Standard deviation.

Table 3

Categories of student perceptions of the impact of 21st century learning space on their learning and motivation

Impact	*F (%)*	*Examples of Comments*
Enhanced Psychological comfort	10 (50%)	"I feel like it almost makes it easier to concentrate and easier to learn. You know, [because] you feel more at home almost." "Whereas it's really comfortable and relaxing I also feel that because of the comfort and relaxation I am more willing to listen to stuff." "It makes learning more personal."
Intrinsic motivation	8 (40%)	"Once again that comes back to a personal choice. If you choose to study then it is very conducive to that." "The furniture is comfy and it's comfy whether you [want to] pay attention or... It's a double edge sword on that one."
Enhanced physical comfort	2 (10%)	"Probably because of the room size and just the general level of comfort with it, it actually made it detrimental to paying attention."

Note: F = Frequency of comments by students

Table 4

Student comparison of the 21st Century learning space to traditional/standard classrooms in terms of opportunities for classroom engagement

	Worse than TC		Same as TC		Better than TC	
	F	%	F	%	F	%
Items						
Opportunities for instructor-student interactions	1	4.00	0	0.00	24	96.00
Student physical comfort in class	0	0.00	2	8.00	23	92.00
Group work/collaborative learning	0	0.00	2	8.00	23	92.00
Opportunities for student-student interactions	0	0.00	3	12.00	22	88.00

Note: TC= Traditional classrooms

Table 5

Student comparison of 21st Century learning space to traditional/standard classrooms in terms of overall learning and motivation

	Worse than TC		Same as TC		Better than TC	
	F	%	F	%	F	%
Items						
Overall classroom learning	0	0.00	5	20.00	20	80.00
Student interest in attending class	3	12.00	4	16.00	18	72.00
Student motivation to learn in class	1	4.00	8	32.00	16	64.00
Personal work	1	4.00	11	44.00	13	52.00

Note: TC= Traditional classrooms

Table 6

Benefits of the furniture in the 21st Century learning space

Advantages	F (%)	Examples of Comments
Adaptable for Class Activities	29 (34.5%)	*"So… if we need to have group time, we can circle up a bunch of stuff."*
		"It's also cool being able to like customize the space, so you're like the way you want to learn."
Comfortable	26 (31.0%)	*"It's comfortable."*
Easy to Use/Accessible	9 (10.5%)	*"It's really easy to manipulate."*
		"If you're doing like group sessions… these couches with the tables in them are perfect for it because everyone's kind of got what they need right next to each other, talking face to face."
Facilitates Instructor/Student Interaction	9 (10.5%)	*"The mentors can sit down like, literally right next to me, and show me exactly what to do or see exactly what I'm doing.*
Variety of Seating Options	8 (9.3%)	*"I like that we have options."*
		"If you ever [want to] switch seats, you can switch seats."
Encourages Focus/ Concentration	3 (3.5%)	*"I feel like it almost makes it easier to concentrate and easier to learn."*
		"I feel like I can focus and study here.

Note: F = Frequency of comments by students

Table 7

Challenges associated with furniture in the 21st Century learning space

Categories	F (%)	Examples of Comments
Too Much Furniture for Space/Crowded	9 (30.0%)	*"There might be a little bit too much."* *"If someone leaves their chair out then it seems like it's too much."*
Awkward or Difficult to Use	6 (20.0%)	*"I don't like to work in a group on the couches because I think it's like… it's like when you go out to eat at a restaurant and you can't get out."* *"I would love sitting on these, but then after a while I realized I couldn't do any, like, typing things."*
Sometimes Disorganized	6 (20.0%)	*"Sometimes I don't like the disorganization of it all."* *"It does get messed up."*
Difficulty Accessing Outlets	4 (13.3%)	*"Unless you're along the wall, it's really hard to find the outlets."*
Too Comfortable/ Distracting	3 (10.0%)	*"I guess it's bad that they are so comfortable because you could fall asleep easier."*
Not Enough Tables	2 (6.7%)	*"We have too many seats and not enough tables."*

Note: F = Frequency of comments by students