EDUCAUSE LEARNING INITIATIVE

Considering Classroom Seating for Students and Faculty in the 21st Century

sei Seeking Evidence of Impact

SEI Case Study March 2014

Snapshot

Institution: Buffalo State, State University of New York, an urban, public university with a total enrollment of nearly 12,000 students

Timetable: Spring 2010 to fall 2013

Contacts: Melaine C. Kenyon, Director of Instructional Technology, kenyonmc@buffalostate.edu
Eugene J. Harvey, Assessment & Reference Librarian, E. H. Butler Library, harveyej@buffalostate.edu

URL: http://ir.buffalostate.edu/seating-study.html

In colleges and universities, the physical learning environment embodies an institution's educational philosophy and priorities. Ideally, such environments are planned with considered attention to the institution's goals for learning and learners and are designed to reflect the institution's strategic directions. In practice, however, decisions about the design of learning environments are often made at some remove from teaching, learning, and the classroom. Moreover, such decisions can be influenced by dwindling budgets, enrollment concerns, and physical constraints in the classroom. Sometimes the result is a learning space that is not well aligned with student and faculty expectations and that can even impede—rather than support—teaching and learning. Such factors carry even more importance today, given the pace at which learning and pedagogy are evolving.

Buffalo State has renovated, or currently has in construction, most of its instructional spaces. The university's Facilities Master Plan 2013–2023 outlines continued capital expenditures of $300 million between 2013 and 2018 to build or renovate buildings that contain instructional spaces such as classrooms and teaching labs. The majority of the furniture and seating arrangements in the classrooms could be considered traditional (if not outmoded), and new spaces in academic buildings need to be planned with the future of teaching and learning in mind.

Within this context, Buffalo State undertook a quantitative, cross-sectional research study that explored students' perceptions of five different seating styles in typical classrooms. The study's outcomes indicate a need for campuses to reconsider the purposes and roles of seating styles in the 21st-century classroom.

1. Project Overview

1.1. Project Goals, Context, and Design

Given that Buffalo State is in the process of renovating several buildings containing academic classrooms, it became important to select a chair that meets the needs of 21st-century students and faculty. With numerous seating styles available, guiding principles were necessary to select a chair or seating style that solidly supports classroom learning and modern teaching efforts. The main principles of interest in this study

included equitable use in seating, flexibility in use, limited physical effort, and different size and space options for various approaches and uses. The construction of the chair needed to be comfortable and spacious yet easily flexible, with multiple means of engagement, and facilitative of shifting tasks or purposes within the classroom.

During the fall 2011 and spring 2012 semesters, after the project's IRB proposal was approved, Buffalo State undertook a comprehensive examination of seating styles and configurations in classrooms across the campus. Researchers reviewed current classroom configurations and interviewed key stakeholders; they also conducted an extensive review of relevant literature and compared marketing materials from providers of classroom furniture.

Based on those inputs, the director of instructional technology selected and purchased a modern mobile chair for testing within one classroom (see figure 1). Four other seating styles were selected for comparison: tablet arm chairs, fixed-tiered seating with tablet arms, rectangle tables with standard chairs, and trapezoid tables with chairs on casters (see figures 2–5). Because the modern mobile chair seemed to embody design characteristics valuable to the expectations of today's students and faculty, it was hypothesized that faculty and students would indicate a strong preference for that chair relative to the other seating styles.

Figure 1. Modern Mobile Chair

Figure 2. Tablet Arm Chair

Figure 3. Fixed-Tiered Seating with Tablet Arm

Figure 4. Rectangle Tables with Standard Chairs

Figure 5. Trapezoid Tables with Chairs on Casters

To operationalize measurement of student perceptions, the Classroom Seating Rating Scale for Students was developed, based on the classroom and seating design literature, to measure the dimensions of comfort and space, learning engagement, and interactivity (see the appendix). A version of the scale was also developed for faculty (the faculty scale is not included in this document). Designed to measure perceptions of and satisfaction with classroom seating styles, the scale was developed intentionally as a tool to help the university rapidly assess the types of classroom seating on campus, with the goal of using

data to drive future furniture purchases. Another factor in the scale's development was that it needed to be capable of being administered and completed quickly and efficiently to minimize disruption of class time and instruction.

1.2. Data-Collection Methods

For each chair style, researchers determined the total number of courses taught in the identified classrooms, and a random sample of rooms was preselected for survey outreach. Instructors assigned to teach a course in a selected room were sent a package containing an instructional memo, the Classroom Seating Rating Scale for Faculty, and copies of the Classroom Seating Rating Scale for Students. Instructors were asked to complete the faculty survey, administer the student questionnaires in class, and return completed surveys to the researchers. Students completed the surveys midsemester, which allowed them to experience the seating style for at least six weeks.

Using a cross-sectional approach to data collection, 45 of the 73 packets were completed and returned during the fall 2011 and spring 2012 semesters (a 62% response rate). A total of 863 student surveys were completed and returned. Table 1 summarizes the number of valid student surveys by seating category. Due to a lower faculty response rate, study researchers decided to continue efforts to collect data from that group. Consequently, only student data are reported in this study.

Table 1. Student Survey Responses, by Seating Category

Seating Category	Number of Valid Surveys
Modern Mobile Chairs	196
Tablet Arm Chairs	123
Fixed-Tiered Seating with Tablet Arms	266
Rectangle Tables with Standard Chairs	131
Trapezoid Tables with Chairs on Casters	147
Total	**863**

1.3. Data-Analysis Methods

A one-way, between-subjects analysis of variance (ANOVA) was determined to be the most appropriate method of comparing students' perceptions of the different seating styles. Based on scale score averages, each seating group was compared to the others. Post-hoc comparisons fleshed out statistically significant differences between them. To further clarify groups of seating scores, three homogenous subsets were determined and reported. Subset 1 included modern mobile chairs and trapezoid tables with chairs on casters; subset 2 included rectangle tables with standard chairs; and subset 3 included tablet arm chairs and fixed-tiered seating with tablet arms.

1.4. Findings

Students rated the modern mobile chairs and trapezoid tables with chairs on casters (subset 1) highest, while traditional tablet arm chairs and fixed-tiered seating with tablet arms (subset 3) scored lowest; rectangle tables with standard chairs (Subset 2) scored in the middle. The seating option in subset 3 (tablet arm chairs and fixed-tiered seating with tablet arms) scored significantly lower than the other three seating styles.

Although relatively different, the two seating styles in subset 1 seem to possess design characteristics important to students. One design feature of clear importance appears to be mobility. For subset 1 styles, casters enable quick, easy transitions between various modes of teaching and learning and different kinds of tasks, helping ensure a sense of flexibility within the classroom space. The ability to swivel or pivot easily helps students keep an open line of sight with the instructor, visual focal points (e.g., a whiteboard, screen projections, etc.), and other students. Even the personal work surfaces for these seating styles are movable—the modern mobile chair via its swivel arm, and the trapezoid table via its casters. Conversely, the lack of mobility in subsets 2 and 3 might hinder the ability of students and instructors to engage in collaborative work. Without that type of flexibility, traditional forms of instruction, such as the lecture, may work best in those classrooms. Also, mobility likely spurs postural change and physical movement, which, in turn, promotes active sitting. Active sitting, sometimes referred to as dynamic sitting, refers to nonrestrictive occupant movements within seats. Studies of sitting surfaces suggest that active sitting may increase blood flow, oxygen intake, muscular stimulation, and spinal and pelvic shifting while preventing or decreasing the risk of back and neck pain resulting from poor posture and passive or restrictive sitting.

1.5. Communication of Results

Study results were presented on campus through meetings to key stakeholders, including facilities planning, technology governance, and faculty. These results were also shared with students, faculty, and administrators via the 2012 Faculty/Staff Research and Creativity Fall Forum.

In terms of scholarly communication, a peer-reviewed article was published in the open access *Journal of Learning Spaces* (2013, vol. 2, no. 1). Also, the researchers presented nationally at EDUCAUSE 2012 in Denver, CO.

1.6. Influence on Campus Practices

To date, this study has fostered changes in furniture selection in the most recently completed building on campus, which makes use of tables and chairs in its classrooms. In addition, the procurement of an alternative mobile chair style within eight generally scheduled classrooms helped override an initial choice to use traditional tablet arm chairs, even though the decision slightly impacted seating capacity.

Furthermore, the modern mobile chair used in this study fostered discussions among faculty on innovative teaching methods, especially active-learning pedagogies. Furniture-vendor visits involving administrators and academic deans raised interest in building an active-learning classroom using the modern mobile chair. The registrar's office, however, was reluctant to reassign a generally scheduled classroom due to assumptions of decreased seating capacity. Consequently, a computer lab in the library with 22 student stations was selected as the site of a new active-learning classroom due to existing power and data infrastructure and the desire for equity in space utilization. Contrary to assumptions, though, the new active-learning classroom increased seating capacity to 30 (an increase of 36%) and generated considerable positive discussion from librarians and faculty using the new space. Faculty interest was so high that a second active-learning space with a seating capacity of 36 (an increase of 64%) was built to accommodate their teaching needs for applying new pedagogies within the classroom. An unintended consequence of this room's success was the need to carefully coordinate course scheduling due to overwhelming demand from faculty for the new space.

Study results also led to many other discussions, encompassing such topics as future directions of professional development, the capacity of current staffing to provide more than technical support for

faculty encouraged to teach in new learning spaces, why some faculty adapt to the renovated classroom while others do not, and the effect of cultural changes on tenure and promotion.[1]

2. Reflection on Design, Methodology, and Effectiveness

2.1. Project Design, Data Collection, and Analysis

When applied within the context of higher education, universal design is an approach that seeks to build and maintain a learning environment for all students and faculty.[2] With numerous seating styles available in the furniture industry, guiding principles were necessary to select a seating option that supports classroom learning and modern teaching efforts. Many of the principles of universal design developed by the Center for Universal Design at North Carolina State University were helpful in the seating selection process, as were Nair and Fielding's eight truths about classroom comfort.[3]

Embedding choice into the classroom is essential, given the diversity of learners, instructors, and instructional modalities. Seating styles in classrooms are easily changeable environmental variables that impact choice, purpose, inclusivity, and functionality. An informal review of campus stakeholders revealed many specific criteria required in seating styles for campus learning spaces. Each stakeholder had unique needs:

- The registrar's office requested a style that does not further reduce classroom seating capacity.
- Custodial services required an easy-to-clean model with proven durability.
- Facilities planning was concerned with overall spatial aesthetics.
- Faculty advocated for easily movable seating to encourage active and collaborative learning.
- Students wanted comfortable seating that accommodated different student sizes, had adequate personal storage, and demonstrated sufficient surface workspace.
- Disability services requested unbiased "one seat for all" seating with solid back support, comfortable for most students with specialized needs, and supporting individually wide ranges, preferences, and abilities related to body size and posture.

Recommendations from these stakeholders informed the decision to outfit one classroom with modern mobile chairs with the goal of assessing seating styles across campus.

The study examined the impact of seating on students' satisfaction, but other environmental factors or conditions play important roles within the classroom. As Griffin and Banning discussed two decades ago, the classroom is a behavioral setting that comprises both the physical environment aspect and the human or social aspect.[4] Even so, person-in-environment theories pertaining to spatial arrangements within classrooms, visual design factors, aural factors, touch and movement, and other sensory stimulation variables have been debated intently.[5] Current research continues to examine the impact of classroom environment variables as factors that affect instruction and learning. Room temperature, the presence of natural light, seating capacity, seating location, and room size are only a few other environment variables that might affect student perceptions of and satisfaction with learning spaces.[6]

For experimentation, this study compared a specific brand of chair to traditional seating arrangements at Buffalo State. Clearly a multitude of other seating styles could be used for further study. The designs, layouts, and configurations are almost limitless. Future research may attempt to determine corollaries between movable furniture—in particular, the modern mobile chair—and findings in the literature about

student and faculty satisfaction with learning environments, some of which is directly related to seating type and seating arrangements.

This study suggests possible further research, including cross-referencing findings to gauge how student academic performance might correlate to preferences for seating. Also, researchers hope to secure adequate response from faculty to complete an analysis of their preferences for classroom seating.

2.2. Effectiveness and Influence on Campus Practices

Data-driven decision making has become the norm, and even this relatively simple study on "just a chair" can have a snowball effect on other campuses. For Buffalo State, this study affected faculty teaching practices, student learning experiences, and classroom design. The results of this study provided a foundation and justification for future classroom design and subsequent purchase of modern mobile chairs for eight technology-enhanced classrooms renovated in a former art gallery. As further evidence of impact, trapezoid tables and chairs on casters were selected for the next academic building's technology-enhanced classrooms. Two buildings currently in the schematic design phase are planning for classroom furniture that models the modern mobile chair.

Notes

1. Tom Warger and Gregory Dobbin, "Learning Environments: Where Space, Technology, and Culture Converge," EDUCAUSE Learning Initiative Paper 1, 2009, http://net.educause.edu/ir/library/pdf/ELI3021.pdf; Robert J. Beichner, "The Scale-Up Project: A Student-Centered, Active Learning Environment for Undergraduate Programs," invited paper for the National Academy of Sciences, September 2008, http://physics.ucf.edu/~bindell/PHY%202049%20SCALE-UP%20Fall%202011/Beichner_CommissionedPaper.pdf.
2. Robert A. Shaw, "Employing Universal Design for Instruction," *New Directions for Student Services*, issue 134 (Summer 2011), doi: 10.1002/ss.392.
3. Center for Universal Design, *The Principles of Universal Design, Version 2.0.*, http://www.ncsu.edu/www/ncsu/design/sod5/cud/about_ud/udprinciples.htm; Prakash Nair and Randall Fielding, "A Comfortable Truth: Well-Planned Classrooms Make a Difference," *Edutopia* (March 28, 2007), http://www.edutopia.org/comfortable-truth-well-planned-classrooms-make-difference.
4. Tim Griffin, "The Physical Environment of the College Classroom and Its Affects on Students," *Campus Ecologist* 8, no. 1 (1990), http://www.campusecologist.com/1990/01/05/volume-8-number-1-1990/; James H. Banning, "The Physical Environment of the College Classroom: An Instructional Aid," *Campus Ecologist* 11, no. 4 (1993), http://www.campusecologist.com/1993/01/05/volume-11-number-4-1993/.
5. Ibid.
6. Sandra Veltri, James H. Banning, and Timothy Gray Davies, "The Community College Classroom Environment: Student Perceptions," *College Student Journal* 40, no. 3, 2006; Mark Winterbottom and Arnold Wilkins, "Lighting and Discomfort in the Classroom," *Journal of Environmental Psychology* 29, no. 1 (March 2009): 63–75, doi: 10.1016/j.jenvp.2008.11.007; Amanda Careena Fernandes, Jinyan Huang, and Vince Rinaldo, "Does Where a Student Sits Really Matter? The Impact of Seating Locations on Student Classroom Learning," *International Journal of Applied Educational Studies* 10, no. 1 (April 2011): 66–77; Brigitte Burgess and Naz Kaya, "Gender Differences in Student Attitude for Seating Layout in College Classrooms," *College Student Journal* 41, no. 4 (December 2007).

Appendix: Rating Scale for Students

Buffalo State
State University of New York

Classroom Seating Rating Scale (CSRS) for Students

This survey is designed to gather information from students at Buffalo State College to determine classroom seating needs and preferences. The results data will be used for the college to decide upon future classroom seating. You must be 18 years of age or older to participate in this survey. Participation is voluntary, anonymous and should pose minimal risk to participants. Your submission of answers is your consent to participate. Resulting data will be retained for three years in compliance with federal regulations.

Item	Degree of Agreement*				
These seats are uncomfortable.	SA	A	N	D	SD
These seats cause pain while I sit in them.	SA	A	N	D	SD
I can concentrate well while sitting in these seats.	SA	A	N	D	SD
I cannot focus well while sitting in these seats.	SA	A	N	D	SD
These seats are more comfortable than other types of seats in other classrooms.	SA	A	N	D	SD
It is easier to talk to other students when sitting in these seats.	SA	A	N	D	SD
These seats make it easy to engage in group work.	SA	A	N	D	SD
These seats bother or disrupt other students.	SA	A	N	D	SD
I have enough table space to work easily in class.	SA	A	N	D	SD
It is difficult to store my stuff at my seat.	SA	A	N	D	SD
These seats helped the instructor to connect better with the class and me.	SA	A	N	D	SD
I could engage in learning better/more easily while sitting in these seats.	SA	A	N	D	SD
These seats enabled a variety of classroom activities.	SA	A	N	D	SD
I can participate more actively in classroom exercises using these seats.	SA	A	N	D	SD
The seating enhanced in-class exercises.	SA	A	N	D	SD

***SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree**