

Implications

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Designing Spaces for Active Learning

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Existing literature on learning spaces suggests design features impact teaching and learning (Brown & Long, 2006; Chism & Bickford, 2002; Chism, 2006; Lomas & Oblinger, 2006; Oblinger, 2006). However, few if any research studies support this assertion with actual evidence.

To help close the knowledge gap, a team of research experts, tenured faculty members, and undergraduate researchers at the University of Minnesota set out to explore relationships among formal and informal learning spaces, teaching and learning practices, and student learning outcomes in an Archibald G. Bush funded pilot study in the fall of 2008. The goal was to develop evidence-based criteria for student-centered, integrated, active learning spaces using flexible design and an innovative use of technology tools.

Learning Spaces Research Model

Three research teams were included in this exploratory study. The study was comprised of one faculty member teaching the course, one research expert from the Office of Information Technology (OIT), and one or more undergraduate student

researchers trained to conduct formal research, including interviews and class observation. This approach was chosen because of the University's interest in involving undergraduates in the research process. Recent success involving undergraduates in research has been reported by the University of Rochester (Gibbons & Foster, 2007), Carleton College (Nixon, forthcoming), and the Carnegie Foundation's Advancement of Teaching and Learning's "Student Voice in the Scholarship of Teaching and Learning" program.

Research Methods

The Study's Primary Question was "To what extent, if any, do formal and informal learning environments shape teaching and learning practices and student learning outcomes?" Sub-questions were as follows:

- What is the relationship, if any, between formal learning spaces and student learning outcomes?
- What is the relationship, if any, between type of learning space and the teaching/learning activities employed by the instructor?
- Where, when, and how do students complete their course assignments?

To answer these questions, the research team applied traditional methods that included instructor interviews (before

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and after the course), student focus groups for each course, and a minimum of 15 class observations using a collaboratively-designed classroom observation form. Consistent, open communication was essential to managing the copious research and curricular issues that emerged. Biweekly research team meetings proved to be vitally important.

Student assignment logs and student photo surveys were introduced as it became evident that more innovative research methods were needed to provide descriptive answers to the research questions. Assignment logs provided individualized, learning-specific details about the environment in which students completed their coursework, including exposure to food and drink, use of technology and multimedia, noise level, and the amount of people working with and around them. Photo surveys supported a visually-rich understanding of students' use of formal and informal learning spaces.

Features of Active Learning Classrooms

The Office of Classroom Management (OCM) constructed two pilot project, general purpose classrooms that were designed as student-centered, flexible, active learning spaces. The project was intended to stimulate interest in innovative classroom design, to demonstrate flexible classroom construction techniques, and to allow assessment of learning outcomes. OCM partnered with the OIT Digital Media Center for this research-based assessment.

Pilot spaces were general purpose classroom renovations designed to support active engagement of both instructors and students. Classrooms were labeled Active Learning Classrooms (ALCs) and provided switchable laptop-based technology, multiple fixed-panel display/projection systems, and an instructor station that allowed display of specific information. Each space featured reconfigurable, low-profile flooring with internal power and cable management to accommodate technology devices.

Demountable wall systems allowed the rooms to be reconfigured, saving renovation costs over the life cycle of the building. ALCs could be “flexed” on an annual basis to meet changing rooms sizes or pedagogical (i.e., teaching) requirements. The largest space (117 at capacity) was divisible into two ALCs (72 and 36 capacity), two traditional seating table/chair classrooms, or one ALC and one traditional classroom. Key to the experience were the round tables that seat 9 students each, which enabled students to work in small groups. A 360-degree, glass-surface marker board around the circumference of the classroom and document camera were also included (see fig. 1).

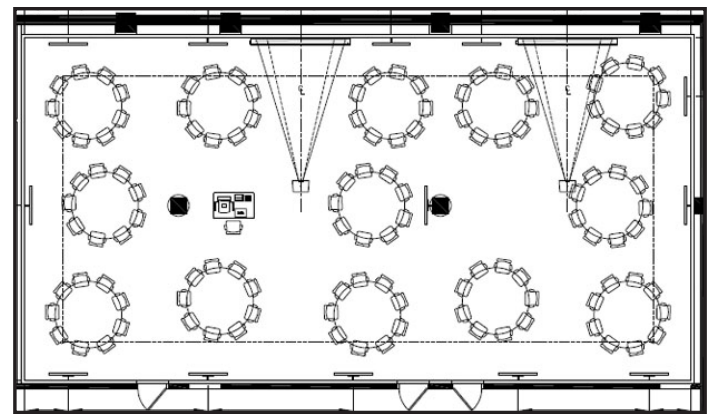


Fig. 1: ALCs are designed to foster an interactive, student centered learning experience.

Classroom Case Studies

Three case study courses were selected based on faculty interest in the scholarship of teaching and learning, classroom location, course discipline, and class size. Due to differences across the courses selected, a variety of teaching and learning strategies were employed. Pilot learning spaces allowed faculty and students to experience and assess the impact of new classroom designs on teaching and learning practices. The following table provides details of the courses, research team, classroom technology, and layouts (Fig. 2 next page).

Course Information	About the Space	Classroom Layouts A-C
<p>Family Social Science: Personal and Family Finances 117 students</p> <p>Instructor: Catherine Solheim</p> <p>Student Researcher: Kevin Race</p> <p>Research Fellow: Aimee Whiteside</p>	<p>Layout A. Explored the relationship, if any, between learning spaces in a large-enrollment course. The ALC was a “smart,” technology-rich classroom featuring dual projection capabilities, large LCD student display screens, and glass markerboards around the perimeter of the classroom. This research situation allowed the course research team to develop and test a number of hypotheses, such as: <i>Students learning in ALCs accomplish Student Learning Outcomes (SLOs) at higher rates than students learning in traditional classrooms.</i></p>	
<p>Post-Secondary Teaching and Learning: Principles of Biological Sciences 37-45 students</p> <p>Instructor: Jay Hatch</p> <p>Student Researchers: Lexi Schmidt and Tabinda Hasan</p> <p>Research Fellow: D. Christopher Brooks</p>	<p>Layout B. Used a quasi-experimental comparison between a traditional learning space and another ALC (seats 45). This classroom setting allowed the research team to develop and test a number of hypotheses, such as: <i>Students learning in ALCs accomplish Student Learning Outcomes (SLOs) at higher rates than students learning in traditional classrooms.</i></p>	
<p>Writing: Technical and Professional Writing 22 students</p> <p>Instructor: Lee-Ann Breuch</p> <p>Student Researcher: Tim Quan</p> <p>Research Fellow: Aimee Whiteside</p>	<p>Layout C. Explored the relationship, if any, between learning spaces for a writing course. The learning space for this case study emerged from a 2008 partnership between the Office of Information Technology (OIT) and the College of Liberal Arts (CLA).</p>	

Fig. 2: Details of the three case study courses including course information, methods, and classroom layouts.

Instructor and Student Outcomes

Data from a related study conducted in September 2007 to May 2008 by the ALC Pilot Evaluation Team suggested that the ALCs yielded very positive responses from instructors and students. Instructors found their overall relationships with their students had deepened, they felt closer to their students. Students surveyed found the ALCs made them feel more connected, particularly with their classmates, and they noted the positive effects of this learning space on their collaborative projects.

Although the final analysis from this Fall 2008 Bush Grant-funded exploratory study derived from questionnaire data, interviews, class observations, focus groups, student assignment logs, and photo surveys will not be complete until Summer 2009, the data does suggest the following preliminary implications:

- **Round tables** inherently created a collaborative environment for learning and, in most cases, allowed students to quickly and easily create a community of learners. Round tables forced students to look at each other, thus changing the relationship. Round tables were key to the experience in the ALC.
- Students and instructors had different views on **room layout and design**. In one case of a very large open formal learning space, students in the focus group reported that they enjoyed the open space. These students reported that this space made them feel closer to their instructor than they would have in a more traditional classroom. The instructor in that same space felt overwhelmed by the openness and size of the space and preferred the control that a smaller.
- **Furniture layout** was found beneficial for small group discussions. As instructors posed a discussion question to the class, students could discuss the problem separately at their tables, and then write ideas on the markerboards placed around the classroom. It was easy to participate, compared



Fig. 3: Students find better collaboration with use of round tables.

to traditional classrooms where students are arranged in a grid formation.

- **Comfort and convenience** features including the availability of food and drink, wireless connectivity, and lighting. Aesthetics, flexibility, and comfort provided by the furniture and the space were central concerns for students.
- Students and instructors were divided in their views regarding the **availability and access to technology**. When laptop computers with wireless connectivity were available in the classroom, many students came to class earlier and stayed later. Student focus group participants reported that availability of technology in their learning space elevated their learning experience and helped them to become more efficient, effective citizens. The instructor, on the other hand, saw students' use of technology during class as disrespectful and disruptive to learning. This instructor also reported that students were noticeably less comfortable when technology tools were removed from the learning space.
- **Glass markerboards** that helped students collaborate with their teams received favorable responses. One instructor noted reflections

from the glass markerboard to be problematic. Instructors found document cameras and student display screens to be the most important features.

Future Research on Learning Spaces

The University of Minnesota findings provide a starting point not only for designers, but also further research on learning-supportive spaces. The following are recommendations for future research:

- 1. Select faculty members who are invested in learning space research and the scholarship of teaching and learning.** Carefully select faculty members who have participated in different faculty development programs related to technology.
- 2. Form research teams with faculty members, research experts, and student researchers.** Partnering trained student researchers with faculty members and research experts in a research team will allow the use of more productive research instruments and methods, keep the project on task, and maintain better information about the curricula and teaching strategies.
- 3. Involve undergraduates as partners in the research process.** As students themselves, student researchers inherently understand the student audience. They see things that researchers, faculty members, administrators, and other experts might miss.
- 4. Supplement traditional research methods with innovative tools.** New approaches such as student logs and learning space photo surveys may provide data that better and more completely answer researchers' questions, leading to evidence-based solutions.

References

—Brown, M., & Long, P. (2006). Trends in learning space design. In D. Oblinger, (Ed.), *Learning Spaces*. EDUCAUSE. Retrieved December 1, 2007, from <http://www.educause.edu/ir/library/pdf/pub7102.pdf>.
—Chism, N. (2006). Challenging traditional assumptions and rethinking learning spaces. In

D. Oblinger (Ed.), *Learning Spaces*. EDUCAUSE. Retrieved December 1, 2007, from <http://www.educause.edu/ir/library/pdf/pub7102.pdf>.

—Chism, N., & Bickford, D. (Eds.). (2002). The importance of physical space in creating supportive learning environments. *New Directions for Teaching and Learning*, 92, 91-97.

—Foster, N., & Gibbons, S. (2007). *Studying Students: The undergraduate research project at the University of Rochester*. Chicago: Association of College and Research Libraries. Retrieved August 11, 2008, from http://www.ala.org/ala/acrl/acrlpubs/downloadables/Foster-Gibbons_cmpd.pdf.

—Lomas, M., & Oblinger, D. (2006). Student practices and their impact on learning spaces. In D. Oblinger (Ed.), *Learning spaces*. EDUCAUSE. retrieved from <http://net.educause.edu/ir/library/pdf/PUB7102b.pdf>.

—Oblinger, D. (2006). Space as a change agent. In , D. Oblinger (Ed.), *Learning Spaces*. EDUCAUSE. Retrieved from the Internet on December 1, 2007 at <http://www.educause.edu/ir/library/pdf/pub7102.pdf>.

—University of Minnesota Active Learning Classrooms Pilot Evaluation Team. (2008). *Active learning classrooms pilot evaluation: Fall 2007 findings and recommendations*. University of Minnesota. Retrieved October 8, 2008, from <http://dmc.umn.edu/activelearningclassrooms/alc2007.pdf>.

Additional Resources

—Brown, M., & Lippincott, J. (2003). Learning spaces: More than meets the eye. *EDUCAUSE Quarterly* 1. Retrieved December 7, 2007, from <http://www-cdn.educause.edu/ir/library/pdf/PUB7102.pdf>.

—EDUCAUSE Learning Space Design Constituent Group. Retrieved from <http://www.educause.edu/LearningSpaceDesignConstituentGroup/5983>.

—Milne, A. (2006). Designing blended learning space to the student experience. In D. Oblinger (Ed.), *Learning Spaces*. EDUCAUSE.

Retrieved from <http://net.educause.edu/ir/library/pdf/PUB7102k.pdf>.

—Montgomery, T. (2008). Space matters: Experiences of managing static formal learning spaces. *Active Learning in Higher Education*, 9, 122-138

—Oblinger, D. (2003). *Boomers, Gen-Xers, and Millennials: Understanding the 'new students'*. EDUCAUSE Review 38(4), 37-47. Retrieved from <http://www.educause.edu/ir/library/pdf/erm0342.pdf>.

—Oblinger, D., & Oblinger, J. (2005). Is it age or IT: First steps toward understanding the net generation. In D. Oblinger and J. Oblinger. *Educating the Net Generation*. EDUCAUSE. Retrieved December 1, 2007, from <http://www.educause.edu/ir/library/pdf/pub7101.pdf>.

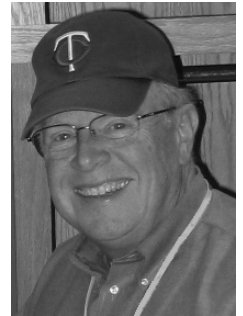
—University of Minnesota Office of Classroom Management. (2008). U of M Active Learning General Purpose Classroom Initiative. University of Minnesota. Retrieved from <http://www.classroom.umn.edu/active-learn-room.asp>.

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—*Ergonomics*

“Obstructions and Light Loss in Rooms”
—*Lighting Research & Technology*

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