Learning spaces in higher education environments have received much attention in the last several years due to innovative architectural design, the movement to connect campus spaces with learning, and assessment technologies that allow for both qualitative and quantitative evaluation of relevant information. Our research has focused on the connections among learning space, learning, and pedagogical methods and on the characteristics of successful programmatic change linked to learning spaces. Beginning in the fall of 2004, we instituted a multiyear study to (1) develop a system for assessing physical learning spaces on college and university campuses; (2) explore the relationship between learning and the characteristics of learning spaces; (3) gather and examine data and information regarding satisfaction and engagement for faculty and students in learning environments; and (4) define the relationship between innovative pedagogy and learning spaces. In addition, we began work on developing a model for encouraging strategic change to match programming with expectations for learning spaces. The ultimate goal in this ongoing study is to create environments that promote learning.

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A System for Assessment

The limited literature on spaces in relation to learning in higher education required a “blank slate” approach for developing an assessment strategy. The first priority was to identify measurement targets, which we based on the rationale for assessment in Figure 1. The initial hypothesis was a simplistic assumption that learning was directly influenced by characteristics of the learning space, pedagogy, and academic programming. The two-step procedure for assessment provided a set of criteria to identify relevant measurable factors and a process for determining the relationships between space and pedagogy, programming, and engagement.

Key characteristics of learning spaces and relationships had to be identified in order to lay a foundation for ongoing measurement; student and faculty focus groups, interviews, and surveys provided these data. Pedagogical practices and academic programming linked to learning had a high profile in the literature with regard to the transition from teacher-centered to learner-centered education; we measured students’ learning preferences with questions developed from the literature through focus groups, interviews, and surveys. Learning was assessed through measures of engagement: the National Study of Student Engagement (NSSE) and our own photographic studies. The photographic data verified the NSSE survey results through observation and quantification of specific types and frequencies of engagement in various locations throughout campus. Early in this process, engagement emerged as the best measure for learning, due to the complexity of assessing specific learning outcomes.

Employing a systematic strategy of data gathering that incorporated multiple methods for ascertaining our findings, we gleaned four major insights from the data. First, faculty tend to facilitate students’ experiences based on the faculty member’s comfort level with pedagogical practices, ranging from those that are highly innovative to those that are entrenched in tradition. Spaces can limit the range of pedagogical practices that faculty feel comfortable using, but they do not expand the range. Second, students react positively to spaces that treat them with respect, that are serious, and that encourage interaction with other students and faculty. Students are most engaged where their basic needs can be met. Third, physical characteristics (especially mastery over the environment and comfort) are extremely important; the emotional reaction related to the environment encourages or discourages engagement for both faculty and students. Fourth, academic programs that encourage integration, faculty communication, respect for the student, and innovation with scheduling, space use, and time are most likely to engage students and faculty and to positively influence learning.

Characteristics of Learning Spaces

Key characteristics of learning spaces had to be identified to develop specific targets for understanding the physical requirements for engagement. Rate-of-use data from a library photographic study verified preferences, which were identified through indirect measures (i.e., focus groups, interviews, surveys). Preferences for spaces with differing physical characteristics (e.g., with or without windows, table size, comfortable seating) and functions (e.g., individual or group study, access to references) were documented through frequency counts of users in specific locations.

Data from the photographic study revealed those library aspects that encouraged or discouraged both individual and group engagement with the library facilities. Individual study was encouraged by spaces that are free from distractions and noise, have good lighting, are comfortable, and possess pleasing aesthetics. Spaces designated for individual work should house computer stations and study carrels, as well as a variety of other furniture. Spaces designed to increase group work should have soft furniture, four- to six-person tables, and computers. In addition, all spaces should facilitate interpersonal communication, be controllable, and promote the integration of basic human needs and desires (e.g., eating, drinking, and enjoyment) with learning activities.

A major finding from this photographic study was that the re-designation of a space function will not change usage
patterns unless the physical aspects of the space are reconfigured. In addition, given the long-standing traditions of library procedures, users want permission (e.g., signs indicating what is allowed) before they will use the space in different ways.

**Faculty and Students**

The third stage of the multiyear project focused on the interactions between learning spaces, faculty, students, and student learning, as symbolized in Figure 2. The reciprocal interactions between space and faculty, between space and students, and between faculty and students are complicated by the concurrent reciprocal interaction between the learning space and the faculty-student interaction.

The complexity of measuring these interactions required a new strategy for assessment. The following questions framed this stage of the study:

1. How do faculty and students assess the “fit” between course goals and the physical facility of the learning space?
2. What is the relationship between space characteristics and pedagogical innovation?
3. Do faculty communities of practice promote innovative practices in pedagogy and use of space?

A quasi-experimental approach was used to investigate the relationship between the characteristics of four different classrooms and pedagogical practices: four classes were rotated through the rooms during a semester. The four rooms were all designed differently, ranging from traditional seats in rows to highly flexible accommodations. Flexible space contained comfortable, movable furniture and was relatively unstructured. One space contained large tables with comfortable chairs, and another space had soft, movable chairs with tablet arms (called the “circle room” due to the typical configuration of the chairs in a circle). To address question 3, the study included graduate courses held on two evenings per week. One group participated in a community of practice once a month to discuss the members’ pedagogy; the other group participated only in the room rotation.

**Faculty who were not comfortable with a range of pedagogical approaches tended to alter the most innovative spaces so that the rooms would have a “lecture room” feel.**

Observations and photo studies documented the interactions. Surveys and focus groups revealed faculty members’ and students’ perceptions of the experiences. The study confirmed that academic engagement was encouraged by learning spaces that were comfortable, open, flexible, and appealing to the emotions. Students were most engaged in settings and in academic activities that encouraged interpersonal interactions and that were supported by technology. In comparison, when students met in more traditional classrooms, with seats arranged in rows and with the instructor at the front of the room, they felt they had less responsibility for participation. Poor air circulation, uncomfortable temperatures, distractions, and noninteractive pedagogical practices all discouraged engagement. Interestingly, when classes began in the traditional room, the room was rated as acceptable. But students who experienced the flexible and comfortable rooms first and then spent four weeks in the traditional classroom perceived the traditional classroom negatively. Perception of the learning space was framed by the past experiences of the users; experiences in spaces with aspects that promoted engagement tended to heighten users’ expectations for future learning spaces.

Faculty who were not comfortable with a range of pedagogical approaches tended to alter the most innovative spaces so that the rooms would have a “lecture room” feel. Space that was unstructured, with too many options, was viewed as overwhelming, and it discouraged innovation. On the other hand, space that was extremely restrictive also discouraged pedagogical innovation. Although faculty members’ awareness of pedagogical options was expanded, they typically failed to follow through with innovative pedagogical practices, preferring to adapt the space to their own style. Thus, the next phase of the multiyear study focused on understanding the elements that encouraged the connection between learning space and innovative pedagogy.

**The Relationship between Innovative Pedagogy and Learning Spaces**

A review of the data collected from the faculty groups in this study and from...
a highly innovative faculty group in an earlier stage of this study suggested that specific elements did indeed encourage the link between learning space and innovative pedagogical practices. A successful connection between learning space and pedagogical and programmatic innovation requires attention to teacher learning and engagement.

Teachers tend to engage in three types of learning activities: (1) sharing and reflecting on practice and experiences; (2) experimenting with new ideas and techniques; and (3) gathering information independently. Pedagogical innovation is constrained by lack of time, resource availability, meaningful rewards, and limited power to make changes. Adult learning processes are ideally a (1) self-regulated, (2) planned, (3) spiral, and (4) reflective behavioral change. The core of self-regulated learning is best defined as “independently directing the process of improving teaching and/or attaining learning goals.”

The assessment process for investigating the hypothesis that a successful connection between learning space and pedagogical innovation necessitates attention to teacher learning and engagement first required that learning space be redefined to consist of the content to be learned, as well as the environment in which the learning occurs. Learning spaces that are likely to increase the engagement of the learning facilitators promote a sense of connection with the environment, stimulate positive emotional responses, interest, and enjoyment, and encourage feelings of autonomy and competence during challenging tasks. In addition, learning contexts that incorporate high-quality opportunities for independent and social activities are likely to hold the attention of adult learners, including faculty. Learning is optimized through engagement, and engagement is promoted through thoughtful learning facilitation within appropriate learning contexts.

The assessment plan for this stage of the multiyear study was created to address the issues in the literature through a phenomenological process by involving the researcher and the study participants (i.e., the faculty) in the conversation over a two-year period. It provided sufficient time, resources, and meaningful rewards, and it empowered participants to make changes. Conceptually, the idea was to gain, from all members of the various programs in a Learning Teaching Center (LTC), engagement in the creation of their own assessments. Data from their self-created and self-administered assessments then would be used to drive program improvement.

The two-year plan included a year of development and a year of implementation. Development began with the collection of materials such as policy and accreditation documents, assessment instruments that were currently used, and research literature relating to the development of assessment outcomes. Individual interviews with LTC unit members enabled a better understanding of their roles and helped with the creation of the vision. While providing an opportunity for all members to actively contribute to the visioning process, these activities also capitalized on the creativity, diversity, and expertise of the members and increased the members’ ownership of the vision. The result was the creation of one mission statement, which reflected the general consensus of the entire unit while allowing for individualization of specific goals.

All programs in the unit established the same three assessment goals: engagement, satisfaction, and learning. Each program created specific objectives that were meaningful to help improve work and decision-making and that were worth the time and effort needed to measure them. Assessment measures were created for each objective. To allow for consistency of measurement and end-of-year aggregation of data, the “Active Visioning” process used Goal Attainment Scaling as the outcome gauge. In the second year of the process, unit members implemented the assessments and reported on their results. Although we have not yet analyzed all of the data, anecdotal reports indicate that after some initial hesitation by LTC members, they accepted and, in some cases, became very interested in the assessment process. We believe that our investigation into the use of self-developed and self-implemented assessment practices will demonstrate that faculty-development strategies can indeed strengthen the connection between learning space and innovative pedagogical practices.

**Summary**

At this point, our research leads us to agree with C. Carney Strange and James H. Banning: campus culture, social climate, and environmental press (the notion that environments shape individuals and thus their behavior within specific contexts) influence the effectiveness of learning spaces.

We have also found that learning spaces can encourage or constrain behavior. Students and faculty engage in a full range of learning behaviors (1) when environments are constructed to optimize interaction between faculty and students inside and outside of the classroom or course time; (2) when there is high engagement with course material both through class preparation, on the part of faculty and students, and through active learning inside class; and (3) when the atmosphere encourages...
students and faculty to behave as if “serious work” is taking place.

Students will use any space for learning activities if the space is so designed. Providing a diverse set of spaces where faculty and students can “run into” one another increases engagement and learning. Undergraduate students are particularly eager to find study and work spaces that meet their needs throughout the day and into the evening. Space outside of faculty offices should be carefully designed to provide for interaction between students and faculty. If faculty are “tucked away” from students or from one another, they run the risk of encouraging the practice of isolation, which limits the development of student and faculty relationships and thus their impact on one another.

Students and faculty are accustomed to a variety of space options that serve their needs. Learning spaces that encourage engagement are visually appealing, have flexible lighting and temperature controls, and allow access to natural light. They are also designed to limit auditory distractions from outside, hallways, air handlers, and classrooms next door. A pleasant olfactory presence, permission to eat or drink, and comfortable and easy-to-negotiate spaces tend to improve engagement and satisfaction.

Outfitting an engaging environment requires careful consideration of furniture selection. Flexible furniture should be lightweight and easily movable, with a ratio between furniture and free space that allows for alteration of the room setup. Although rooms should not be scheduled based solely on “space occupancy rates,” there are wise ways to outfit rooms to improve pedagogical practices to increase learning. Seating and flat-space options should take into consideration the full needs of students. Graduate students, who spend long hours in class, are particularly sensitive to seating options. Having just one seating option in a room is not desirable. Seating options, when possible, should include comfortable rolling chairs, straight-back chairs, and some soft seating. Although faculty and students often want flat surfaces where they can spread out their work and have extra room, they also report that these same flat surfaces may keep students from engaging fully in
In short, there appears to be a reciprocal interaction between a learning space and its users. Institutions that assess the use of learning spaces on their campuses must also ascertain pedagogical practices that yield optimal learning; space and pedagogy are undeniably intertwined. The level of student and faculty engagement is a symptom of the effectiveness of the learning experience and represents the quality of learning outcomes. Without assessment, institutions may miss the important connections between context, institutional culture, and students’ specific needs. Maximizing learning is seldom an endeavor that involves one simple approach; it therefore must be studied, experimented with, and perfected using active assessment.

Notes
3. Hunley and Schaller, “Assessing Learning Spaces.”
4. For a detailed account of this process, see ibid.