First Questions for Designing Higher Education Learning Spaces[1]

by Scott Bennett

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We often start the design of learning spaces with service and operational considerations rather than with questions about the character of the learning we want to happen in the space. To correct this practice, six questions are here proposed that colleges and universities should ask first and persistently throughout the construction or renovation of learning spaces. Much of this discussion draws on the National Survey of Student Engagement; for another essay that draws substantially on NSSE, see the author's "Designing for Uncertainty: Three Approaches" in the March 2007 issue of the *Journal of Academic Librarianship*.

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INTRODUCTION

It is commonly said that architects need great clients to design great buildings. To be a great client for learning spaces, institutions must act on the observation that questions regarding "the nature of the *educational experience* [that is desired in a given renovation or construction project] . . . are questions that must be asked first and asked persistently throughout the [planning] process."[2] This paper undertakes to identify the first questions a college or university should ask when planning the construction or renovation of a learning space.[3]

Learning spaces cover a lot of ground in higher education. Arguably they encompass the entire campus of a college or university. This paper focuses more narrowly on those non-discipline-specific spaces where students take control of and responsibility for their own learning. Group study space, now a common feature of library design, exemplifies such learning spaces. These spaces are not designed to support the delivery of library services; students are neither served nor taught in these space. Students use these spaces to take command of their own learning. Other examples of learning spaces of concern to this paper are information/learning commons (usually built in libraries) and computing laboratories (sometimes built in libraries). In these two latter cases, space design is usually concerned in significant measure with the delivery of services and with instruction, but the intention is always to foster active, independent learning.

Largely excluded from consideration in this paper are discipline-specific spaces, even those consciously designed to foster active, independent learning. Science laboratories, engineering shops, and studio spaces (for instruction in art, architecture, music, and dance) are not considered here, although they have much to teach us about designing for collaborative learning. Other learning spaces outside the scope of this paper are classrooms; auditoriums; museum and other display spaces; intramural sports facilities; and administrative, student services, and health care buildings. These are spaces where people other than students typically control the use of the space, where students are served or acted on. Dinning and residence halls are also not considered in this paper, although we will see that access to food is a critically important element in the design of successful learning spaces.

This paper identifies questions about learning spaces that should be asked not only first but also persistently, in each

phase of planning and building a learning space. It is this *persistence* of first questions that ties the concerns of this paper to the architectural discipline of building performance evaluation, a continuous quality improvement activity practiced by architects and their clients. Conceptually, building performance evaluation has its roots in post-occupancy evaluation, or the effort to understand how well a completed project meets the needs of those who use it. Building performance evaluation brings the same evaluative perspective to bear on *all* of the steps in creating a structure: planning, programming, design, construction, occupancy, and adaptive reuse. Such evaluation formalizes the opportunities to learn in each phase of a project and institutes continuous quality improvement.[4]

As an architectural discipline, building performance evaluation is conceptually related to a number of other disciplines. These include architectural theory, environmental design, learning theory and cognitive psychology, and the evaluation of educational outcomes. These related disciplines will occasionally figure in this paper, which, however, makes no effort to deal with them systematically or exhaustively.[5]

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Before turning to the first questions that should drive the design of learning spaces, it is useful to reflect briefly on the linkage between design and behavior. Higher education has little experience in posing design questions about the learning behaviors it may want to encourage,[6] and we are skeptical of claims that architectural design can directly effect specific learning behaviors. This skepticism is well taken as regards any deterministic view of the link between design and behavior. The alternative view espoused in this paper is architectural or environmental probabilism, where design features make certain behaviors likely but not certain.[7] Well designed spaces afford their occupants the opportunity to act in certain ways but do ensure that those activities will happen.

The better we understand the design elements that afford college students opportunities to learn and the spaces in which students may act on these opportunities, the more likely we are to design successfully and get full value from our investment in learning spaces. This probabilistic view is especially appropriate to design problems that are "wicked" rather than "tame." The former are problems that have no definitive formulation and where problem formulation and problem solving are identical. There is no rule for knowing when to cease asking questions about the nature of a "wicked" problem and no definitive set of operations to solve them. Experimentation with "wicked" problems is impossible except by engaging anew with the problem. "Tame" problems, by contrast, can be exhaustively formulated and have other characteristics opposite to those of "wicked" problems.

"Well-mannered" problems occupy a fuzzy middle ground and "can be dealt with in a probabilistic, if not a deterministic, manner."[8] The hope of this essay is that by first and persistently asking six questions about learning behaviors and

by calling for design practices that explicitly address these questions, it will be possible to shift the creation of learning spaces from being a mostly "wicked" to a somewhat "well-mannered" design problem.

SIX FIRST QUESTIONS

Each of the following six questions can be used to inquire about a specific learning space that a college wishes to renovate or build. The commentary following each question expands on the question and describes what is at stake in asking it. While the commentary takes a decided view of each question, no effort is made actually to answer them. The commentary may sometimes suggest the nature of possible answers, but actual answers – or indeed the salience of each question – will vary widely depending on the institution, the project, and educational intention.

Question 1: What is it about the Learning that will Happen in this Space that Compels us to Build a Bricks and Mortar Learning Space, rather than Rely on a Virtual One?

Over the last fifteen years or so, we have demonstrated the ability to create robust virtual environments for learning. Question 1 recognizes this accomplishment and asks a threshold question: can the desired learning be accomplished in virtual space? If it can, why should one build physical space, which will almost always be more expensive and less amenable to future change than virtual space?[9] This threshold question is not posed to indicate a default preference for virtual learning spaces. It is meant rather to force attention to the alternatives we have in virtual and physical learning spaces and to understand what about the learning experience we wish to create compels us to use one of them, physical space.

This first question is no rhetorical one. Sometimes virtual space is clearly to be preferred, and it is likely that over the next ten to twenty years higher education will make still greater use of virtual learning spaces. Indeed, speaker after speaker at the 2004 ELI Fall Focus Session on the design of classroom space commented on relatively how little learning happens in the classroom.[10] One participant, with delicious irony, opined that in the future students will attend classes at home and come to campus to study. The National Center for Academic Transformation, under the leadership of Carol A. Twigg, has demonstrated the power of information technology to improve student learning outcomes and reduce the cost of higher education.[11] This paper is concerned with physical learning spaces and does not argue the case for virtual learning.[12] But surely higher education can ill-afford to ignore any opportunity to secure much needed productivity gains through information technology. Neither should we be unmindful of Richard Lanham's observation that if our business is the broadest possible access to and success in learning, then "electronic instructional systems offer the only hope for the radically leveraged mass instruction the problems of general literacy pose."[13]

Even believing that virtual learning spaces will become increasingly important, it is clear that physical learning spaces are often needed. What is it that compels a choice in favor of physical space?

- Some aspects of *immersion learning* are hard to achieve except in physical spaces. This argument is generally

applicable to physical learning spaces and may indeed be the underlying rationale for a campus-based, residential experience for students. John Seely Brown observes, for instance, that "learning is a remarkably social process. In truth, it occurs not as a response to teaching, but rather as a result of a social framework that fosters learning.... [It is] the learning communities that universities establish and nurture that remove them from the realm of a delivery service, or from being mere traffickers of information, to [become instead] knowledge creators. An on-campus social learning environment offers exposure to multiple communities of scholars and practices, giving students broad access to people from different fields, backgrounds, and expectations, as well as opportunities for intensive study, all of which combine to form a creative tension that spawns new ideas, perspectives, and knowledge."[14]

- Some of the *social dimensions of learning* cannot be fully realized or substituted for in virtual space. These include, for instance, the learning opportunities that come with racial, ethnic, religious, and economic diversity. Such diversity does not disappear in virtual learning spaces, but its expression may be muted by the cocooning environment of virtual communication that allows a measure of anonymity and the avoidance of what is personally challenging.

- The character of *collaborative learning* is likely to be different in physical and virtual spaces. Successful collaboration is of course possible in both environments, but in physical space the sensory environment (say of body language) is richer, and personal negotiations are more direct and not complicated by mediating technology.

- Physical space is needed for the *performance aspect of teaching and learning*. Many faculty, for instance, are superb performers in the classroom, which they take as their performance space. And depending on how students are involved in the class, the classroom also becomes performance space for students, with all of the pressures resulting from performing in the presence of peers. For some performance spaces – some science laboratories and studios for some of the arts, for instance – there are no adequate virtual substitutes for physical learning spaces.

These factors compelling a choice for physical space are here described in general terms. They gain considerably more interest and sharper definition when invoked in planning specific learning spaces. This is especially true of spaces like information/learning commons and computer laboratories, where important service functions must be accommodated and may sometimes displace learning functions. If, for instance, the primary motive for creating a computer laboratory is simply to provide access to computers, the laboratory can be designed primarily as a work space, rather than as learning space, and many of its service functions delivered virtually. A computer laboratory consciously designed for collaborative learning will doubtless accommodate the same services but will likely have a decidedly different character.[15]

Question 2: How Might this Space be Designed to Encourage Students to Spend More Time Studying and Studying More Productively?
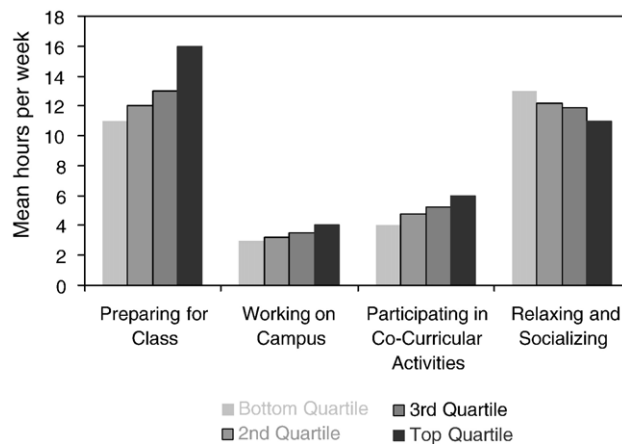
As the National Survey of Student Engagement observes, "what students put into their education determines what they get out of it." This is especially true as regards the amount of time spent on learning tasks. "Time devoted to preparing for class...[is] positively related with other engagement items and self-reported educational and personal growth." Nonetheless, "only about 11 percent of full-time students spend more than 25 hours a week preparing for class, the approximate number that faculty say is needed to do well in college. More than two-fifths (44 percent) spend 10 or less hours a week preparing for class."[16]

Given the investment colleges and universities make in bricks and mortar buildings – and indeed in whole campuses – to provide strong environments for learning, it is deeply troubling to know that nearly 90 percent of full-time students fail to spend the time on task that faculty believe is needed for academic success. By this measure, our massive investment in physical learning spaces is surely underperforming. Just as surely, we must find ways to encourage students to invest more of their time in learning.

This imperative drives us to ask what competes with learning for student time and how we might design spaces that strongly favor learning.

NSSE provides an answer to the first part of this question in an analysis of what it calls "deep learning"— learning characterized by higher order, integrative, and reflective learning behaviors. Fig. 1 shows the time spent per week on various activities by students ranked, in quartiles, by their engagement with deep learning behaviors. The more time students spend preparing for class, working on campus, and participating in co-curricular activities, the more they report themselves as engaged in deep learning behaviors. This pattern of positive correlations is broken with relaxing and socializing activities, which command almost as much time as preparing for class. The chart indicates a strong competition between study and socializing

Figure 1
Time Spent per Week in Selected Activities by Deep Learning Quartile

in students' allocation of their time (*Student Engagement*, Table 9, p. 21).

Are preparing for class and socializing the antithetical behaviors these data suggest? While students often draw a sharp distinction between these behaviors, they also regularly relax the distinction when asked to characterize their actual learning behaviors. Students at Sewanee: The University of the South, when asked where they have conversations about class material with persons not enrolled in the class – one of the behaviors contributing to deep learning – reported that 43 percent of these conversations happened in residential spaces, 21 percent happened in their dinning hall, and another 12 percent happened in other campuses spaces, such as campus walks, a coffee shop, and the gym. It is clear that this learning behavior (and others, as we will see) tolerates a high degree of what might be called "socializing."[17]

Space designs that acknowledge the social dimension of this and other learning behaviors and that enable students to manage socializing in ways that are positive for learning are likely to encourage more time on task and more productive studying, and thereby yield a better return on the investment in physical learning spaces. This argument reframes the issue, shifting from an apparent competition between study and socializing to a regulation of behaviors that are inextricably both academic and social in nature.

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Framing the issue so, there is much more to learn from what Sewanee students had to say about the self-regulation, or self-discipline, they exercised for learning. The following observations draw upon interviews conducted by students in an independent studies course led by anthropology professor Richard A. O'Connor.[18] Sewanee students understand they are obligated to study—to spend time on task. The result of effective self-regulation is that students come to

> feel good about studying because it's the right thing to do. It's not thought to be fun or easy – studying is widely seen as self-denial – but the discipline can develop into an expressive form with its own small pleasures and distinctive rituals. In the end, studying becomes a practice with a life of its own. It's not just a response to assignments but a highly personal and often meaningful way of being a student.

Sewanee students identified three characteristics of the spaces that they favored when studying. These features of space helped them to focus on their studies and exercise the self-discipline of being a learner. Two of the three are relatively straightforward: "convenience" and "comfort."

- "Convenience" means such things as not having "to lug my books," having everything needed for study ready to hand, being able to spread out one's materials, and having easy access to parking.

- "Comfort" involves having ready access to food and beverages; being able to listen to music; being physically comfortable, especially as regards furniture and lounging; and being able to take breaks. For instance, 67 percent of the students mentioned music as helping them to focus on their studies, either alone (e.g., "music ... prefer[ably] loud, without vocals") or with other distractions (e.g., "radio, friends, traffic passing by"). Sixty-three percent of the respondents mentioned snacks or drinks as helping them to focus, either alone or with other focusing aids (e.g., "always a drink ... and sometimes I need an extra boost—Skittles"). Fourteen percent said taking breaks was important to maintaining their focus, either alone or with other focusing aids ("taking a 10–15 minute break after every hour at studying. Cigarette break. Drink"; "taking breaks to chat with friends, check my e-mail ... get something to eat").

Comfort when studying clearly has a significant social dimension. The same is even more remarkably true of the third characteristic of favored study spaces, "quiet."

Students said that "quiet" helped them to focus on their studies and maintain self-discipline. While "quiet" was an auditory term for Sewanee students, it was as often or even more frequently also used to mean physically still or calm, or an environment free from distractions. Some of these distractions are social in character. And while quiet, or freedom from distraction, is valued, it is clear that one can get too much of it while studying. The quiet sought varies greatly from student to student and from situation to situation for a given student. Students wanted a study environment that is "distraction-free ... combined with enough noise and activity so that I don't feel as if I'm in a sensory deprivation tank"; they want a place that "is not distracting but there is stuff going on so I don't get bored or fall asleep." More specifically:

- 33 percent of the student respondents favored "silence and solitude" in the usual meaning of these words. One student, for instance, wanted to avoid socializing with the "15 friends [who] want to say 'hi' while you are working," while another wanted to avoid "people ... passing by or eating or opening a bag of chips."

- 52 percent wanted "quiet and calm but not silence and solitude." For some having quiet did not preclude music (e.g., "I usually listen to music. Bach especially, because his music is very structured and helps me focus. I am good at tuning out distractions"). Another student reported that "I really can't study alone—I like to have people around to ask/answer questions." Another said "when it is too quiet I zone out—so it is easier when people are around me/music is playing."

- 15 percent liked "some noise and distraction." As one student said, "I like noise and distraction ... like music, or people talking in the background. I find it comforting for some reason and it allows me to be more at ease." O'Connor

observes that as this sort of environment is often thought not to be conducive to study, the actual numbers of students preferring this environment might be somewhat higher that reported.

"…students often place their study habits in a social context and see their goal as not eliminating the social dimension of learning but as regulating the social dimension."

Describing the library as a study space, one student reported avoiding it because it "is too social" while another student found the mix just right: "there are always people coming in and out—it keeps me awake! It's also pretty quiet." What we see here is that students often place their study habits in a social context and see their goal as not eliminating the social dimension of learning but as regulating the social dimension. Students know that learning regularly happens in a community, and the ability to manipulate the social dimension of learning is essential to their success in focusing on their studies, in disciplining themselves for learning. Successful design requires that we listen attentively and thoughtfully to what students tell us about the behaviors they use to discipline themselves successfully for study. We need to understand that much of the time, studying and socializing are not alternative choices for students (though they sometimes are!). More often than not, studying and socializing are elements in a community of learning that need to be managed, the one with reference to the other, if students are to succeed as learners.

Question 3: For What Position on the Spectrum from Isolated Study to Collaborative Study Should this Learning Space be Designed?

There was a time when study was always understood to be a solitary activity, and collaboration was often seen as a form of cheating. Individual studies or carrels in libraries exemplified this understanding. Today, study is understood to be a collaborative, or a communal activity as well.[19] Collaborative study is a particular instance and an important form of the fruitful mix of learning and socializing discussed in Question 2. Learning environments well designed for learning promote this sense of community as, for instance, in the significant commitment to group study space now typical of library design. And more generally, we have already considered John Seely Brown's argument that it is "the learning communities that universities establish and nurture that remove them from the realm of a delivery service, or from being mere traffickers of information, to [become instead] knowledge creators."

So a vital question for the design of any learning space is where it will function on the spectrum ranging from isolated to collaborative study. What do we know that might give substance to this question?

Active and collaborative learning is one of the NSSE benchmarks of effective educational practice. Working with classmates outside of class to prepare class assignments is one of the specific behaviors that contribute to active and

Figure 2
Frequency of Working Collaboratively Outside of Class

| | First-year students | | Seniors | |
	All institutions	Top 5% institutions	All institutions	Top 5% institutions
Never	15%	7%	8%	3%
Sometimes	47%	31%	35%	27%
Often	29%	37%	34%	41%
Very Often	10%	26%	23%	29%

collaborative learning. Fig. 2 summarizes what student respondents to the 2004 NSSE survey reported on the frequency of their working collaboratively outside of class. Two things are impressive here: the frequency with which collaborative study happens and the dramatic increase in the frequency of collaborative study as students advance in their course of studies. Whereas 39 percent of first-year students report studying collaboratively often or very often, the percentage of seniors reporting the same frequencies increases to 57 percent. These percentages are impressively higher at the schools that score in the top 5 percent of this measure: 63 percent and 70 percent, respectively.[20]

We also know something of faculty views on collaborative study. When asked how important it is to them that their students work with classmates outside of class to prepare class assignments, 22 percent of faculty nation-wide ranked this learning behavior as not important; 28 percent ranked it as somewhat important; 27 percent ranked it as important; and 24 percent ranked it as very important.[21] Thus, 51 percent of faculty nation-wide thought this learning behavior important or very important, a figure roughly comparable to the number of seniors who reported engaging in the activity often or very often.

Learning space design that is responsive to these data must accommodate both solitary and collaborative learning behaviors, understanding that both occur with approximately equal frequency, but with collaborative learning behaviors growing more important over the four- or five-year course of a student's work. Where there is a desire proactively to encourage effective educational practice, space designs might consciously favor collaborative work, thereby facilitating movement toward the behaviors characteristic of institutions scoring in the top 5 percent of all schools.

These conclusions from NSSE and FSSE data seem relatively straightforward. But once more, if one listens thoughtfully to what students say of their learning behaviors, a third study behavior emerges quite strongly. Consider, once more, the testimony of Sewanee students:

- "It's nice to work in a place where you know other people are doing the same thing."

- "It helps when someone else is around me studying because if they are working it helps me stayed focused."

- "I like it quiet [to focus], but I don't like to be the only one there. It makes me feel better knowing other people are awake."

- "A studious environment—the library, a room with others studying [helps me focus]."

- "Being around other people who are studying [helps focusing]."

- "Seeing other people working provides encouragement."

- "I like [the study rooms in a classroom building] because you aren't sitting alone but others are studying there too."

O'Connor names the learning behavior described by these students as "studying along." He observes that

> students readily distinguished between individual and group study, but their actual practices revealed a third type: studying along rather than alone or together. In effect, a student studies alongside others who are studying, sharing space but working separately rather than participating in a joint project…. Even a silent audience can validate one's efforts, but in the last example [given above] the student goes on to say 'I guess I also socialize with the people out there, but [it] provides a good break … or an opportunity to share what I'm reading when I find it interesting.' Is she studying alone if finding an insight quickly brings the pleasure of sharing it? (O'Connor, "Seeing duPont Library," p. 68).

The identification of studying along as a distinctive but common learning behavior – as it is, for instance, in library reading rooms – is another reminder of how pervasively learning is also socializing, of how exceptionally strong the social dimensions of learning are.

While Question 3 is best posed with reference to nationally well-documented learning behaviors and the direct testimony of students, it is useful to recognize that the spectrum of isolated to collaborative study has an analog, in environmental design, in the spectrum of private to public spaces, and in the concept of territoriality. In the former, people feel there are important differences in spaces that are considered public (e.g., streets), semi-public (e.g., the grounds in front of multi-housing units), semi-private (e.g., front and back yards of single family residences), and private (e.g., the interior of residences). Territories are spaces that manifest these public/private characteristics and, in addition, provide a sense of identity (e.g., the China towns in many cities) and establish a frame of reference for expected behaviors (e.g., zoning requirements and property covenants [Lang, *Architectural Theory*, pp. 145–156]). Designers have extensive experience with these issues, and some empirical findings, that should be considered in the design of learning spaces. Of course, ideas of what is private and public and of territoriality vary immensely from culture to culture and from person to person. Understanding this variability will usually be a source of insight and of well-tuned design.

Question 4: How Will Claims to Authority Over Knowledge be Managed by the Design of this Space? What will this Space Affirm About the Nature of Knowledge?

Most fundamentally, academic culture is built around ideas of merit and the aspiration to be open to all. Our deep allegiance to these values and our efforts to maintain them as the wellsprings of all we do sometimes blind us to how stratified academic culture actually is. Every institution has an explicit language for these strata, which typically includes such terms as "faculty," "student," and "support staff." These terms are much more than convenient personnel classifications. They "reflect the established divisions and hierarchies that structure the production and reproduction of knowledge in traditional college settings. Among these divisions and hierarchies is the designation of different degrees of power and prestige and of different kinds of educational responsibility."[22] These terms mark master/apprentice relationships; they establish who is central and who is peripheral to education;[23] they legitimate deference and privilege—as, for instance, in the different ways employees account for their work time.

In thinking about the design of learning spaces, the most important aspect of this stratification of academic life is the way that claims to authority over knowledge are asserted and upheld. The archetypal behavior for asserting authority over knowledge is the faculty member's lecture; the archetypal space designed to reinforce that authority is the classroom, with the teacher standing in front and in command of the chalk board and other teaching technologies, while students are seated attentively facing their instructor. There are many other ways we design spaces to reinforce claims to authority over knowledge. Examples include book-lined faculty offices and librarians ensconced behind monumental reference desks with the ready-reference collection and a computer at their command.

Differences in authority over knowledge are inherent to higher education. It is, after all, impossible to learn except by acknowledging one's own lack of knowledge and by asserting a wish to reverse that lack. So the challenge for space design is not to deny such differences but to decide how the differences will be managed and what understanding of knowledge will be projected.

The understanding or concept of knowledge most familiar in higher education is a foundational one. Such a view holds that "knowledge is an entity formalized by the individual mind and verified against reality."[24] Knowledge in this sense is founded in external reality as engaged by individual intelligence. Foundational views of knowledge celebrate the accomplishments of the individual scholar; they ratify the authority over knowledge of the teacher. Foundational views of knowledge drive most classroom teaching, inform the conduct of academic departments, dominate academic reward systems, and shape almost all of the structures of prestige in academe.

An alternative, non-foundational view of knowledge holds that knowledge is constructed by people acting within communities. "People construct knowledge working together in groups, interdependently. All knowledge is therefore the 'property' not of an individual person but of some community or other, the community that constructed it in the language spoken by the members of that community" (Bruffee, *Collaborative Learning*, pp. 294–295). Non-foundational views of knowledge are most frequently met, in higher education, in seminars, and in the research laboratories of scientists. As John Seely Brown observes, it is

> through participation in communities that deep learning occurs. People don't learn to become physicists by memorizing formulas; rather it's the implicit practices that matter most. Indeed, knowing only the explicit, mouthing the formulas, is exactly what gives an outsider away. Insiders know more. By coming to inhabit the relevant community, they get to know not just the "standard" answers, but the real questions, sensibilities, and aesthetics, and why they matter.

The task of the university is to make these communities, and especially the real questions and sensibilities of these communities, open and accessible to those who want to learn. Again, as Brown says,

> the real test of a university is the community access it provides. Any attempt to retool the education system must … involve expanding access to the communities of practice that comprise the university and not simply the content of courses…. This intermingling on campus enriches students' opportunities for exposure to a variety of communities (Brown, "Learning in the Digital Age," pp. 68–69).

"The way we design learning spaces will do much to define the roles we take and the status we hold in academic life."

We need only look about our campuses to find abundant examples of learning spaces designed to manage learning as a transfer of foundational knowledge from the authority to the novice. Learning spaces designed to manage learning as a community endeavor involving non-foundational ways of knowing are less plentiful.[25] This is not surprising, as the way we manage the choices between these alternative views of learning and authority involves fundamental and, for many, profound choices in the way we conceive of ourselves as members of the higher education community. The way we design learning spaces will do much to define the roles we take and the status we hold in academic life.

The centrality of this issue of roles was evident in a workshop that was not primarily concerned with learning spaces but explored the ways information technology might be integrated into classroom teaching. Bryn Mawr College hosted the workshop in May, 2000. Nine institutional teams each comprised of a faculty member from the social sciences, a student, a librarian, and an information technologist attended. Jonathan T. Church, an anthropologist, observed the personal dynamics of the participants as they worked together.[26] He commented on the dramatic shift in personal roles required for the strong collaboration achieved at the workshop, reporting that

> one after another, workshop participants remarked about how much "good will" there was between participants. It seems then "good will" is *not something workshop participants would automatically assume of college colleagues*. Taken away from the daily institutional structuring of professional identity and relatively equalized in terms of authority by the liminal quality of the workshop, participants expressed pleasant surprise that "underneath" the professional identities of faculty member, librarian, information technologist, and student were people willing to collaborate (emphasis added).

Workshop participants came with a defined role and an established understanding of that role, only to find that the collaborative purposes of the workshop required a fundamental rethinking of roles and authority over knowledge.

• For faculty, the pervasive information technologies of the campus and the often greater expertise of students with these technologies "transgressed boundaries of authority and expertise associated with professional identities…. A consequence of these transgressions is that participants are made aware of their investments of the self in 'professional identities' that require…a quite self-conscious accounting. If students have more expertise than faculty members, then faculty must account what expertise they actually have and what constitutes important expertise." More specifically, collaboration with students, librarians, and information technologists left faculty "wondering what a classroom would look like and what teaching would mean if faculty were not the sole proprietor of the class…. For faculty, then, sharing the stage requires a profound reexamination of their pedagogical identities."

• The dilemma for librarians "lies in imagining an identity that takes them outside of the library and more into the classroom, and in imagining what would happen [to the demands on their time] if such a move were successful."

• The challenge to information technologists is "to imagine a role for themselves and fashion an institutional niche. With some heartfelt irony, a number of instructional technologists wondered, 'do faculty know what we do?' In many ways, the answer to that question is 'no.' Perceiving themselves for the most part on the lower rungs of the institutional hierarchy, instructional technologists admit a personal hesitancy in approaching faculty about pedagogical issues."

• "The challenge for students was to reimagine a collaborative identity in which they would be partially responsible for constructing their own educational vehicles." For faculty, librarians, and information technologists, "the challenge is recognizing the actual authority of student voices, and institutionally facilitating these voices."

Collaborative learning and claims to authority over knowledge, learning communities, and a non-foundational view of knowledge figure prominently in this commentary on Question 4. This is not because such values are the only ones appropriate to the design of learning spaces, but because they are often appropriate and we have relatively less experience in designing spaces that foster them. These values are especially appropriate when an institution wants to create an environment of active learning and wishes thereby to secure the greatest possible return on its investments in libraries and information technology. Such ambitions require one to embrace the paradigm shift in higher education toward producing learning and away from delivering instruction.[27] In this environment, traditional academic identities and the claims to authority over knowledge that accompany them are likely to give way. In their place we will find a "forging [of] professional identities where authority and expertise is shared and acknowledged," where "investments…of the self [are made] without the disenfranchisement of the other" (Church, "Reimagining Professional Identities"). One might add that faculty, librarians, and information technologists are less likely to make this paradigm shift if the learning spaces we create for their use not only fail to support the shift but in fact reinforce foundational understandings of knowledge and celebrate – as conventional design so often does – their claims to authority over knowledge.

Question 5: Should this Space be Designed to Encourage Student/Teacher Exchanges Outside of the Classroom?

Students discussing ideas from their readings or classes with faculty members outside of class is one such exchange. It is also one of NSSE's markers of deep learning. This behavior and several other student–faculty interactions constitute a NSSE benchmark of effective educational practice.

Fig. 3 draws on 2004 NSSE data and indicates that student discussions with faculty outside of class are strikingly uncommon. Nation-wide, more than 75 percent of both first-year students and seniors report they never or only sometimes have such conversations with faculty. Even at the top-scoring institutions, more than 50 percent of both first-year students and seniors report never or only sometimes having such discussions. Faculty reports on how they spend their time confirm the picture drawn by students. Nation-wide, more than 75 percent of faculty indicate that in a typical week they spend no time interacting with students outside of the classroom (16 percent) or between one and four hours (62 percent).

The NSSE student–faculty exchanges benchmark includes two other behaviors that are of interest to designers of learning spaces:

- *Students work with faculty members on activities other than coursework* (*committees, orientation, student life activities, etc.*). In 2004, a total of 80 percent of seniors nation-wide reported never doing this (51 percent) or doing it only sometimes (29 percent). In the 2004 FSSE report, 41 percent of faculty nation-wide reported spending no time in this way, while 47 percent reported spending one to four hours weekly in this way. In addition, 16 percent of faculty nation-wide reported spending no time with "other inactions with students outside of the classroom," while 62 percent reported spending one to four hours weekly in this way.

- *Students work on a research project with a faculty member outside of course or program requirements*. In 2004, 16 percent of seniors nation-wide reported not having decided to pursue this activity, while 55 percent stated they did not plan such activity. In the 2004 FSSE report, 23 percent of faculty nation-wide thought it not important for students to pursue this activity, while 32 percent thought it only somewhat important (*Student Engagement*, p. 41; "Faculty Survey of Student Engagement," pp. 1, 9).

Faculty–student interactions outside the classroom are demonstrably a weak element in our educational practice. Why is this and how might we work to change it?

Figure 3
Frequency of Student/Faculty Discussions of Class Material Outside of Class

| | First-year students | | Seniors | |
	All institutions	Top 5% institutions	All institutions	Top 5% institutions
Never	44%	19%	29%	10%
Sometimes	41%	41%	47%	47%
Often	11%	27%	17%	17%
Very Often	4%	13%	7%	7%

Given the classroom-based conception of students normally produced by foundational views of knowledge and faculty claims to authority over knowledge, it is often hard to imagine how academic engagement with students might happen outside the classroom. The sort of engagement NSSE measures runs counter to traditional roles, and for that reason both students and faculty may often feel uncertain how to seek out such engagement and uncomfortable in practicing it.

But just the disruptive act of asking about such behaviors is one way to open the door to them. For instance, one of the organizers of the techno-pedagogy project described in Question 4 sees the disruptive emergence of technology in teaching as an event that challenges members of the higher education community to rethink roles and professional identities. Alison Cook-Sather observes that "the advent of information technologies provides…an unprecedented opportunity to re-vision identities and relationships and to expand the pedagogical sphere in higher education because it calls into question everyone's interpretation of their own and others' roles." She describes this re-visioning process as faculty, librarians, information technologists, and students experienced it in the techno-pedagogy workshop. "Standing 'on equal footing,' as one student participant described it, challenged [workshop participants] to *engage in a different kind of conversation*, highlighted the different kinds of expertise and questions they have respectively and that they share, and facilitated their re-imagining how they might define who they are and what they do." The result for several students was that for "*the first time they felt really listened to, by everyone but by professors in particular*" (emphasis added). For this to happen requires, as Cook-Sather observes, "a significant reconceptualization of the student identity and role."

Cook-Sather and her colleagues had to create a special environment for this re-visioning of identities and roles, "a time/place out of time/place, a liminal space" fit for exploring "what people currently experience and believe and what is possible in terms of their own and others' roles" ("Unrolling Roles," pp. 124–125, 131–132, 134). Any wish to design learning spaces for faculty–student exchanges outside of the classroom faces the considerable challenge of creating environments in which both groups can begin to imagine roles and ways of relating to one another different from those of the classroom. This is indeed a difficult design task. The design element so far used most frequently to meet the difficulty is the provision of food—a great social equalizer. We doubtless will find other design factors that promise success. Most importantly, we must become quite self-conscious and intentional in using design elements to relax traditional understandings of faculty and student roles and open the door to other possibilities.

Question 6: How Might this Space Enrich Educational Experiences?

This question derives from the NSSE benchmarks for effective educational practice and takes on specific meaning and invites targeted design responses when asked with reference to several of the behaviors NSSE specifies as components of the benchmark. Fig. 4 sets out those behaviors and the relevant data from 2004 (*Student Engagement*, p. 43).

The first two of these five behaviors relate to diversity. There is little difference between the frequency of these behaviors for first-year students and seniors: about half of

Figure 4
Behaviors that Enrich Educational Experiences

	First-year students		Seniors	
	All institutions	Top 5% institutions	All institutions	Top 5% institutions
Serious conversations with students who are very different in terms of their religious beliefs, political opinions, or personal values				
Never	12%	7%	10%	3%
Sometimes	32%	23%	34%	25%
Often	29%	29%	29%	32%
Very Often	27%	41%	26%	40%
Serious conversations with students of a different race or ethnicity				
Never	17%	9%	13%	7%
Sometimes	34%	23%	35%	33%
Often	25%	29%	27%	28%
Very Often	24%	40%	25%	33%
Independent study or self-designed major				
Have not decided	34%	28%	10%	2%
Do not plan to	48%	49%	63%	47%
Plan to do	16%	19%	9%	3%
Done	3%	4%	18%	48%
Culminating senior experience (comprehensive exam, capstone course, thesis project, etc.)				
Have not decided	43%	34%	11%	1%
Do not plan to	15%	15%	34%	7%
Plan to do	41%	48%	28%	21%
Done	1%	2%	27%	72%
Participation in a learning community or some other formal program where students take two or more classes together				
Have not decided	37%	25%	15%	9%
Do not plan to	30%	28%	58%	61%
Plan to do	20%	19%	6%	3%
Done	13%	29%	21%	27%

both cohorts report they engage in these cross-cultural and cross-racial conversations often or very often. Faculty reports on the frequency of these behaviors in the specific classes they considered when responding to the FSSE survey suggest these conversations happen more often outside of the classroom than within. Only 45 percent of faculty nation-wide reported that cross-cultural conversations occurred in their class often or very often, compared to first-year student and senior reports of 56 percent and 55 percent, respectively. The differences were even wider for cross-racial conversations: 32 percent of faculty nation-wide reported these conversations occurred in their classes often or very often, compared to fist-year student and senior reports of 49 percent and 52 percent, respectively ("Faculty Survey of Student Engagement," p. 14). These data suggest the importance of designing a variety of learning spaces, especially outside the classroom, that foster such conversations if higher education is to get full value from its considerable efforts to establish and defend diversity.

The last three of the behaviors relate to how students shape their course of studies. They invite attention to the learning spaces where students will exercise these choices. Twenty-seven percent of seniors reported planning or doing independent study or a self-designed major and 27 percent reported having decided to participate in a learning community, while a much higher 55 percent of seniors reported having had a culminating academic experience. Faculty attribute more importance to these behaviors than do students. For instance, 71 percent of faculty nation-wide ranked having a capstone experience as important or very important, whereas only 55 percent of seniors reported planning to do or having done a capstone experience. Similarly, where 51 percent of faculty nation-wide thought independent study important or very important, only 19

percent of first-year students and 27 percent of seniors reported planning to do or having done such study. Faculty and students were somewhat closer in their judgments on the importance of learning communities. Forty-five percent of faculty nation-wide ranked learning communities as important or very important, compared to the 33 percent of first-year students and 27 percent of seniors who reported planning to participate or having participated in a learning community ("Faculty Survey of Student Engagement," pp. 1–2). These data suggest it would be educationally worthwhile to make these three learning behaviors more attractive to students. Doing so would doubtless require providing congenial, productive, and merit-conferring learning spaces to accommodate independent study, capstone experiences, and learning communities.

The NSSE benchmarks identify specific learning behaviors of well-documented importance for enriching learning experiences. To conclude this discussion of Question 6, it is worth turning briefly to some more general behaviors that cognitive psychology suggests are also important.

In *Cognition and Environment: Functioning in an Uncertain World*, Stephen Kaplan and Rachel Kaplan were particularly concerned to understand learning as a behavior critical to survival and evolutionary success. Their discussion of the how people comprehend the information content of various environments and how people express preferences among environments is important for designers. The Kaplans identify four informational factors, or characteristics, that demonstrably involve people and draw them powerfully to space. They name two that are particularly germane to enriching learning experiences: *complexity*, or the perceived capacity of the space to occupy interest and stimulate activity, and *mystery*, or the perception that entering the setting will lead to increased learning, interaction, or interest.[28]

What might *complexity* and *mystery* mean in the design of learning spaces? While this paper is concerned with first questions rather than design answers, it may help to clarify the question to suggest two answers. Learning spaces designed to celebrate the accomplishments of learning – by exhibiting its products (scientific posters, engineering models, the results of research projects and independent study, etc.) or by offering performance venues (for talks, art exhibits, award activities, etc.) – will indicate that the space is itself meant to occupy interest and stimulate intellectual activity. Such thinking informed the design of the café and gallery that are part of the computing center in Cox Hall at Emory University, for instance.[29] And by understanding the Kaplan's argument about *complexity* and *mystery*, we will understand the persistence of monumental design, particularly in library learning spaces, as something more than blind adherence to tradition. Such monumentality can serve strongly both to occupy interest and to promise increased interaction and learning; monumentality itself invites occupancy and exploration. So for instance, members of the Sewanee task force specifically charged with design issues recommended that "the entry and lobby areas [of the duPont Library] must be monumental and inspiring so prospective students will *yearn* to learn at this institution" (emphasis added). And one of the principal recommendations of the entire task force was that the duPont Library needs to be an inspiring space, so that it might "evoke the traditions of scholarship that anchor and inspire academic life. The more palpable and inviting that

tradition is, the better chance our graduates will be life-long learners" (Sewanee "Task Force Final Report," pp. 39, 9).

SECOND QUESTIONS

To argue as this essay does that there is a set of vitally important first question implies the existence of other, second questions. To make this distinction is not to understate the importance of second questions. It is rather to argue that decisions about first questions are of primary importance and should govern the consideration of other questions.

It is also to argue that a planning process that allows second questions to govern decisions about first questions is almost bound to produce an underperforming learning space. This is no idle caution. We know, for instance, that the planning of libraries employed systematic assessments of library operations (such as the circulation of print materials) more than twice as often as they employed a systematic assessment of modes of student learning or of the modes of faculty teaching. The first planning method occurred in 85 percent of library projects completed between 1992 and 2001, compared to 41 percent and 31 percent for the second and third methods, respectively. The dominance of operational knowledge over knowledge of teaching and learning is even greater than these numbers suggest, as the numbers almost certainly overstate the frequency of systematic assessments of learning and teaching.[30]

This evidence suggests how commonly we allow second questions to prevail over first questions. Imagine the difference in our designs for the deployment of library staff and information technologists if we made our concern for learning the unambiguous first priority. This would be quite different from our ordinary practice, where the service operations of these staffs are our primary design concern and where we trust – or, worse, where we assume – that good learning follows from good service. In the design of learning spaces, such behavior approximates making the now discredited assumption that good learning follows from the delivery of good lectures. In both cases, we confuse means – good service and good lectures – with our end purpose, which is effective learning. Such confusion about the difference between first and second questions can obviate the best of design intentions and help ensure a poor return on investments in learning spaces.[31]

> "Imagine the difference in our designs for the deployment of library staff and information technologists if we made our concern for learning the unambiguous first priority. This would be quite different from our ordinary practice, where the service operations of these staffs are our primary design concern…"

Although this essay is primarily concerned with first questions, it is useful to mention some vitally important second questions that must be addressed. No design, however well calculated to advance learning, will be succeed if these second questions are not also successfully addressed.

Architects regularly ask and answer a host of questions about behaviors that are not specifically learning behaviors but must be considered in designing virtually any space.[32] These questions include those about

- human-factors engineering – principally involving the conditions of temperature, humidity, light, and the absence of physical barriers – and the ergonomics of furniture.

- way-finding and how to make it easy for occupants to build cognitive maps of the buildings or other spaces they use— through, for instance, establishing clear paths for movement, districts for distinctive activities, landmarks for locating oneself, etc.[33]

These matters are vital, and failure to address them thoughtfully can doom a space. Unhappily, complaints about the "institutional" feel of many learning spaces and about physically uncomfortable and non-intuitive spaces are some of those most commonly lodged against college and university buildings, whether they be long neglected and in need of renovation or even newly built or renovated. It is genuinely difficult to succeed in human-factors engineering, and the bad consequences of asking students to learn in psychologically or physiologically uncomfortable spaces are all too familiar.

ANSWERING FIRST QUESTIONS

This essay is concerned with identifying first questions, not with answering them. By way of conclusion, it is worthwhile mentioning some of the pitfalls and opportunities these questions pose.

The first and most common pitfall is believing the task of evaluating the success of a learning space falls only at the end of the process of creating it. This is the view that informed post-occupancy evaluation for some decades, and advocates of such evaluation regularly found themselves having to explain the failure to do it.[34] It appears that the higher education community has exempted its investments in physical space from the obligation it has otherwise accepted of evaluating outcomes and demonstrating value. To escape this trap of good intentions and inaction, it is necessary to employ evaluation in every step, from first to last. Adopting this evaluative frame of reference for every step of a construction or renovation projection is the conceptual heart of the shift from post-occupancy evaluation to building performance evaluation. This evaluative frame of reference requires asking and answering first questions both *systematically* and *persistently*. The failure to do this is all too likely to allow second questions, especially those of operational and service effectiveness, to become primary and take over the project. The task force planning the future of the duPont Library at Sewanee explicitly warned against "allowing service to displace learning. A service orientation maximizes access to anonymous customers. It aims to move patrons through an impersonal building. A learning orientation, in contrast, holds learners in a commonwealth of learning communities. It connects rather than

dissolves distinctions" (Sewanee "Task Force Final Report," p. 12).

"The first and most common pitfall is believing the task of evaluating the success of a learning space falls only at the end of the process of creating it."

A second common pitfall is, having asked the first questions, to assume the answers are well known. Typical of this behavior is the statement, made by a liberal arts college library director, that

> we didn't do formal surveys [as a part of space planning]. Given the size of [the college] … there's an awful lot of comfortable interaction—library with students, library with faculty, several librarians are on the faculty council. [There has been] on campus … a very comfortable respect by faculty and students for the library…. All along there's very active involvement with and keeping up with not only what the curriculum is now but where it's going. I think there's a very good sense of where the faculty wants to go as well as how students are doing their work. So it made more sense to us not to be formal but to take advantage of the communications that we had (Bennett, *Libraries Designed for Learning*, p. 35).

One would like to take this statement at face value and believe librarians have become so successfully embedded in the college's learning activities that they already have the insider's knowledge needed to design successfully. Even where this is the case, formal surveys and other means of systematic inquiry[35] could be a useful reality check and a means of guarding against the insider's blinders. Alternatively, one might fear that disavowals of need for systematic inquiry are self-deluding. We have seen elsewhere in this essay how powerfully the roles normally played by various members of the academic community work against mutual regard and deep collaboration on matters of learning.[36] We also saw how difficult, but also how rewarding, it was for faculty, librarians, information technologists, and students to work to counter the force of their usual roles in higher education.

Just as there are common pitfalls to avoid, so there are opportunities to seize. Chief among them is the opportunity to understand the learning culture of one's own institution and how it may resonate with and differ from the cultures of other colleges and universities. Such commonalities and differences are vital realities. They are recognized, for instance, in the way NSSE and FSSE report nation-wide results, results for top-scoring institutions, and results by the Carnegie classification by institutions. This essay has drawn heavily on the "Task Force Final Report" at Sewanee because its members thought it imperative to understand the particular learning culture of their university—and by understanding it, to increase the likelihood that new investments in the duPont Library would be fully productive.

A resolve to ask the right questions first and persistently implies some uncertainty about answers. Such uncertainty yields important opportunities for experimentation. One need not seek far for the reasons why experimenting is rarely done in building or renovating learning spaces. As William J. Mitchell,

former dean of MIT's School of Architecture and Planning, observes:

> buildings are expensive. People want to minimize risk in construction projects and so may get organized in a very bureaucratic way. It's risk minimization rather than experimentation. That's in fact very short-sighted, and it really is important to be more adventurous and experimental…. We're in a period of extremely rapid change. It's easy enough to speculate about what might work, but there's a difference between speculation and evidence. I think it's extremely important for academic institutions to do, wherever they can, lots of small-scale, adventurous experiments and really monitor the results and try to build up a reliable experience base rather than depend on preconceptions and prejudices.[37]

Happily as regards experimentation, learning spaces are often most powerfully defined by their furniture. And furniture lends itself to relatively low-cost, highly instructive, easily modified experiments. Just as it is important to ask the right questions early in a project, so it is essential to experiment early with promising answers, before large sums are invested in "preconceptions and prejudices" rather than in a "reliable base" of information. Experimentation is a critically important way to build continuous learning and quality improvement into the design of learning spaces. It normally takes many years to secure approval and funding for renovating or building new campus spaces. By spending part of that time consciously experimenting with small-scale designs that explore alternative answers to the first questions about these projects, colleges and universities are the less likely to waste the rare opportunities they have to build and renovate.

Jill Gremmels gives powerful voice to the challenge this essay addresses. She is the College Librarian at Wartburg College and said of the planning effort to renovate the Vogel Library there that "libraries have tried to support learning, but I don't think libraries have traditionally said 'We want to make learning happen here.'" Acting on this difference, Gremmels and her colleagues changed the questions with which they began:

> We didn't start out with what I think is the traditional question, "How much stuff do we have to get in this building, and what kind of stuff is it?"… We didn't do that. We started out the planning by saying, "What do we want to happen in this building?" And the answer to that was that we wanted to be much more proactive about promoting learning…. We wanted the architecture to make [the library] be like a think tank atmosphere, where there would be lots of exciting ideas bouncing around, and people could interact with each other and text and whatever technological stuff they might require, so that great minds could do their thing in this space (Bennett, *Libraries Designed for Learning*, pp. 3, 27–28).

The Vogel library is a fit learning space for great minds because its planning was shaped, early and persistently, by the right first questions—questions not primarily about "stuff" or even about library services, but about the nature of the educational experience Wartburg College wished to create. The success of the Vogel Library should inspire us all to begin and to persist in the same way.

NOTES AND REFERENCES

1. ©Scott Bennett, 2006. Readers of this essay and librarians may copy it without the copyright owner's permission, if the author and

publisher are acknowledged in the copy and the copy is used for educational, not-for-profit purposes.

2. Jeanne Narum, "Building Communities: Asking the Right Questions," Project Kaleidoscope (N.D.); emphasis added. Available: http://www.pkal.org/documents/BuildingCommunitiesAsking TheRightQuestions.cfm (18 July 2006). Narum is Director of Project Kaleidoscope and provides an excellent general review of sources on the design of learning spaces in "Transforming the Physical Environment for Learning," *Change* 36 (September/October 2004): 62–66. This issue of *Change* includes several other articles discussing other aspects of current teaching and learning practices and their intersection with technology.

3. For another, briefer treatment of this topic, see Stephen R. Acker and Michael D. Miller, *Campus Learning Spaces: Investing in How Students Learn*, Research Bulletin Volume 2005, No. 8 (Boulder, CO: EDUCAUSE Center for Applied Research, 2005). Acker and Miller end their paper with a set of "Questions to Ask" (p. 9). Available: http://www.educause.edu/LibraryDetailPage/ 666?ID= ERB0508 (18 July 2006).

4. See Wolfgang F. E. Preiser and Jacqueline C. Visher, eds., *Assessing Building Performance* (Oxford: Elsevier Butterworth Heineman, 2005) for an authoritative account of building performance evaluation. The first two chapters, by Preiser, Visher, and Ulrich Schramm, on "The Evolution of Building Performance Evaluation: An Introduction" and "A Conceptual Framework for Building Performance Evaluation" are particularly germane. See also Preiser, Harvey Z. Rabinowitz, and Edward T. White, *Post-Occupancy Evaluation* (New York: Van Nostrand Reinhold, 1988) and *Learning from Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation*, Federal Facilities Council Technical Report No. 145 (Washington, DC: National Academy Press, 2001).

5. Some useful works in these related disciplines are: Jon Lang, *Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design* (New York: Van Nostrand Reinhold, 1987); John Zeisel, *Inquiry by Design: Tools for Environment-Behavior Research* (Monterey, CA: Brooks/Cole Publishing, 1981); *How People Learn: Brain, Mind, Experience, and School*, ed. John D. Bransford, Ann L. Brown, and Rodney R. Cocking (Washington, DC: National Academy Press, 1999); Stephen Kaplan and Rachel Kaplan, *Cognition and Environment: Functioning in an Uncertain World* (New York: Praeger, 1982); and *Student Engagement: Pathways to Collegiate Success. 2004 Annual [NSSE] Survey Results* (Bloomington, IN: National Survey of Student Engagement, 2004). Available: http://nsse.iub.edu/html/ report-2004.cfm (18 July 2006).

6. James H. Banning and M. R. Canard argue that "among the many methods employed to foster student development, the use of the physical environment is perhaps the least understood and the most neglected." See "The Physical Environment Supports Student Development," *Campus Ecologist* 4 (Nos. 1–3, 1986): 1. The landmark report *How People Learn*, 1999, is silent on space design and exemplifies the neglect of the physical environment in understanding learning behaviors. Nancy Van Note Chism observes that very little has been written that applies learning theory to the design of learning spaces; see "A Tale of Two Classrooms" in *The Importance of Physical Space in Creating Supportive Learning Environments*, ed. Chism and Deborah J. Bickford, New Directions for Teaching and Learning. No. 29 (San Francisco, CA: Jossey-Bass, 2002), p. 8. Further illustrating this point is Betsy Barefoot, et al., *Achieving and Sustaining Institutional Excellence for the First Year of College* (San Francisco, CA: Jossey-Bass, 2005). This book presents case studies of colleges and universities with excellent first-year programs. The criteria for selecting the case study institutions included nothing about the spaces within which those programs are conducted.

7. See C. Carney Strange and James H. Banning, *Educating by Design: Creating Campus Learning Environments that Work* (San Francisco, CA: Jossey-Bass, 2001), pp. 13–15; see also Lang, *Architectural Theory*, pp. 100–108, and his Chapter 10, "The Built Environment and Human Behavior" for a fuller account of these ideas.

8. Lang, *Architectural Theory*, p. 43, summarizes this terminology; see also Werner Kunz and Horst W. J. Rittel, "Information Science: On the Structure of its Problems," *Information Storage and Retrieval* 8 (1972): 95–98.

9. This question challenges traditional practices in the most fundamental way. For more on disruptive challenges to education, see Clayton M. Christensen, Sally Aaron, and William Clark, "Disruption in Education," in *The Internet and the University: 2001 Forum*, ed. Maureen Devlin, Richard Larson, and Joel Meyerson (Boulder, CO: Educause, 2002), pp. 19–44. Available: http://www.educause.edu/LibraryDetailPage/666?ID=PUB5007 (18 July 2006).

10. For information about the Learning Space Design program of the Education Learning Initiative, an EDUCAUSE enterprise, see http://www.educause.edu/LearningSpace/5521 (18 July 2006). In this same vein, Howard Strauss argues that we need to attend less to classroom space in bringing information technology to bear on learning; see "New Learning Spaces: Smart Learners, Not Smart Classrooms," *Syllabus* 6 (Sept. 2002): 12–17.

11. See http://www.theNCAT.org (18 July 2006).

12. James Neal makes a powerful and provocative argument for the virtual library in "Physical Places/Virtual Spaces," in *The Library as Place/Symposium on Building and Revitalizing Health Sciences Libraries in the Digital Age* (Bethesda, MD: National Library of Medicine and Association of Academic Health Sciences Libraries, 2004); a CD-DVD. The Welch Medical Library at Johns Hopkins University offers a notable example of planning for a library that increasingly occupies virtual space and other non-library spaces. See "Welch Medical Library [at Johns Hopkins University] Architectural Study," 2002, available at http://www.welch.jhu.edu/architecturalstudy/ index.html (18 July 2006); and Kathleen Burr Oliver, "The Johns Hopkins Welch Medical Library as Base: Information Professionals Working in Library User Environments," in *Library as Place: Rethinking Roles, Rethinking Spaces* (Washington, DC: Council on Library and Information Resources, 2005): 66–75. Available: http://www.clir.org/pubs/abstract/pub129abst.html (18 July 2006).

13. Richard A. Lanham, *The Electronic Word: Democracy, Technology, and the Arts*, (Chicago, IL: University of Chicago Press (1993), pp. 22–23. See also Scott Bennett, *"The Golden Age of Libraries," Journal of Academic Librarianship*, 27 (July, 2001): 256–258.

14. John Seely Brown, "Learning in the Digital Age," in *The Internet and the University*, pp. 65, 69. For immersion learning, see also Richard A. O'Connor and Scott Bennett, "The Power of Place in Learning," *Planning for Higher Education* 33 (June–August 2005): 28–30.

15. For an introduction to the issues of equipping physical learning spaces with technology, see Malcolm B. Brown and Joan K. Lippincott, "Learning Spaces: More than Meets the Eye," *EDUCAUSE Quarterly* 26 (No. 1, 2003): 14–16. Available: http://www.educause.edu/ir/library/pdf/eqm0312.pdf (18 July 2006).

16. *Student Engagement*, p. 13. NSSE data figure prominently in the discussion that follows of Questions 2–6. For yet another way to bring NSSE data to bear on the design of learning spaces, see Scott Bennett, "Designing for Uncertainty: Three Approaches," published in the March 2007 issue of the *Journal of Academic Librarianship*.

17. Scott Bennett, "Righting the Balance," in *Library as Place*, pp. 18–21.

18. See O'Connor, "Seeing duPont [Library] within Sewanee and Student Life," a substantial appendix to the "Task Force Final Report for the Jessee Ball duPont Library," 2005. Available: http://library.sewanee.edu/libplan/plan1.html (18 July 2006).

19. See, for instance, *How People Learn*, 1999, p. xvii.

20. *Student Engagement*, p. 39. These NSSE data represent students in all types of colleges and universities. The pattern of significant increases in collaborative study between the first and senior years holds true for all of the five Carnegie classifications of institutions separately analyzed in the NSSE data.

21. See "2004 Faculty Survey of Student Engagement" conducted by NSSE; available: http://fsse.iub.edu/index.cfm (18 July 2006).

22. Alison Cook-Sather, "Unrolling Roles in Techno-Pedagogy: Toward New Forms of Collaboration in Traditional College Settings," *Innovative Higher Education* 26 (Winter, 2001): 121–122.

23. For an account of the educational function of support staff who are customarily not thought to contribute centrally to the educational enterprise, see Patricia M. King and Nathan L. Lindsay, "Teachable Moments, Teachable Places: Education Beyond the Classroom," *Change* 36 (May/June 2004): 51–55.

24. Kenneth A. Bruffee, *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge*, 2nd ed., (Baltimore, MD: Johns Hopkins University Press, 1999), p. 180.

25. For a thought experiment on the design of the library reference desk as affirming a non-foundation view of knowledge, see Scott Bennett, "The Choice for Learning," pp. 8–11.

26. This account of the workshop draws heavily on Church, "Reimagining Professional Identities: A Reflection on Collaboration and Techno-Pedagogy," a report under the publications tab at the Web site "Talking Toward Techno-Pedagogy," 2000. Available: http://serendip.brynmawr.edu/talking/ (18 July 2006).

27. See Robert B. Barr and John Tagg, "From Teaching to Learning—A New Paradigm for Undergraduate Education," *Change* 27 (November/December, 1995): 12–25.

28. See Chapter 4, "Evaluation, Preference, and Human Needs," in Kaplan, *Cognition and Environment*, pp. 73–98. The factors referenced here are developed at some length in the chapter sections titled "Human Needs and Environmental Preference" and "Informational Factors in Environmental Preference," pp. 79 ff. For a brief explanation of these factors, see Ken A. Graetz and Michael J. Goliber, "Designing Collaborative Learning Places: Psychological Foundations and New Frontiers," in *The Importance of Physical Space*, p. 15.

29. See http://www.it.emory.edu/cox/ (18 July 2006).

30. Scott Bennett, *Libraries Designed for Learning*, (Washington, DC: Council on Library and Information Resources, 2003), pp. 20–22. Available: http://www.clir.org/pubs/abstract/pub122abst.html (18 July 2006).

31. The testimony of a New Zealand librarian, who visited the United States hoping to find innovations in library design that might stimulate thinking about his own library, suggests this outcome. "We looked for libraries that were really forward thinking and had, as a result of that thinking, produced advanced and exciting buildings. By and large we failed to find them. . .. New thinking at the planning stages rarely resulted in concrete evidence of a new manner of providing services. What we saw was mostly traditional dressed as new." See Michael Wooliscroft, "Challenge, Stimulation and Ultimate Fulfillment: The Development of the Information Services Building at the University of Otago, 1993–2002," *Australian Academic and Research Libraries*, 34 (June, 2003): 127.

32. This account draws heavily on Lang, *Architectural Theory*, "Activity Patterns and the Built Environment," pp. 109–177.

33. Kaplan, *Cognition and Environment*, pp. 81 ff. discusses these issues and two additional cognitive characteristics that demonstrably draw people powerfully to space: *Coherence*, or the ease with which a space can be organized cognitively, and *legibility*, or the perceived ease of use.

34. See, for instance, *Learning from Our Buildings*, pp. 3–5.

35. Zeisel, *Inquiry by Design*, provides an excellent guide to many modes of systematic inquiry useful to space design.

36. This difficulty was evident in the way participants attending the 2004 and 2005–06 workshops on information literacy offered by the Council of Independent Colleges described the learning/teaching environments on their campuses. 93 percent of the library directors attending the workshops affirmed that "my campus encourages a climate of collaboration," whereas only a much lower 59 percent could affirm that "collaboration exists among curricula designers, faculty, librarians, academic advisors, computing staff" (unpublished CIC data). See Scott Bennett, "Campus Cultures for Information Literacy," portal: Libraries and the Academy, April 2007.

37. Mitchell, "Designing the Space: A Conversation with William J. Mitchell," *Syllabus* 17 (September, 2003): 13.