

Library Learning Spaces: Investigating Libraries and Investing in Student Feedback

Camille Andrews and Sara E. Wright



This paper will examine how students in academic libraries work collaboratively and individually, what they need in terms of furniture, technology and spaces, and how librarians can determine student needs. During a major library renovation in 2007, Mann Library—which serves the Colleges of Agriculture, Life Sciences, and Human Ecology at Cornell University—responded to students’ need for more group work spaces with the unveiling of a new collaborative center. Five years later, it was time for an upgrade. In the spring of 2012, our library’s learning technologies team began the next phase of space redesign by applying a variety of qualitative and quantitative methods to find out what users at our research-intensive university now need to work most effectively. Through surveys, interviews, usability tests of collaborative technologies, and participatory design exercises, our team gathered feedback on the study behaviors and needs of students. We then used this data to help redesign our collaborative study spaces and assessed the results. Included in this paper are our research methods, the results and evolution of our space design and assessment efforts, and how the library has responded to that feedback.



Introduction

In addition to the theoretical literature on library as place, charting the changing conception of the library from a space for collections to an information or learning commons to a space that supports the creation of information in a variety of mediums,¹ there has been a parallel emphasis on practical approaches to discovering and meeting changing user needs for 21st century libraries, including the use of participatory and ethnographic research methods in space design.² Besides the landmark University of Rochester and Ethnographic Research in Illinois Academic Libraries studies,³ numerous participatory and user-centered design studies have been done at libraries in a variety of settings.⁴ Though it is difficult to general-

ize from disparate qualitative studies done at different types of libraries, overall trends in the US include creating spaces that are collaborative, transformational, specific to their users, and often designed for and with patrons. As Watson notes,

...In summary, learning spaces in American libraries typically include the following features:

highly flexible space to support a wide variety of activities

storage areas for extra chairs, smart boards, computers and replacement parts

modular furniture that can be readily reconfigured into conference rooms, traditional class-

Camille Andrews is User Engagement Librarian, Albert R. Mann Library, Cornell University, e-mail: ca92@cornell.edu; Sara E. Wright is Head of User Services & Engagement, Albert R. Mann Library, Cornell University, e-mail: sew268@cornell.edu

rooms or computer laboratories, in addition to relaxed study and learning environments

redundant telecommunications to provide access to local servers and the internet

additional electrical support to provide power, for use or recharging of student-owned devices

distance learning capabilities to permit linkage to other learning centres

external and internal corridors that permit the use of learning spaces when the rest of the facility is closed

acoustical conditioning to reduce the intrusion of conversations, lecturers, phone use, or sudden intrusive sound which distract learning

lighting that provides a range of light intensity, and enhances colours and skin tones...⁵

In our environmental scan of several libraries, including those at Duke, Emory, Georgia Institute of Technology, Harvard, North Carolina State University, and University of Amherst Massachusetts in the spring of 2013, we found similar themes as well as:

- a wide variety of comfortable furniture types (often of varying heights, shapes, and colors) to meet varying user needs;
- creative service models (including collaborations with and/or merging of library and general student support services) and a trend toward self-service;
- flexible and integrated technology--both low (whiteboards and power outlets) and high (media walls and labs for visualization and simulation); and
- a variety of space types: traditional book-filled quiet space; group and individual study; faculty & graduate student commons; flex classrooms; multimedia labs; and makerspaces).

In 2007, in response to changing space trends, Albert R. Mann Library, the life and social sciences library at Cornell University, created the Bissett Collaborative Center, a flexible study space, as part of a major renova-

tion. The Collaborative Center was made possible by an endowment which charged Mann with creating a collaborative, flexible, technology-rich space for students, which they could customize by moving furniture into different configurations and use for collaboration and creation of group projects. From its inception, the library began a long term assessment process to learn what students needed and over the years, the Collaborative Center and eventually other spaces in the library have been reassessed and redesigned to reflect the changes in library function detailed above as well as developments in teaching and learning methods, curriculum, and the study preferences of our continually changing student base. The library staff and students have used a variety of qualitative and quantitative methods to investigate student space needs, inform several phases of renovations, and assess satisfaction with and the continuing impact of space changes. This paper will discuss our methods and the evolution of and impact of our design and assessment program, examine the trends we have seen in student needs for collaborative work space and tools, and look at how students influenced renovations of the library, out of which the idea of the library as a learning lab has grown.

Methods

Mann's initial investigations started even before the 2007 opening of the Bissett Collaborative Center with assistance from students in our Design and Environmental Analysis department. We began our next round of assessment several years later in 2012 during a refresh of the Bissett Collaborative Center. This continued in 2014 when changing space needs and a collaborative strategic space planning process with college administration led us to consolidate the library's footprint from five floors to four and rethink our space usage in concert with an external architecture firm. Figure 1 shows the methods we used to guide our decisions on space usage and furniture purchases.

Results

Though we collected a great deal of information, our data did have some limitations. Since we were study-

FIGURE 1
Methods (for detailed timeline and more information see <https://cornell.box.com/ACRL2015paper>)

Methods	Subjects (number of respondents)	Years
space observations	numbers of individuals and groups, activities, and furniture and technology use in Bissett Collaborative Center and the library as a whole using Excel and SUMA space observation tool	2008, 2012, 2014
surveys	furniture (n=29, 34, 399), furniture color, whiteboards (n=29), software and hardware (see usability tests and surveys), signage (n=~32), and pre and post-redesign satisfaction (n=105, 54)	2008, 2012, 2014
interviews	collaborative (n=6) and individual study preferences (n=~43), space reservation systems (n=28), furniture (n=~43), signage (n=28)	2012, 2014
usability tests and surveys	Teamspot (usability tests: n=15; survey: n=29), Clickshare (tests: n=8), Media:scape (tests: n=8), and Crestron Airmedia (tests: n=7) collaborative screensharing systems; LibCal and D!Bs reservation systems (n=11); laptop docking stations (survey: n=25)	2008, 2012, 2014
environmental scan and visits to other facilities	visits to Duke, North Carolina State University, Georgia Tech, Emory, University of North Carolina-Chapel Hill, University of Massachusetts Amherst	2014
photo diaries	favorite and least favorite spaces for individual and group study, socializing, talking with professors, etc.; use of technology for individual and group study (n=7)	2012
ideal space design exercises	drawings of and interviews on ideal collaborative space (n=~45)	2012
work with students in our Design and Environmental Analysis department	pre-and-post occupancy evaluations, space observations, surveys, ergonomic evaluations of furniture, and literature reviews	2006-2008, 2009, 2012, 2014
focus groups	service points and signage (n=18)	2014

Note: Methods from Council on Library and Information Resources participatory design workshops, the University of Rochester and the Ethnographic Research in Academic Libraries projects, the EDUCAUSE Learning Initiative Discovery Tool: Student Input on Learning Spaces Tool, and the Learning Space Toolkit.⁶

ing different and sometimes fairly specific questions at different times using different methods, most of our data was not longitudinal, and we weren't able to draw broadly generalizable conclusions. Over time, we also had some general methodological issues to address, such as consistent data collection (e.g. different coders using different definitions; drop off in data collection; or collection for different lengths of time at different times of day and semester); data management and curation (e.g. data in various formats in different places and little data documen-

tation); and data reuse and communication (e.g. non-standardized analysis and reporting). However, ultimately we gathered some great data at particular points in time using mixed methods that helped give us quick answers to relevant questions, make decisions, and create the types of spaces that students wanted. Though each of these studies and methods targeted different areas at various times, our findings, summarized below, fell into several broad categories that can be summarized into technology, furniture, ambience or aesthetics, and types of spaces.

March 25-28, 2015, Portland, Oregon

Technology

Complex technology was not always necessary or wanted. Often students just wanted more outlets and whiteboards.* Those two low tech features came up time and time again in all our studies, and whiteboards were the second most commonly used technology item in our collaborative spaces. In our ideal space design exercises, only a few participants asked for higher end technology like smart boards, document cameras or projectors, embedded tablets in tables that could wirelessly project to monitors, multi-touch wall surfaces, media players, and an iPad library. We had at least one request for no technology at all. In our other studies, we did, however, see a need for more administrative technologies such as reservation and digital signage systems; reserveable collaborative spaces in particular are at a premium at the university and more signage was needed to increase awareness of our spaces and services.

Other popular technologies included:

- **Computers & phones:** Personal laptops were, far and away, the most frequently observed technology that our students used. Our interviews revealed that students would often not carry them throughout the day due to the weight, creating a need for library-owned laptops to check out. However, some students disliked not having all their files accessible on library-owned equipment. Phones and other mobile devices were a substitute for laptops for quick tasks. Public desktop computers continue to be heavily used for their specialized software and hardware capabilities.
- **Large screens:** Students wanted more flat panel LCDs (to connect their laptops and see their work on a large screen), projectors, dual monitors, and TVs.
- **Headphones:** Many students we interviewed carried headphones to mitigate noise.

* Whether mobile, wall-mounted, painted walls, chalkboards or glassboards, or used as partitions; 83% wanted more whiteboards when we first surveyed students and even after adding them, we kept getting additional requests for more.

- **Planners.** Whether using an app, digital calendar, or paper planner, most of the students in our photo diary study had fairly elaborate, personally-specific systems for keeping track of their commitments.
- **Other tools for individual and group assignments** included Gmail and other Google apps especially Docs, Blackboard, whiteboards, Microsoft OneNote, WordPad, Sticky Notes, Dropbox, Doodle, Excel, and Work.

Collaborative Technologies. Overall our usability tests of and experience with products like Teamspot, Media:scape, Clickshare, and Crestron Airmedia indicate that students like collaborative technologies but, unsurprisingly, want them to be very easy to use. If they had to spend too time figuring it out or dealing with technical difficulties, then it was a barrier to work (especially since they already have Google apps). For group projects some students were fine with e-mailing work back and forth but others found it problematic for version control on large projects. Those students with more complicated and larger projects or specific formatting or software requirements definitely saw its usefulness. For specific products, we found the following:

- **Google Docs** worked well for many students, despite some formatting issues when transferring to Microsoft Office. Interestingly, one student we interviewed saw Google apps as a mode of communication and sharing with her fellow students, but noted that Word was the professional option for turning in work to her professors.
- **TeamSpot collaborative software** had very useful features, especially integrated file sharing & wireless control, for trained groups with longer term projects and large, complex format files, but involved a learning curve for short projects and infrequent users.
- Screen sharing products like the **Clickshare and Crestron Airmedia wireless presentation systems and Media:scape** screensharing technology were well liked, especially the ability to view multiple screens at once.

Furniture

The main characteristics needed for furniture were variety, comfort, adjustability and mobility. Students wanted a variety of furniture styles and heights for different purposes. The requirements for the furniture they wanted for studying were different from what they wanted for lounging, hanging out, or napping, and students were often explicit about the uses or purposes for which they would like certain pieces of furniture. We tested and added a number of different types of furniture over the years, and students have given us some great input on the type of furniture to add as well as the qualities furniture should possess.

Comfort. Comfort was in the eye of the beholder. There was a split between students who wanted more lounging, reclining or relaxed chairs and those who preferred chairs that made you sit upright, were a bit harder, and had arms and back support. Several students disliked our existing hard wooden chairs, preferring soft, large armchairs; however, others mentioned that they didn't want their furniture too comfortable (e.g. no recliners or chairs so comfortable that they would fall asleep). Couches were popular (for napping and as dividers or conversation nooks) as were armchairs, beanbags and ottomans to a lesser degree. The angle of incline on chairs, texture of materials, mix of cushioning and support, presence of armrests, and availability of footrests and space for belongings or laptops were also considerations in choosing furniture. Mobility and adjustability were also key in many participants' eyes.

Study tables (individual and group) and partitions. Tables for two or four for quiet study in proximity to each other (observed to be our most popular furniture), small end tables, and tables in a variety of shapes and heights were mentioned, especially tables at ergonomic heights and work surfaces with plenty of room to spread out materials and belongings. According to our observations, our mobile laptop tables were also extremely popular. In terms of partitions, a few students in our ideal space design exercises mentioned mobile or retractable walls/partitions that could convert larger group spaces into smaller ones

in a flexible manner and low partitions between individual study tables for greater privacy.

Ambience

Aesthetics and feel. Ambience was critical for students. Our photo diary studies and survey comments indicated that an ambience that was depressing and drab was displeasing, and a couple of our interviewees suggested adding plants, posters, art, and desk lights to make spaces more appealing. Their dislikes included claustrophobic, dark, disorganized, loud, crowded, distracting and high traffic spaces without enough outlets or work surface. Students liked a modern, new, open, clean ambience with a "library" feel that encouraged productivity. Stacks were seen not only as a resource but also as an environmental cue. In mentioning a newly renovated bookless study space in another library, one student commented that it wasn't really a library. When asked what constituted a library, a few students responded desks, stacks, and books. To them, the bookless renovated space felt like a cafeteria, and a social space that you have to "put on makeup to go to." However, there was still a desire for more informal, fun areas without stacks, where they had the ability to do group work and talk.

Nature. Perhaps unsurprisingly for a library connected to the Colleges of Agriculture & Life Sciences and Human Ecology, there was an emphasis on nature and bringing the outside into our design. The desire for windows and natural light (including skylights) was a frequent response in our ideal space design exercises, with students wanting furniture positioned to make the most of the view out the windows and over our central atrium. If natural light was not a possibility, then they wanted lamps, though cautioning us to be careful about glare on screens, particularly in technology-enabled rooms. Maximizing opportunities to place plants throughout the library whether as decoration, privacy screens/dividers, or centerpieces was another suggestion. A surprising number of participants asked for water features in our ideal space design exercises, including elements such as a fountain, pond, waterfall, in floor aquarium, or water wall

as a centerpiece, focal point, and noise dampener. In terms of color, nature colors like blue and green were popular, as well richer colors that “popped” like plum and red.

Basic amenities. Students needed certain amenities nearby, including food, drink and supplies (e.g. office supplies, studio materials, printers, sinks). Mann Library already has a café on the first floor in the lobby but we received some suggestions for improvement with a few people indicating they wanted more self-serve options like vending (both supply and food) and coffee machines, along with the ability to microwave food, which was crucial given our extended nighttime hours.

Types of Spaces

Zones of activity. Students had differing space needs for individual and group work, and either implicitly or explicitly made distinctions between areas for particular needs and characteristics that would make them successful. In their ideal space design plans, some participants drew distinct zones (for individual or collaborative study, “traditional” library vs. fun informal space, private or semi-private vs. open space, and areas for quiet or talking) or mentioned rooms with specific themes or colors. In both individual and group space, students wanted to talk without worrying about their volume or other people seeing their in-progress work. Overall, the characteristics students wanted included: quiet (but not so quiet they couldn’t have low conversations or talk without distracting others); low traffic and lack of distractions while they were studying; spaces that weren’t overcrowded and where they had a modicum of privacy; and windows, glass walls (not only for the view but also as writing surfaces) or open space for good views. In our ideal space design exercises, students sometimes drew completely mobile spaces, but kept some structure by adding walls or partitions—permanent and moveable—and other features like booths or whiteboards that would separate space.

Privacy. Students wanted both social “face time” and areas of privacy, depending on temperament and

activity. Though studying was the most favored activity in our collaborative spaces, “chilling” (e.g. watching movies, texting, checking social media and basically anything besides studying, reading, sleeping or talking) and socializing were fairly popular. Interestingly, that social atmosphere could also contribute to work; some students wanted to be seen and liked the social pressure to focus on work in highly sought after spaces like the computers on our first floor, whereas others preferred more isolated and private space. Patrons requested different levels of privacy for different types of spaces, and unsurprisingly, there was no real consensus except that we should have rooms and spaces of all types: at least some individual and group spaces with mostly complete privacy; some individual and group spaces with partial privacy (as long as there was decent noise dampening); and both quiet and louder collaborative open areas for quiet productivity in visual range of others and for social face time and productivity under peer pressure. As a couple of students noted, partial privacy raised their awareness of time passing and what was happening around them, showed whether rooms were occupied, and reminded them to take breaks and that the library was shared space where they needed to be respectful of one another.

Individual Study. In terms of individual study space, our interviews indicated that the overall need was for quiet space with plenty of outlets and large tables or work surfaces with chairs at the right height (which varied depending on respondent). There was a mix of people who liked studying in the open where they could see and be seen) and those who liked partial privacy. What bothered people most were noise and visual distractions, lack of outlets, the comfort level and ergonomic qualities of furniture, not enough space to work, level of privacy, temperature fluctuations, bad lighting, and seeing people sleeping. In general students wanted individual spaces to be quiet, personal areas and liked to study alone in natural light with at least the illusion of privacy.

Group Work. Students experienced various frustrations with finding space to work together on group

projects. There was consistently a need for more group study spaces in a variety of sizes and levels of enclosure that included both reserveable (particularly for 2-4 people) as well as first come, first served space so that they could drop in when needed. Students often mentioned the difficulty of scheduling meetings and rooms at particular times they all could meet in a location central to their dorm or classes and known to all group members. Their other issues with reserving spaces included others reserving in advance but not showing up, and group rooms being used by individuals. Students suggested having some system to monitor whether or not a space was being used by a group or an individual—whether it was reserved or just drop in—to avoid abuse of space.

The frequency and type of group work at Cornell depended on major and college and the nature of the group work. Our findings showed that group presentations and projects weren't the only type of work students were doing. For example, engineering and physics students might not have official group projects but do have problem sets that they want to collaborate on or simply be around others working on the same material. Those doing field and lab work may have other collaborative needs (such as compiling literature reviews). Collaborative work could include quick touchdown meetings with TAs or other students, assembling individual project parts created by group members, brainstorming, practicing presentations, working on non-academic projects, or studying in proximity. For the latter, the need for “alone together” type of space that Georgia Tech identified in their studies with Herman Miller⁷ was something that we noticed as well.

Though two to four people was a common group size for us, there was a mix of sizes of collaborative space suggested: small group study rooms (quiet or collaborative with tables, phone, and whiteboard), large conference rooms (boardroom style or teleconference-enabled); group rooms that are enclosed to mitigate sound or with moveable dividers/partitions; and open collaborative spaces with an iPad library and tables with inset tablet computers.

Other types of spaces. Informal zones or places for study breaks (with things like couches, TVs, a bed, or fireplace) showed up in a few ideal space design drawings. One of the most frequent requests we received was for reserveable interview rooms as most of our spaces are for first come, first served use. This makes scheduling interviews difficult, since dorm rooms and open spaces are prone to interruptions, noise, and poor reception or connectivity for cell phones or Skype. Our café, lobby and outdoor spaces served as informal social spaces between classes, though the acoustics in the lobby make it prohibitive for sustained study. The library was less often a place for students to talk to their professors apart from our classrooms, though some did use our quieter, casual spaces instead of their classrooms or departmental spaces to discuss assignments with their instructors.

Impact of Assessment and Next Steps *Renovations and Changes in Space Usage and User Satisfaction*

All of these data have led to multiple renovations of the study spaces in the library and allowed us to avoid some of the issues that arise when renovating under the challenges of narrow purchasing decision windows and limited information. We have been able to add furniture, technology, amenities and services that students have tested and asked for, including:

- Greater variety of furniture, including soft seating, bean bags, ottomans, semicircular booths with built in large tables, computer and LCDs, and tables (mobile and fixed) of different heights (including standing height) and shapes with large work surfaces
- Mobile whiteboards, screens, and partitions for additional privacy for group work
- LCD screens, whether mobile or integrated into the furniture, and screensharing technologies
- More consistent branding as a collaborative space where talking was encouraged
- More color to make spaces more inviting
- Vending machines for office supplies and

apples (separate machines) in the lobby

- Addition of and updates to LibCal space reservation system, recently expanded to a pilot for our whole library system
- Extended 24/5 hours in our lobby
- Consultation areas for our writing center and statistical support units in basement and on first floor

These renovations have greatly increased our space popularity and satisfaction. In the before and after surveys on the renovated collaborative spaces, overall our user satisfaction increased from about 3.6 to 4.6 out of 5 (3 being neutral and 5 being very satisfied), which we counted as a great success. According to space observations, our space usage has also increased over time on our second floor.

Next Steps

Our next phase of renovation on our second floor and the consolidation of library footprint is in process during spring 2015. We are planning the following:

- Addition of 265 seats and reclamation of 169 seats, 9 individual study rooms and 3 group study rooms
- Addition of quiet collaborative as well as more individual study space with more high backed semicircular booths as well as couches with screens and semi-enclosed chairs and carrels for quiet small groups
- Addition of individual carrels, adjustable and standing height stations, floor-level flip out chairs (like structured beanbags) and adjustable rocking chairs for those who prefer different postures for individual study
- Addition of writeable glassboard along the length of one wall and mobile stools
- Upcoming extension of our existing Bissett collaborative space and move of the stacks to create more space, a quiet zone buffer, and additional nooks for study

We will be conducting pre- and post-renovation surveys and are hoping to see positive changes not only in satisfaction but also an impact on student learning

outcomes. After the completion of the second floor renovations this spring, we will be investigating moving or reconfiguring our service desks and continuing work on our signage and wayfinding to address student concerns.

Overall the studies over the past years have improved our student engagement. Our students were very appreciative that we asked for their input and see the library as place where their opinion matters. We also gained a better understanding of our users, what they want and need, and where gaps are in what we do and don't know about them. Starting long term studies has also helped build a culture of assessment, making it a part of what we do and getting administrative buy in. This has also led to Mann addressing issues with our assessment infrastructure in several ways, including: creating a data management plan, a warehouse of methodologies with training guides and a storage space for data; investigating quantitative and qualitative analysis and visualization programs like Tableau and Dedoose;[†] and planning future assessment, including regular studies with repeated cross sectional or longitudinal design and assessment of the impact of our spaces and services on student learning outcomes.

Assessment is also being translated into other areas like our service point task force, a group charged with investigating updates to our public services desk placement, which did focus groups in 2014. What began as an investigation into service desk placement has become a larger inquiry into our signage and wayfinding in our physical and virtual spaces. Moving assessment from basic questions and space satisfaction to a deeper overall user-centered engagement is a key part of 21st century librarianship, and this approach led to the creation of the User Engagement Librarian position which is responsible for space, service, and technology assessment and outreach to users. In service to that larger goal, we have also begun building and deepening partnerships and collaboration with: academic departments like Design and Environmental Analysis, Applied Economics and Management, and Communication; with student support services like Student Affairs, our writing cen-

[†] Tableau (<http://www.tableausoftware.com/>) and Dedoose (<http://www.dedoose.com/>)

ter, and statistical support units; and even with others in the library such as our Assessment and Communication unit and our data management and curation group.

Because of our partnerships with students and classes (particularly in our Design and Environmental Analysis department), the library is also increasingly seen as a learning lab. The use of student researchers gave us greater access to other students (who might have had less inhibition talking to them than library staff) and insight into new methodologies, while we provided them with a real world problem and guidance on research. We are exploring ways to broaden our engagement with students and to open up the library further as a center for real-world, authentic, and inquiry-based learning and projects that benefit both students and the library. At a basic level, we are planning lightweight ways to continue to gather feedback (such as weekly flipchart surveys and questions and feedback on our social media channels) as well as continuing our more in-depth participatory design and user studies. At a more ambitious level, we hope to expand beyond serving as a client in certain class projects to a deeper collaboration and exploration with faculty and students, whether that be through a library design internship or scholarship for selected students with funding and/or credit or through a dedicated library innovation class such as the Library Test Kitchen at the Harvard Graduate School for Design.⁸ Whatever the path, the methods, best practices and trends we have seen so far in investigating our students' needs will certainly guide our way.

Acknowledgements

The authors would like to acknowledge the excellent work of all library staff who have contributed to this project over the years, especially Kathy Chiang, Howard Raskin, the library's Assessment & Communication unit, and renovation and Mann Learning Technologies committees past and present. Additionally we would like to thank the Bissett and van Tienhoven families for their generous support and funding, and the librarians at Duke, Emory, Georgia Institute of Technology, Harvard, North Carolina State University,

and University of Amherst Massachusetts who kindly hosted and spoke with us during our environmental scan. Finally this work also could not have been done without the generosity of the vendors who have loaned us products for testing, and the participation and hard work of Design and Environmental Analysis students and professors throughout the years.

Notes

1. Arlee Turner, Bernadette Welch, and Sue Reynolds, "Learning Spaces in Academic Libraries—A Review of the Evolving Trends," *Australian Academic & Research Libraries* 44, no. 4 (2013): 226–34, doi:10.1080/00048623.2013.857383; Scott Bennett, *Libraries Designed for Learning* (Washington, D.C.: Council on Library and Information Resources, 2003), <http://www.clir.org/pubs/abstract/pub122abst.html>; Scott Bennett, "Libraries and Learning: A History of Paradigm Change." *Portal-Libraries and the Academy* 9, no. 2 (April 2009): 181–97; Joan Lippincott, "Information Commons: Meeting Millennials' Needs." *Journal of Library Administration* 52, no. 6 (2012): 538–48. doi:10.1080/01930826.2012.707950.
2. Council on Library and Information Resources, Nancy Fried Foster and CLIR Seminar on Issues of Participatory Design in Academic Libraries, *Participatory Design in Academic Libraries Methods, Findings, and Implementations*, (Washington, D.C.: Council on Library and Information Resources, 2012), <http://www.clir.org/pubs/reports/pub155>.
3. Nancy Fried Foster and Susan Gibbons, *Studying Students: The Undergraduate Research Project at the University of Rochester* (Chicago: Association of College and Research Libraries, 2007); Lynda M. Duke and Andrew D. Asher, *College Libraries and Student Culture: What We Now Know* (Chicago: American Library Association, 2012).
4. Council on Library and Information Resources, et. al., *Participatory Design in Academic Libraries*.
5. Matthew Simon, "US Projects and Trends," in *Better Library and Learning Space*, ed. Les Watson, (London: Facet Publishing, 2013), <http://lib.myilibrary.com/detail.asp?ID=600682>, 33–34.
6. Foster and Gibbons, eds., *Studying Students*; Andrew Asher and Susan Miller, *So You Want to Do Anthropology in Your Library? or A Practical Guide to Ethnographic Research in Academic Libraries*, accessed February 12, 2015, <http://www.erialproject.org/publications/toolkit/>; "ELI Discovery Tool: Student Input on Learning Spaces Tool," EDUCAUSE Learning Initiative, accessed February 18, 2015, <http://www.educause.edu/library/resources/eli-discovery-tool-student-input-learning-spaces-tool/>; "Learning Space Toolkit," accessed February 12, 2015, <http://learningspacetoolkit.org/>.
7. "Clough Commons Research Study: Student Use Modes at the Clough Commons," Charlie Bennett et al, last modified August 7, 2013, <http://hdl.handle.net/1853/48746>.
8. Anne Gray Fischer, "The Library Test Kitchen at Harvard University," *BostonGlobe.com*, June 15, 2013, <https://www.bostonglobe.com/arts/books/2013/06/15/the-library-test-kitchen-harvard-university/G4LsBrZUuYYJTOXEsT2QHJ/story.html>.

March 25–28, 2015, Portland, Oregon