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Participatory Design of Purdue University's Active Learning Center Final Report

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Participatory Design of Purdue University's Active Learning Center

Executive Summary

Purdue University's commitment to active learning requires facilities that support small-group work, peer learning, the use of technology, and other classroom innovations. The Active Learning Center is intended to provide classroom space combined seamlessly with library space to meet these needs. Members of the Libraries faculty and staff conducted a series of information-gathering activities to gain insight into the range of activities, work practices and preferences that the new building must support. It is our hope that the building will indeed support these activities, serve as a centrally located, flagship building for Purdue University, and support and inspire learning for years to come.

The main activities of the project were observations conducted in library and other selected spaces twice a day for a week early in the Spring 2013 semester; design workshops in which disciplinary faculty, undergraduates, and Libraries faculty and staff drew an ideal version of the new building; reply cards that requested simple responses about work practices and workspace selection from more than a thousand people in library spaces; and five-minute interviews about study sessions with undergraduates in non-library campus locations. Additionally, a team developed a vision statement for the Libraries presence in the new building and a consulting social scientist conducted individual and group meetings to probe the vision, highest hopes and deepest fears related to the proposed Active Learning Center.

With regard to undergraduates, we found that:

- Many undergraduates prefer to study in the library or in a library-like space because being there helps them focus, feel comfortable and secure, and do good work
- By and large, undergraduates do what they intended to do in their study sessions and reducing distractions and managing noise through separation of quiet and noisy spaces and the use of good acoustical materials would improve their outcomes
- A very large proportion of students work individually but a significant and probably growing number are required to work in groups – the building must accommodate both
- Personal technology – which students reported that they used more than anything else to complete assignments – is pervasive and requires Wi-Fi, outlets and chargers
- Spaces are "full" at no more than 50 percent capacity when they are used for study
- Students need different spaces at different times of day, for different activities, and to suit differences in work styles and individual needs
- Students need better information about availability of classroom spaces if they are to use these spaces during non-class times

- Students at Purdue indicate greater interest in relatively unadorned spaces that are equipped for serious, focused work, collaboration, communication, and high productivity than for grandiose spaces and expensive architectural flourishes

With regard to teaching in the Active Learning Center, we found that:

- Faculty members see the new building as an open, technology-rich "real-world" space; they have strong preferences for "right-sized" rooms; easy reconfiguration of space and furniture; spaces, furnishings and technology that support group work and conference-style sharing; and places that foster creativity, conversation and community

With regard to the library presence in the Active Learning Center, we found that Libraries faculty and staff:

- Imagine the new building as an open, fluid collection of small and large spaces for learning, meeting, and working; they need group spaces of various sizes for their own work and desire their own private spaces, even if small
- Anticipate smaller collections, a smaller staff, and a greater need for new kinds of expertise, especially in technology areas, and this will require training

Additionally, the Project Team emphasizes that the concept of the Library is changing so rapidly that it is hard to predict the ALC's future needs. The design must allow for flexibility and change in work practices and in technology. The people who will use the Active Learning Center will need to enter, leave and move through the building via more than one door and pathway in order to minimize disruption to others and reduce inconvenience to themselves. And students still need to connect to resources and expertise so the Active Learning Center must be built to support access to online and physical materials and to the people who support finding and using them.

Participatory Design of Purdue University's Active Learning Center

Final Report

By Nancy Fried Foster, Teresa Balser, RaeLynn Boes, Dianna Deputy, Will Ferrall, Michael Fosmire, Jeremy Garritano, Amanda Gill, Vicki Killion, Monica Kirkwood, Clarence Maybee, Kristen Twardowski, Jane Yatcilla, and Tao Zhang

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Background

A major effort to implement an "active learning" approach at Purdue University, and to change pedagogy and the curriculum to support this new approach, is driving the need for new kinds of classrooms and a new vision of library space. The rationale for this approach is laid out in the white paper, "Purdue University Active Learning Center: Our 'Number One' Capital Project," which states that, "Embedded in our strategic plans, informed by research, studies and surveys, and underscored by physical facility necessity, Purdue's commitment to student success is premised on innovation in instruction in the classroom and by the total learning/study environment surrounding the classroom." The vision of what surrounds the formal learning environment is articulated in a statement entitled, "The Libraries Presence in the Active Learning Center" (appended). It states that, "Purdue's Active Learning Center (ALC) will be a facility that seamlessly combines library study and learning spaces with classrooms in one building; it will provide space, resources, services, and technology to support research and active learning." Both documents are supported by findings in the DEGW e-publication, "A Study of Trends in Pedagogy at Purdue: Analysis of the Impact of Changes in Pedagogy and Study Needs on Space Planning."

Existing spaces on the Purdue University campus barely meet the needs of lecture-based instruction and other traditional pedagogies and will soon fall short even there, as older buildings must be replaced and current classroom space is slated for demolition. But rather

than replace traditional classrooms with new rooms in the same mold, the University has decided that new construction will be designed specifically to support the active learning approach while also providing replacement space for traditional classrooms that are being lost.

As the white paper and the DEGW report describe it, active learning is "characterized by students' engagement in learning activities that require greater responsibility for the knowledge they gain." It is "collaborative rather than competitive. It is premised on students and instructors being mutually responsible for the knowledge and academic success as an outcome of learning activities. Active learning is not didactic. It is dynamic."

Active learning affects more than a class here and there at Purdue. Unlike at peer institutions, active learning at Purdue is supported by the IM:PACT project: Instruction Matters: Purdue Academic Course Transformation – a campus-wide initiative of the Office of the Provost (http://www.purdue.edu/impact/index.html). A prime objective of IM:PACT is to redesign introductory undergraduate courses with large enrollments toward student-centered teaching and active learning.

However, it is not enough simply to train faculty in the new pedagogy and support their efforts to transform their classes; the changed pedagogy requires facilities that will support small-group work, peer learning, the use of technological supports, and other innovative classroom activities. Some of this new space comes from the renovation of old spaces but more is needed.

The Active Learning Center will help meet this need. In addition to its traditional spaces, it will provide 21st century classroom space combined seamlessly with library space to support all of the in- and out-of-class activities that are required for student success in IM:PACT courses. But how should it be designed?

Current spaces on the Purdue campus provide models for active learning classrooms (for example, the classrooms in Hicks) and for how to provide adjacent study space and use classroom space when class is not in session (for example, Parrish Library in the Krannert School of Management).

We wanted to go beyond these models, to learn how current spaces are used, where they are succeeding, how they might benefit from additional improvements, and what they will need to support by way of student, disciplinary faculty and Libraries faculty and staff activity in the new space. In particular, we wanted to learn how the Libraries' presence in the building could best support the learning that goes on in the classroom, by providing a place for a multitude of activities and learning styles, for group and individual work, for project-related collaboration and for informal interaction. The space should make it possible for students to leave classrooms and continue their learning activities in common areas, and then to move seamlessly back into the classrooms after classes are over for the day. Are current spaces used this way? If not, what would foster such use?

This document reports on a series of information-gathering activities conducted by Libraries faculty and staff to answer these questions. Members of the Libraries faculty and staff who served on the team convened by Dean Jim Mullins were: Teresa Balser, RaeLynn Boes, Dianna Deputy, Will Ferrall, Michael Fosmire (co-leader), Jeremy Garritano, Amanda Gill, Vicki Killion (co-leader), Monica Kirkwood, Clarence Maybee, Kristen Twardowski, Jane Yatcilla, and Tao

Zhang. They were supported by JoAnne Carow, Jamie Seebald, and Carla Heuss. Anthropologist Nancy Fried Foster provided expert assistance throughout the project. The team used a range of modified ethnographic methods developed previously at the University of Rochester to engage prospective users of the building in developing a picture of how they do their course-related work. That is, the team sought to understand the activities that people most needed to conduct in the new spaces in order to share that information with the architects and design professionals who could ensure that those important activities would be supported in the new building.

In this and related documents, we explain our methods, review our findings, and discuss the implications for design of the Active Learning Center. Importantly, we provide information about what people will need to do in the new spaces. It is our hope that the building will, indeed, support these activities, that it will serve as a centrally located, flagship building for Purdue University, and that it will support and inspire active learning for years to come.

Objectives of the Participatory Design Project

The purpose of this project was to provide the best possible information about student, faculty and staff needs to the Planning Committee and the design team to inform the architectural program and optimize the design of the Active Learning Center. Emphasis was placed on the requirements of library spaces in the new building. A secondary purpose was to gather information about current IM:PACT spaces that are slated for renovation or improvement.

Specifically, our objectives were:

- To gain insight on why students select and frequent their favorite study spaces – whether classrooms, libraries, dorms, or other places – in order to identify the qualities and accoutrements of the most desirable spaces

- To see how students are working in current library spaces, including libraries that will be consolidated into the ALC; spaces adjacent to IM:PACT classrooms; spaces that already afford active learning activities; as well as in IM:PACT classrooms

- To identify the work activities that students, disciplinary faculty, and Libraries faculty will need to carry out in the new library space and the states of mind and other intangibles that effective work in library spaces requires

- To develop a statement about what the library will be and what Libraries faculty and staff will do in the new space, which perforce will be different from what libraries currently are and what Libraries faculty and staff do now

- To help Libraries faculty and staff air their fears about closing old libraries and moving into the new space so they can think creatively about the new space, voice their hopes, and contribute to its design

- To add to the picture of what the ALC and its library spaces could optimally be by talking with those who are most knowledgeable, enthusiastic and committed to the philosophy of active learning

Project Activities

Members of the project team formed five sub-teams to engage in information-gathering activities.

Observations: The Observation Sub-Team observed students twice a day for one week in three active learning classrooms and adjacent study spaces in the Purdue Libraries, as well as two study spaces in the Roger B. Gatewood Wing of the Mechanical Engineering (ME) building. The classroom spaces represent different kinds of active learning classrooms, which are also available for students to work in when classes are not in session. Observations were also conducted in two popular study spots within an academic department. Raw and analyzed data are in PURR and a complete report of this sub-team's work will be made available separately.
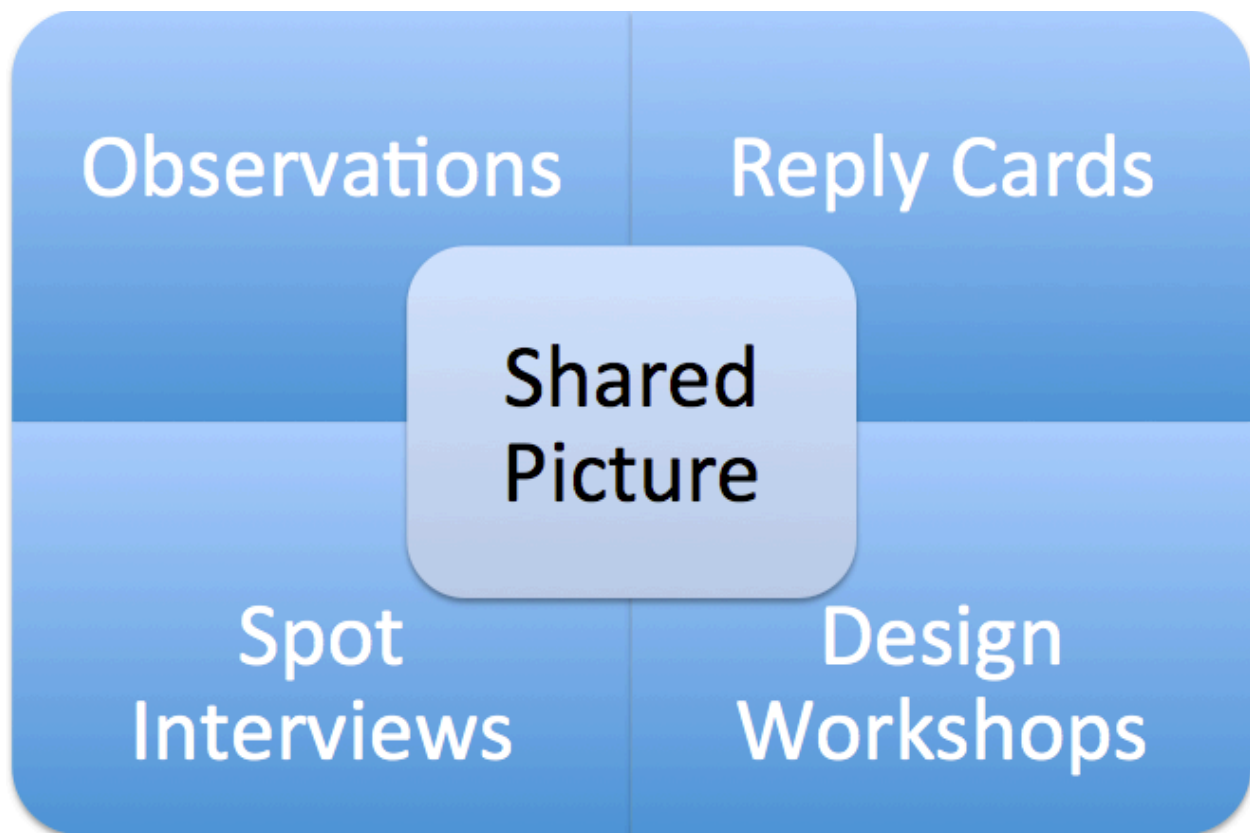
Design Workshops: The Design Workshop Sub-Team conducted design workshops for disciplinary faculty, undergraduate students, and Libraries faculty and staff. Participants were given a scenario related to the Active Learning Center and asked to use the art supplies provided to draw an ideal space. In the debrief, participants were asked to narrate their drawings and then to explain what they expected to do in the space and what equipment they expected to use. A complete report of this sub-team's work, along with original drawings, will be made available separately. Analyses and images of drawings are available in PURR.

Reply Cards: The Reply Card Sub-Team created over a thousand 5-1/2" x 11" cards that student assistants distributed to anyone present in selected library spaces at pre-determined times. Cards asked whether respondents were undergraduates, graduate students or faculty members; department or major; and, for students, expected graduation date; they also asked what the respondent was doing; why the respondent was sitting in the selected area; and where the respondent would go if s/he were required to leave. The full card set is available and electronic datasets can be found in PURR; a full report will be made available separately.

Spot Interviews: The Spot Interview Sub-Team conducted five-minute interviews in various non-library campus locations with undergraduates who were in the space or passing by, including both library users and non-library users. Questions dealt with the last time a respondent did work for a class outside of class. The team asked specifically about what students did, how long they worked, why they chose the location in which they worked, whether they worked individually or with others, and so on. Respondents were undergraduates in science (11), engineering (8), humanities (6), technology (4), social science (4), business (4), math (2), education (1) and agriculture (1). Raw and analyzed data are in PURR and a complete report of the work of this sub-team will be made available separately.

"Shared Picture": In addition to these information-gathering activities, another sub-team developed a vision of the Libraries presence in the new building and the work that Libraries faculty and staff would do there. This statement appears in the Appendix.

The anthropologist supported the work of the sub-teams, conducting confidential interviews with six disciplinary faculty and eight Libraries faculty and staff about their visions of the new building, how it would be staffed and equipped, and what it would offer that current spaces do not provide. The anthropologist also conducted several private conversations, one workshop and one discussion session on what Libraries faculty and staff hope for the Active Learning Center and what concerns they want addressed.

Note that sub-team reports contain extensive detailed information about methods, sampling, and findings.

Key Findings Related to Undergraduates

More than any other single group, we focused on undergraduates, especially in Spot Interviews, Design Workshops and Reply Cards. In Observations, we could not be sure whether we were observing undergraduates, graduate students, disciplinary faculty, or others. For this reason we refer to the "people" we observed rather than to any of these groups.

In the case of Spot Interviews, we chose to conduct these interviews only with undergraduates. Reply Cards were distributed widely and were returned by undergraduates and MA and PhD students as well as by faculty. However, we separated out the responses of undergraduates in some cases in order to zero in on their work practices and needs.

This section presents our most significant and relevant findings. We begin with general findings and move to findings related to the affordances of particular spaces.

Undergraduates report coming to the library because being there helps them do good work

Undergraduates particularly like the quiet of the library and their ability to "focus" in the space and "get a lot done." When we look at Reply Cards, we see that this is particularly the case in Hicks and Potter, where 68 and 60 percent of all respondents, respectively, are there for these reasons.

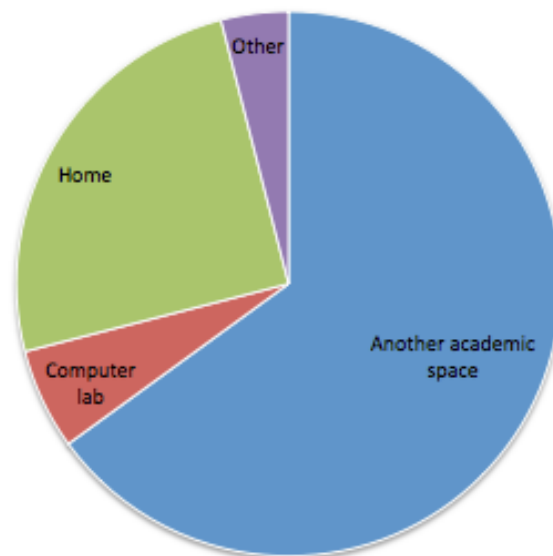## Where Students Would Go If Forced to Move

Chart I. Where Students Would Go If Forced to Move

Students' preference for library spaces in the research reported here is consistent with the findings of a student survey described in the DEGW report. DEGW found that library spaces

topped residential spaces, the Union and other spaces as locations for students to work individually or in groups.

On Reply Cards, undergraduates mention the whiteboards, the comfortable furnishings and the cleanliness of library space. One student wrote, "I focus best on campus (believe it or not)," indicating that the library, like other campus spaces, inspires concentration and mental readiness for work.

We believe that this is supported by related Reply Card responses to a question about where the respondent would go if forced to leave the area in which s/he is now seated. Among undergraduates, 65 percent say that they would go to another academic space, whether a library (30 percent), another space in the same building (19 percent) or space in another campus building (17 percent) and an additional 6 percent would go to a computer lab. Only 25 percent state that they would go home (see Chart I).

Design workshop drawings show us that students want to be comfortable and they do not want to be isolated – they want to "see and be seen" and achieve a mental state that will support serious work (72 percent). More than two thirds indicate that they want to work in a place that is designed to manage sound so that it is neither too noisy nor too quiet and more than half indicate that they want to segregate noisy and quiet activity so that those who want quiet are protected from noise. That said, 59 percent of undergraduates in the design workshops indicated that they want to work at least some of the time in an active, non-quiet space.

In comparing drawings collected at Purdue to those collected at numerous other institutions, the anthropologist notes that Purdue students evince little need for grandiose spaces and expensive architectural flourishes. While students elsewhere depict soaring spaces, monumental artwork, plush furnishings, leather-bound volumes, and other traditional markers of academic space, Purdue students depict practical, workable and relatively unadorned spaces that are equipped for serious, focused work, collaboration, communication, and high productivity.

When undergraduates are in the library, they tend to do homework and study

According to the Reply Cards, the vast majority of undergraduates – 75 percent – use the library to do homework and study (41 and 34 percent of valid responses, respectively; see Chart II). They also take breaks (6 percent), do online work (4 percent) and read (3 percent).

When we look at all responses to the Reply Cards, we see that homework and study are by far the most popular activities in all of the libraries where cards were distributed. In particular, we see that Physics and Potter are most popular as homework spots, with 43 and 42 percent of all respondents, respectively, reporting those activities in these two locations.

In 88 percent of design workshop drawings, students indicate that they need to connect to resources, use the Internet, print, or use databases in their work and 78 percent indicate that they need access to academic content online.

The design workshop drawings provide insights into the activities in which students expect to engage: creating and sharing ideas and content; problem solving; spreading out and working;

getting help from TAs, tutors, IT and research experts; engaging in experiments and simulations; and also relaxing, eating, and having coffee.
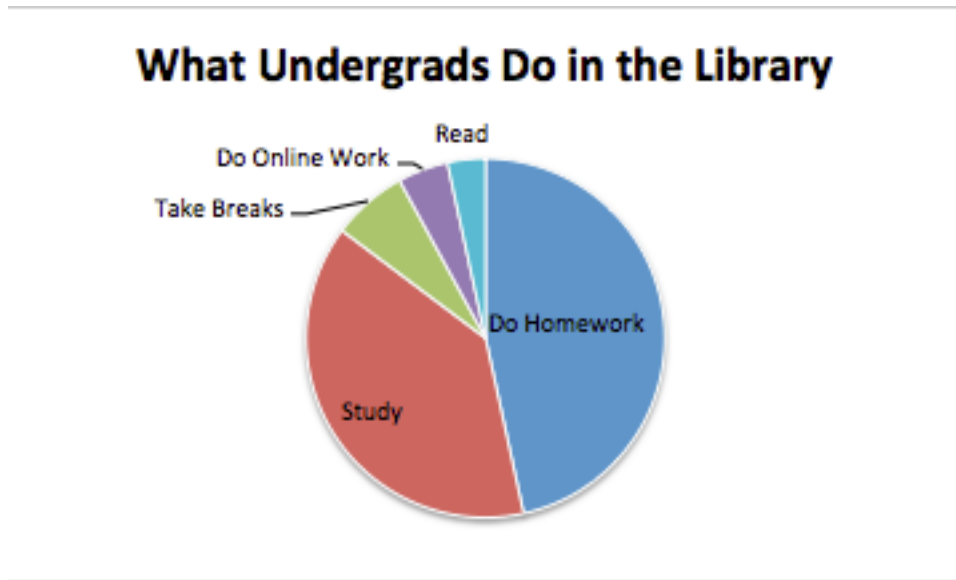

Chart II. What Undergraduates Do in the Library

Most undergraduates come to the library on average every four days

Undergraduates who responded to our Reply Cards reported overwhelmingly that they had been in a library within the past month and *among those* the average time since the last visit was 3.96 days. Those who had not been in a library within the past month reported a far longer time since the last visit (average 140.45 days). Relatedly, undergraduates polled in our Spot Interviews reported that they had last worked on something for a class, outside of the class itself, either the same day as the interview or the day before.

If students work on class assignments every day or two but visit the library ever four days, we infer that they make use of other spaces for many of their study sessions. The question of where they go is addressed in the next section.

Undergraduates tend to select library-like spaces for their study sessions and make use of other spaces opportunistically

Spot Interviews with undergraduates revealed that 40 percent had selected a library, computer area, or resource center for their study session, while 34 percent chose to work at a residence, usually their own or a friend's dorm room. Additionally, 24 percent reported that their last study session had occurred in a lobby or a hallway, in some cases while they were waiting for a class to begin (see Chart III).

Those who worked in dedicated academic spaces, including libraries, did so for convenience (33 percent) or the atmosphere (23 percent) with a few preferring these spaces because their friends would be there (13 percent). Those who chose residences did so for the same reasons but in reverse proportions: atmosphere (40 percent) and convenience (35 percent). For those in

lobby and hallway areas, convenience was far and away the most important consideration (73 percent).

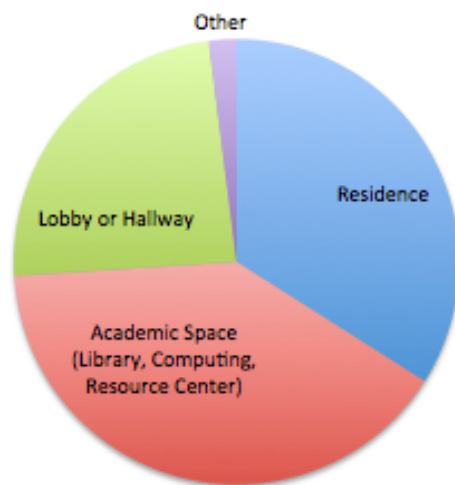## Percentage Who Report Last Study Session in Various Locations

Chart III. Percentage Who Report Last Study Session in Various Locations

Convenience makes some library spaces especially attractive to undergraduates

Many people indicate an interest in working in a campus space where they can focus; they choose the *particular* campus space because it is conveniently located. Although the DEGW report illustrates that the "entire core campus is within 5-10 minutes walking distance," suggesting the every location on campus is "convenient," respondents to our Reply Cards indicate that some spots are "more convenient" than others. More than a third of undergraduate Reply Card respondents said that they were working in their current location due to its convenience (37 percent). To put this in perspective, the proportion was significantly lower for MA and PhD students (22 and 15 percent, respectively). Location seemed to be the biggest draw in the Physics library, with 58 percent of all respondents citing the convenience of this library as the reason they were working there.

Undergraduates work on average one to two hours per study session

When asked how long they worked the last time they did classwork outside of class, undergraduates in Spot Interviews reported one- to two-hour sessions, a length of time that nearly matches the 1.3-hour average reported by undergraduates responding to the Reply Cards.

By and large, undergraduates do what they intended to do in their study sessions

Undergraduate participants in the Spot Interviews reported that they had most recently set aside time to do homework, an assignment or a prelab (48 percent), prepare for an exam or quiz (25 percent), engage in miscellaneous study activities (20 percent), and read (5 percent). In

the event, 59 percent of all respondents reported that they had done what they set out to do. The remainder admitted to web surfing and social networking (30 percent of all unintended activity), socializing (19 percent), emailing and texting (19 percent), eating (8 percent) and watching TV or listening to music (5 percent). Even those whose attention strayed, however, reported that they had also done the intended activity, just not with as much focus and dedication as they had hoped.

Undergraduates say they want to meet in groups; however, outside of class, students working individually significantly outnumber students working in groups

In drawings done in design workshops, more than 90 percent of responding undergraduates indicate that they want to work in a space that supports groups. We believe that this refers to work that they do in class, not work that they do on their own. Indeed, in observations, 23 percent of those present in the selected spaces were working in small groups, that is, actually working together on the same assignment, project or activity.
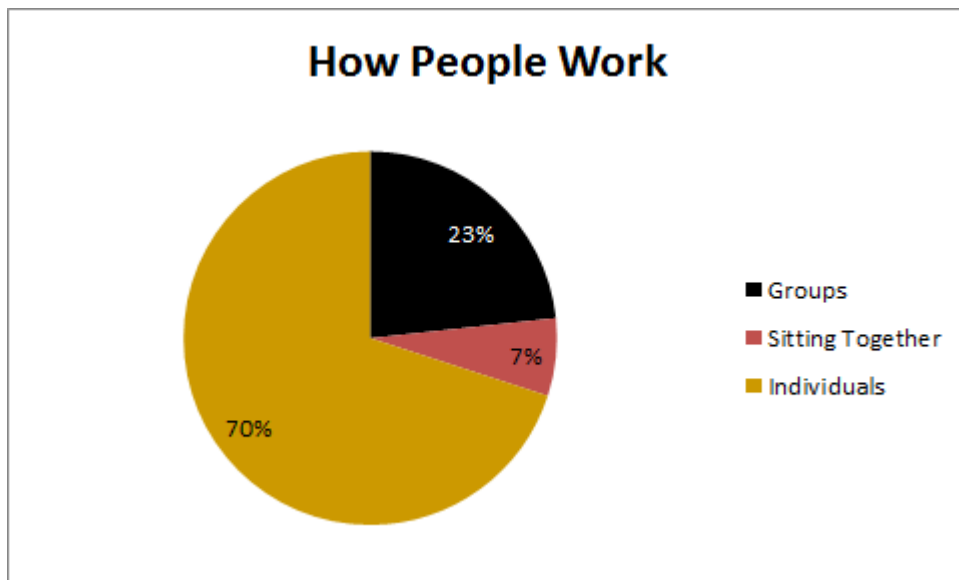

How People Work

- Groups — 23%
- Sitting Together — 7%
- Individuals — 70%

Chart IV: How People Work

Most groups were small: two thirds of the 54 observed groups comprised just two people. As Chart IV shows, a whopping 77 percent of those observed were either working completely alone or were doing their own work while sitting with another person. This accords with another finding from the design workshops, that in almost three quarters of the drawings students indicate that they want to be able to work by themselves.

While the proportion of students working in groups remains relatively low, we believe that it will rise as the number of students taking IM:PACT classes increases. As the DEGW report points out, many trends that are implicated in the move toward IM:PACT classes drive the provision of classroom and library spaces that support group work in particular and interaction in general. They point to trends in "Educational Relevance," "Ubiquitous Learning," "Information Literacy"

and others detailed in the DEGW report, all of which require that students share information, engage in team projects, and become knowledgeable through interpersonal interaction.
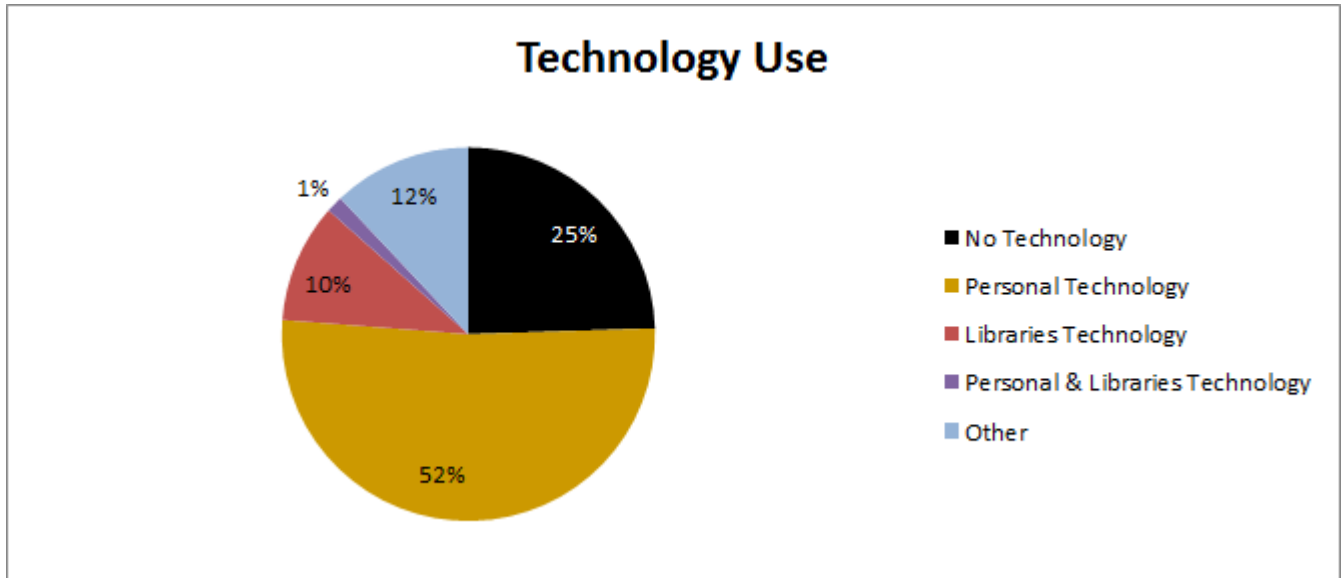
Personal technology is pervasive

Chart V: Technology Use

More than 50 percent of all people coded in the observations appeared to be using their own high-tech devices, including but not limited to laptops, iPads, and smartphones. In the few observed spaces that provided technology, people were also seen to be using library-supplied computers. When we consider only those people whom we coded as "engaged," fully 75 percent were using technology. (See Chart V: Technology Use for a complete breakdown.)

These observations are supported by Reply Card data. Only 10 percent of undergraduate respondents say that they come to the library to use technology that the library provides.

Despite the pervasiveness of technology, few respondents to the Reply Cards report that they are engaged in online work (4 percent overall). This proportion is highest, although still relatively low, in computer areas (11 percent).

When students are engaged in study sessions, they need technology items more than anything else to complete their work

Undergraduates who participated in the Spot Interviews were asked what they needed in order to complete what they were doing the last time they did work for a class outside of the class (see Chart VI). The 58 interviewed students reported needing 155 items, which fell into several categories, the largest of them being technology (38 percent). Other categories were textbooks and reading material (15 percent), notes, notecards and flashcards (13 percent), assignments (6 percent), writing and highlighting implements (15 percent), and paper (13 percent).

What Undergraduates Need in Order to Complete Academic Study Session

Chart VI. What Undergraduates Need in Order to Complete Academic Study Session

Spaces are "full" at no more than 50 percent "capacity" when they are used for study

While every seat may be taken in a room when it is used to teach a class, the capacity of the very same room for voluntary study is no more than half the number of seats in the spaces we observed. On two evenings during the observation week, the space adjacent to the Krannert Learn Lab was close to 50 percent full, which to the observers – experienced Libraries faculty and staff – appeared completely full. Findings were similar in other rooms, although usage was at somewhat lower levels. (See Chart VII for a breakdown of the eight different spaces showing averaged ratios of people using a space to number of seats, or "capacity.") The number of students who can comfortably study in a space is far lower than the number of seats that can be occupied when the space is used for a formal class.

Students gravitate to different spaces from day to evening and from activity to activity

Krannert Learn Lab spaces were consistently well utilized during the evening; they were, in fact, the most densely observed spaces. During the day, the two departmental study spaces were consistently well utilized. As Chart VII shows, this is borne out in observations. We speculate that during the day, students seek places in which to complete preparations for classes, whereas in the evening, they choose spaces in which to work on more expansive assignments and projects or to continue work begun in classes earlier in the day.

In more than three quarters of students' design workshop drawings, they indicate that they want to be able to choose from different kinds of space in which to do their work, and a small percentage want to have access to the space around the clock (13 percent).
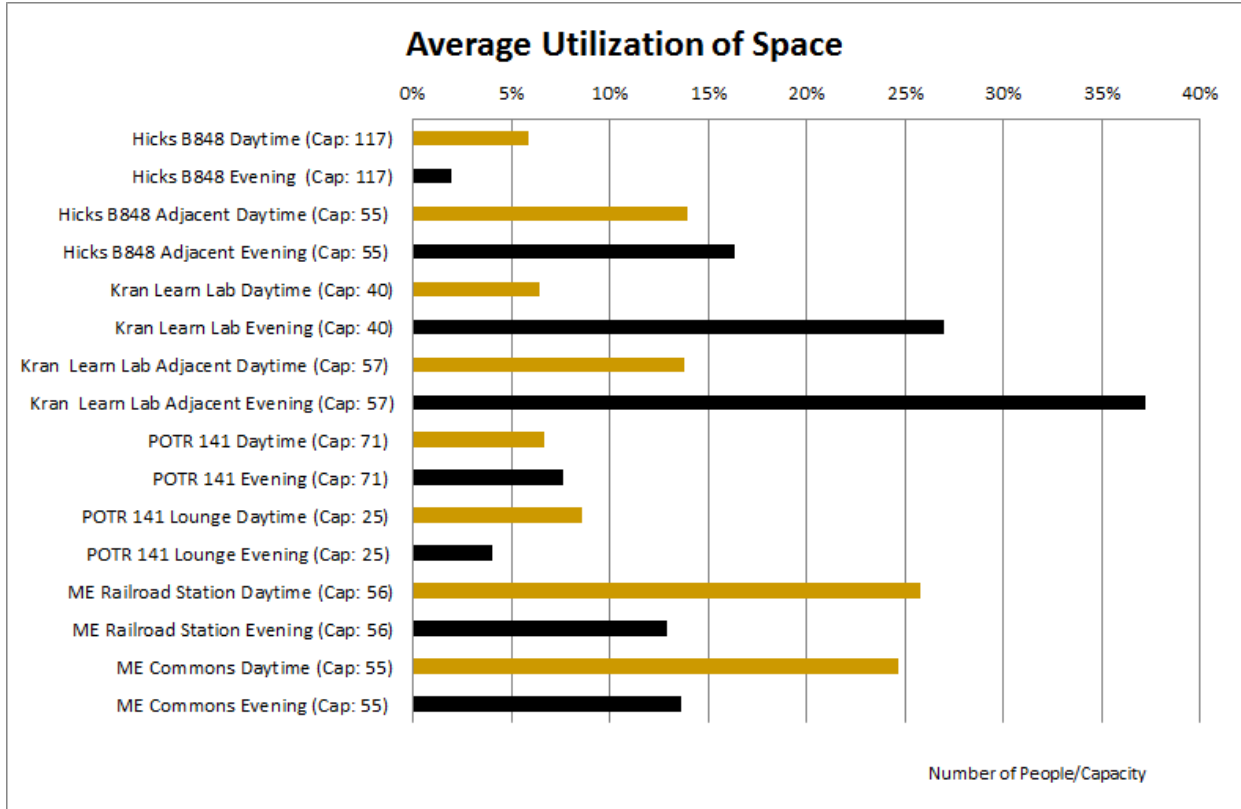
Average Utilization of Space

Chart legend (x-axis): 0% 5% 10% 15% 20% 25% 30% 35% 40%

Categories:
- Hicks B848 Daytime (Cap: 117)
- Hicks B848 Evening (Cap: 117)
- Hicks B848 Adjacent Daytime (Cap: 55)
- Hicks B848 Adjacent Evening (Cap: 55)
- Kran Learn Lab Daytime (Cap: 40)
- Kran Learn Lab Evening (Cap: 40)
- Kran Learn Lab Adjacent Daytime (Cap: 57)
- Kran Learn Lab Adjacent Evening (Cap: 57)
- POTR 141 Daytime (Cap: 71)
- POTR 141 Evening (Cap: 71)
- POTR 141 Lounge Daytime (Cap: 25)
- POTR 141 Lounge Evening (Cap: 25)
- ME Railroad Station Daytime (Cap: 56)
- ME Railroad Station Evening (Cap: 56)
- ME Commons Daytime (Cap: 55)
- ME Commons Evening (Cap: 55)

Number of People/Capacity

Chart VII: Average Utilization of Space

Utilization of Classroom and Adjacent Spaces

Chart legend (x-axis): 0% 10% 20% 30% 40%

HICKS
- Daytime: B848 (Cap: 117)
- Daytime: B848 Adjacent (Cap: 55)
- Evening: B848 (Cap: 117)
- Evening: B848 Adjacent (Cap: 55)

KRAN
- Daytime: Learn Lab (Cap: 40)
- Daytime: Learn Lab Adjacent (Cap: 57)
- Evening: Learn Lab (Cap: 40)
- Evening: Learn Lab Adjacent (Cap: 57)

POTR
- Daytime: 141 (Cap: 71)
- Daytime: 141 Lounge (Cap: 25)
- Evening: 141 (Cap: 71)
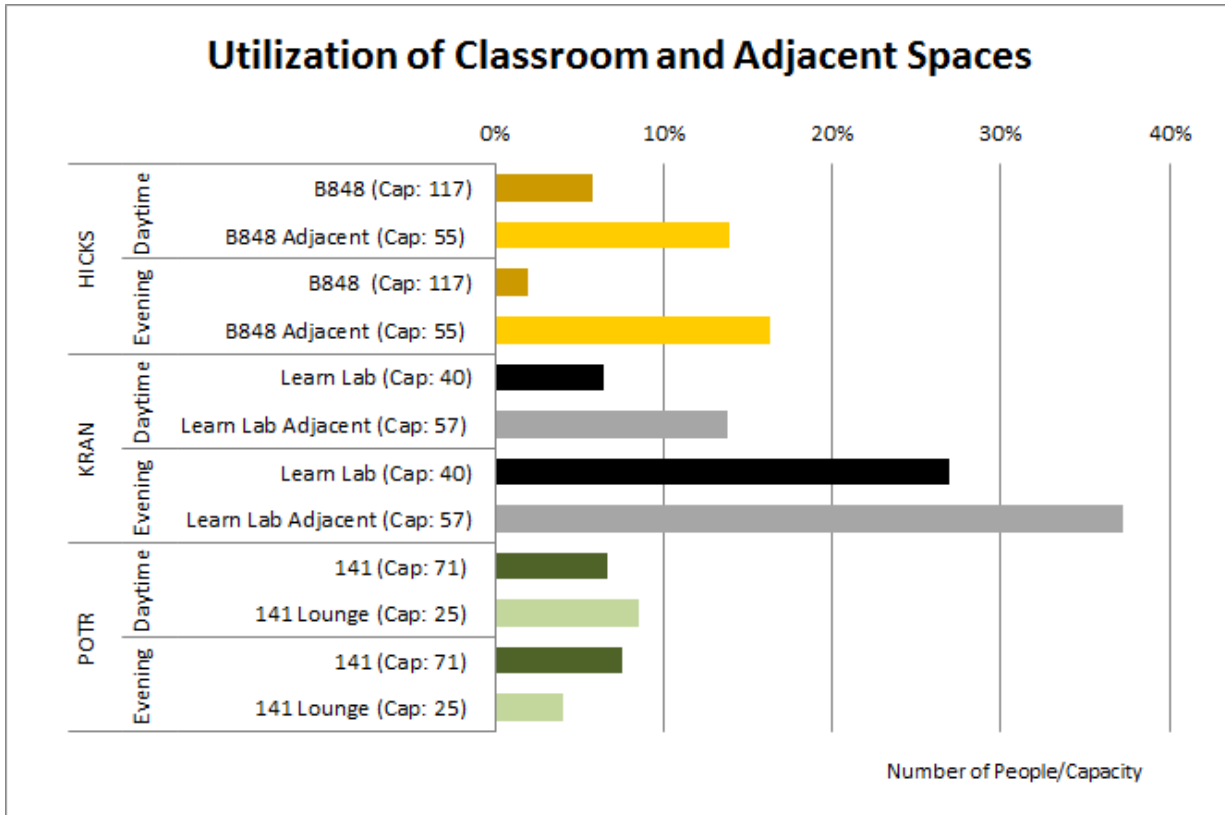- Evening: 141 Lounge (Cap: 25)

Number of People/Capacity

Chart VIII: Utilization of Classroom and Adjacent Spaces

Students avoid using classroom spaces during the day

Chart VIII, which breaks out the classroom and adjacent spaces, shows that adjacent spaces are consistently used more than the classroom spaces they abut.

The Team asked a handful of people working in adjacent areas near Hicks B848, POTR 141, and KRAN Learn Lab why they chose to work there rather than in the nearby classroom and what it would take for them to use the classroom space for their work. Students near the KRAN Learn Lab ceded it to imagined others who might need the computers there; they said they would be more likely to use the space if it provided some areas in which to spread out and work with others. Students working independently outside POTR 141 and Hicks B848 ceded the classrooms to those working in groups, preferring the perceived privacy provided by the carrels outside those classrooms. Two students indicated that they would not enter classroom spaces during the day, even if they appeared available, because they might be intruding on a class, be asked to leave, and suffer embarrassment; it was not worth the risk. Evidently, schedules posted near the door either go unnoticed or are not trusted.

Note: observations in classroom spaces were conducted only at times that no classes were in session.

Students using classroom and adjacent study spaces are highly engaged

During observations, more than 94 percent of individuals in Hicks B848 and the Krannert Learn Lab and their adjacent spaces were "engaged" (not resting, relaxing, or sleeping) during both the daytime and the evening observation times. This was also true for the POTR 141 classroom and the ME Railroad Station study space when observed during the daytime; in the evening, engagement was still high although it dropped to between 65 and 85 percent. In the ME Commons and the POTR 141 Lounge, which have a mix of lounge and study furniture, between 70 and 80 percent of individuals appeared to be engaged.

Further evidence of engagement comes from the Reply Cards, which show that the proportion of respondents, overall, who are taking "downtime" is low at 7 percent. Interestingly, this proportion is highest in the group study spaces (9 percent) and quite low in the computer areas (4 percent).

Key Findings Related to Teaching in the Active Learning Center

We were eager to understand how faculty members imagine the new building and what they could tell us of the work they would do there, particularly insofar as they would use active learning approaches in their courses. We gathered a small amount of information about faculty use of libraries through the Reply Card activity and more pointed information specifically about the new building in the Design Workshops and individual interviews.

In this section, we convey faculty needs and attitudes with regard to the planned Active Learning Center.

Faculty members see the new building as an open, technology-rich "real-world" space

Faculty members spoke in interviews about the qualities and affordances of the new building. They look at it as primarily a space for the kind of learning that goes on in the "real world" – that is, the post-college world. Five of the six interviewed faculty members see the space as a place for learning through conversation and group work. They also see the space as providing for a large variety of needs, from finding resources to getting a cup of coffee and from using cutting-edge technologies to printing a page of notes to writing in marker on a whiteboard. Half of those interviewed call for good acoustics, comfortable common areas, lots of light, and displays of student work throughout the building.
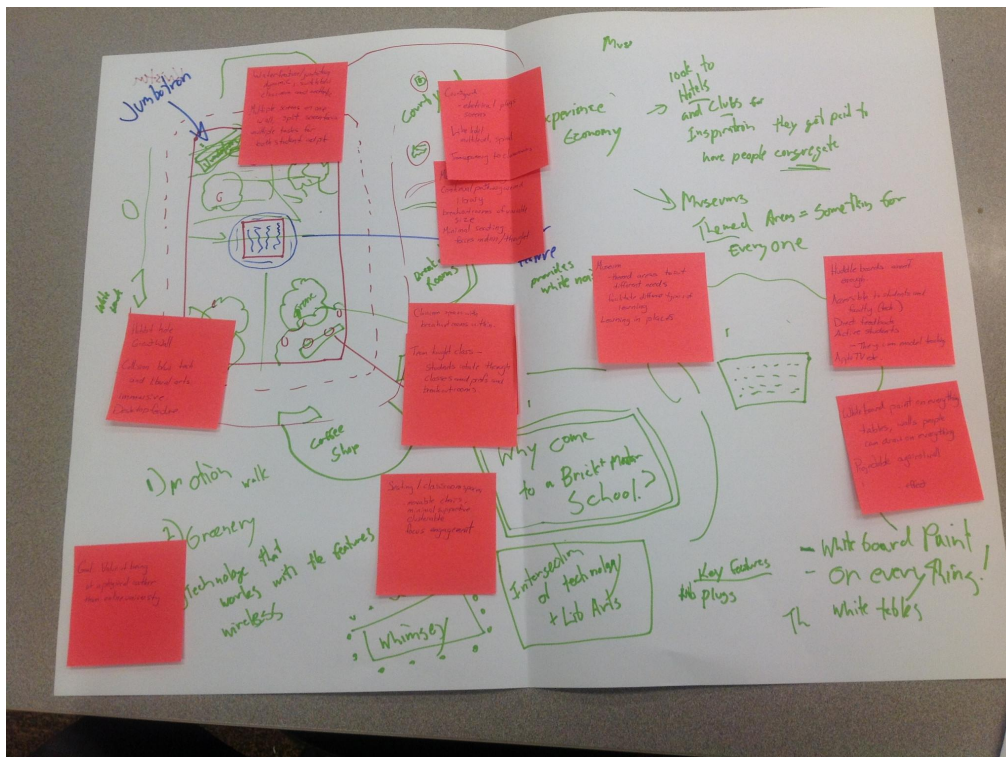

Figure 1. Faculty drawing emphasizing the "intersection of technology and liberal arts" and the desire to add "whimsy" to the learning environment

In interviews, four of the six faculty members made specific mention of such teaching technologies as computers and screens, both for class-wide presentations and for small-group work. In reference to classroom design, two of the six faculty members reiterated a desire to

create "real-world" environments, specifically environments that simulate conferences with simultaneous presentations.

When discussing their experience in existing IM:PACT classrooms in Hicks, half of the faculty members made the point that they prefer whiteboards on walls rather than on wheels. The same number called out the difficulty of teaching in a room that is too big, saying that it makes it hard for students to attend to a class-wide presentation and separates the table groups too much for interaction.

This is supported by drawings done by IM:PACT faculty in design workshops. More than two thirds of the drawings emphasize flexible and configurable teaching spaces that foster group work and interaction. These spaces are shown equipped in more than half the drawings with whiteboards or writeable surfaces, specialized technologies (higher end video editing, 3D printers, and so on), and touchscreens. More than one third of the drawings include multiple screens drawing from multiple sources and other sharing technologies. Half the drawings show spaces that can accommodate large groups but be broken down into smaller spaces for small-group work.
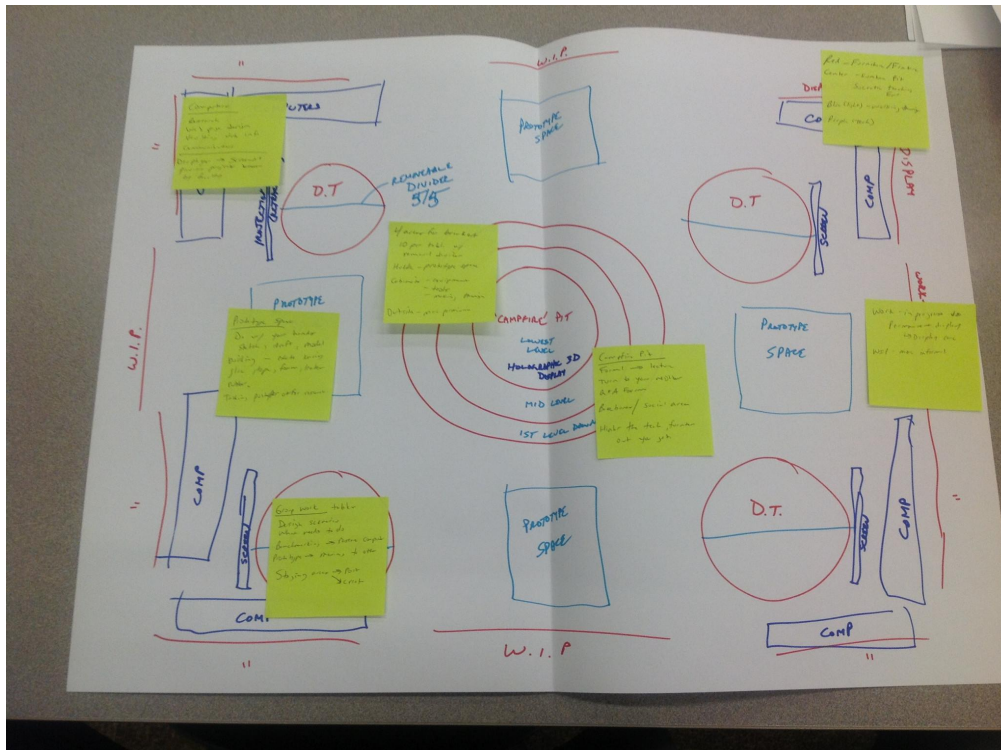

Figure 2. Faculty drawing showing low-tech "campfire" space surrounded by areas for group work, prototyping, and displaying current and past projects

In debriefs of the drawings, faculty enumerate the following activities that will take place in the classroom areas of the new building (in order): lecturing, conducting class discussions, facilitating group work during class, having students work on computers during class, using interactive displays, having students work on whiteboards, having students present their work.

A third or more of the faculty who participated in the workshops want the space to be welcoming, with windows and natural light, and with inspirational displays of art and student work. A third of the faculty in the design workshops also call for moveable tables and chairs, rooms for students to meet in groups ranging from six to 24 individuals, and a source of food and coffee.

Faculty members are far more interested in the teaching spaces than in the library spaces

Faculty members had much less to say about the library spaces in the new building. Three of them hoped that the library would loan iPads, tablets and other devices, provide screens and projection support, and ensure reliable Wi-Fi. Three specifically asked that the library spaces support access to information and help students find resources related to course content. Three expected that the library spaces would serve a "study hall" function; two explicitly called out a need for library space in which students could work on projects together.

Key Findings Related to a Library Presence in the Active Learning Center

Libraries faculty and staff participated in several activities, providing information about the work they expect to do in the new building and sharing their vision of the new building's potentialities. In this section, we convey a library-focused vision of Active Learning Center based on individual interviews, a design workshop, and a group discussion. Note that opinions attributed to "Libraries faculty" reflect views voiced by identified "ALC visionaries," a group that includes faculty, administrators, and some individuals from closely related disciplines.

Libraries faculty imagine the new building as an open, fluid collection of small and large spaces for learning, meeting, and working

All eight interviewed Libraries faculty spoke of the space as a combined classroom/library building, calling attention to the flexibility of the space, its openness and impressiveness, and the fact that it will not be a traditional library that is heavy with physical collections but rather a space in which people work with a wide variety of traditional and cutting-edge resources and technologies. While they voiced very forward-looking ideas about the building in general, three of the eight library faculty specifically stated a need for small private offices for people who work in the building, as well as common areas for relaxing or having lunch. The need for private space was also voiced by Libraries staff.

Libraries faculty anticipate smaller collections, a smaller staff, and a greater need for new kinds of expertise, especially in technology areas

Half of the interviewed Libraries faculty expected that both the collections and the staff would be smaller; at the same time, they said that the people who work in the new building will have to contribute new competencies and specialized abilities, especially in area related to technology (Drupal, social media and so on). Only two of the eight interviewed library faculty called out the importance of staffing service points; two mentioned an emerging need for staff positions related to building operations.

The importance of new, emerging areas of expertise such as GIS and data management was also mentioned in connection with liaison librarians who will work in the building. Half of those interviewed expect that Libraries faculty will be teaching in the building, and three of eight expect to be doing their own research and writing there. Two of eight expect that they will consult with undergraduates, graduate students and faculty members, helping them find the resources they need. The need for professional development for Libraries staff was voiced by Libraries faculty and staff alike.

Libraries faculty expect greater connection and opportunity in the new building

Four of the eight Libraries faculty see the new building as reducing isolation, increasing collaboration among Libraries faculty, and helping all Libraries faculty and staff get better connected to one another. Three of those interviewed see great potential in co-locating people with diverse expertise, and three believe that they will be able to do more interesting, technology-supported work in a more engaging environment. They see the building as supporting the continuing development of active learning pedagogies.

Libraries faculty hope to work with new technologies in the new building

With regard to technologies, six of the eight hope that the building will offer a wide range of analog and digital technologies, from whiteboards to digital displays. Some voice concern that the technologies not "fossilize" – that is, that it not be decided too far in advance how to equip the building and that old technologies can be replaced when necessary. Three of the eight hope that the building will have a technology sandbox where they can try and learn about new technologies, perhaps even those technologies that would be too expensive for a single department to buy but that will be affordable in this shared facility. Another three see the library part of the building loaning out devices and specialized equipment.

Advice to Designers

Having participated in the Participatory Design of the Active Learning Center project for four months, members of the project team found that some findings seem so significant that they are worth calling out as "musts" to communicate to the Planning Committee and the design team. Here is a summary of those key design recommendations and findings.

- The capacity of a space being used for a class is as much as 100 percent greater than the same space when being used for study. Therefore, we recommend ensuring there is enough space for people to be comfortable while engaged in informal learning activities.

- People use library spaces alone and in groups, quietly and noisily, and for a variety of activities, some of which require privacy. The building should provide configurable and varied space that can meet this range of needs.

- More than half of the people we observed were using their own devices, which need to connect to the Internet and be plugged in or recharged on a regular basis.

- Students like to sit together whether they are working on the same thing or not, and in addition to spaces that accommodate academic work, students also need places to relax, nap, reinvigorate, or eat their lunch.

- Students do not want to enter rooms unless they are certain that they are allowed to do so. We need better ways to signal room availability to students if we want them to use classroom spaces during non-class times.

- As the spaces students currently use close and they go to new spaces, we need to keep them informed and we want to anticipate and speak to any concerns or inconveniences raised by these changes, especially concerns over comfort and security.

- The demand for individual, focus-driven study spaces is clear so some areas should be designed as quiet spaces and should be insulated from areas of group study and heavy foot-traffic.

- The concept of the Library is changing so rapidly that it is hard to predict the ALC's future needs. Design for flexibility with the future in mind.

- People who will use the Active Learning Center will need to enter, leave and move through the building via more than one door and pathway in order to minimize disruption to others and reduce inconvenience to themselves.

- Students still need to connect to resources and expertise and to see displays.

Appendix: The Libraries Presence in the Active Learning Center

Academic research libraries are campus centers for the learning that occurs outside the formal classroom. Libraries promote intellectual exchange and development, provide inspiration, and serve as catalysts for building communities of inquiry. They provide common areas connecting classrooms and study spaces, enabling continuity of learning activities. Libraries provide spaces that stimulate learning and meet students' needs by offering a variety of environments, including physical, virtual, group, individual, or project focused. Libraries nurture connections between learners to spark creativity and knowledge creation, as well as offering space for reflection to assimilate learning. In keeping with this vision of academic libraries, Purdue's Active Learning Center (ALC) will be a facility that seamlessly combines library study and learning spaces with classrooms in one building; it will provide space, resources, services, and technology to support research and active learning.

In the ALC, students will feel that the facility has been built for them. Students will be able to find a location, which may vary from day to day, or even hour to hour, where they can be most productive and meet their pressing learning needs. Instructors will find services and facilities that enable effective teaching, and willing partners in the Libraries faculty and staff to make sure that students develop the habits of mind to become informed learners and critical thinkers.

Researchers and faculty will find expertise and technology that help them develop their projects and document and manage their intellectual property and research data. They will find a place that stimulates creativity and collaboration on research grants and scholarship across disciplines, departments and the library. Technology in the space will provide for the storage and use of a wide range of data and will make it possible for scholars to explore new ways of working together and disseminating their research.

Libraries faculty will guide students through the increasingly unmediated and unstructured information landscape, supporting them with expertise and learning resources that will provide the means for them to accurately assess their information needs, and to locate, evaluate, and apply information appropriately in the sciences, engineering, technology and agriculture. Libraries faculty will help students manage the knowledge they have gained, including organizing and publishing content they have produced themselves. In support of the University's core curriculum and learning goals, Libraries faculty will partner with other faculty to enhance student learning through information literacy. Libraries specialists in data services will provide technologies and expertise to the University community to make their original data, texts, or media accessible, sustainable, and reusable.

Libraries staff will provide point-of-need assistance for locating specific information and guidance with finding and using appropriate spaces, equipment, and services that will meet student learning needs. In this welcoming and technology-rich environment, staff will help migrate print-based resources to the virtual environment and organize electronic content to make it available to end-users. Staff will also steward the Libraries' physical collections and ensure that study spaces are maintained and accessible.