SIMMONS COLLEGE
GRADUATE SCHOOL OF LIBRARY AND INFORMATION SCIENCE

USE OF COLLABORATIVE SPACES IN AN ACADEMIC LIBRARY

by

Howard Silver

BA, Zoology, University of New Hampshire, 1976
MSc, Zoology, University of Queensland, Brisbane, 1985
MLS, College of Information Studies, Drexel University, 1985

Submitted in partial fulfillment of the requirements for the degree of Doctor of Arts

May, 2007

Approved by
Gerald Benoit, Faculty Advisor
Graduate School of Library and Information Science
Simmons College

_____

(signature)

USE OF COLLABORATIVE SPACES IN AN ACADEMIC LIBRARY

Simmons College
Graduate School of Library and Information Science
May, 2007

Abstract

With the design of new libraries increasingly emphasizing support for collaborative activity, librarians need to understand how and why their users are working together in library spaces. No published studies quantify the impact of collaborative spaces in academic libraries on student learning behaviors. The objective of this study was to determine how and why the collaborative spaces in an academic library were used, and how well the observed use matched the intent of the people who designed and managed the spaces.

The study was conducted in the Fall of 2005 at a recently built academic library in New England that was designed with over 70% of seating allocated for collaborative use. The primary data collection methods were observation and interviews. Observation sessions were conducted using a sweeps methodology. Approximately 20% of the observed users were interviewed.

Undergraduate students made up 95% of the observed population and third year students were the most frequently observed class. Seventy nine percent of those interviewed visited the library two or more times per week. The mean length of visit for

those interviewed was 3.9 hours. Students estimated that 55% of their non-classroom study took place in the library.

Seventy-one percent of the users were in groups. Sixty-three percent of people in groups were actively working together. There were significant variations in patterns of space utilization by time of day and between different seating clusters. There were significant variations in the spaces that different types of groups selected to work in.

New construction and renovations of academic libraries in recent years have created new kinds of user spaces that support collaborative work and learning. This study demonstrated that this library's collaborative spaces are being used to support both curriculum-initiated and student-driven collaborative learning, and that the library's collaborative spaces are the primary location for this activity on the campus. The collaborative spaces at the study site were heavily used and highly valued by the people who used them. Students view these spaces as essential infrastructure to support project work. The library is viewed by those who use it as a key resource to support their learning, and this perception is supported by frequency of visitation and time spent in the facility.

Acknowledgements

I have many people to thank for their support throughout this project. Sincere thanks to Gerry Benoit, my faculty advisor, for his encouragement, advice and criticism. Claudia Morner sparked my early interest in this topic when I took her library buildings course, and she also helped generate my interest in observational research. Susan Shoemaker provided useful advice and encouragement in the earliest stages of the project proposal. Candy Schwartz was a consistent source of support throughout her tenure as head of the doctoral committee.

Mary Moroney, directory of the Krupp Library, was generous and helpful in a variety of ways. She made numerous accommodations to support my field research, provided a wealth of supporting documentation, and shared her experience and knowledge about the Krupp Library's history, Bryant University, and nature of the student body. Mary reviewed the manuscript and provided factual corrections about the university and library. Colleen Anderson and other Krupp Library staff were also welcoming and informative.

Shelley Strowman was an invaluable resource for training and consultation in the use of SPSS. She went beyond the basics of her role as an SPSS consultant by providing some useful advice on appropriate choices for analysis tools.

Anna Gold and Dan Traister carefully reviewed and edited early drafts of the manuscript. Their thoughtful and constructive criticism has greatly improved the document, and I am very grateful for the time and effort they contributed to the task.

I am most grateful to my wife Alicia, and my children, Ben and Eleanor, for allowing me to take time away from them to pursue this degree, and for their support and encouragement throughout.

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

Background

> *"For centuries, people have visited libraries to find information, and the practical needs of housing collections and accommodating readers have typically driven library design."* Kathlin Smith in (Bennett, 2003, p. vi).

With a critical mass of library-supported and freely available content available to academic community members wherever they choose to work, current library design for public space in academic libraries must now go beyond providing effective access to print collections. In an environment where most access to library collections occurs via the web it is fair to ask if academic institutions still need physical library facilities, and if so, how those facilities serve the needs of the institution and its library's user community?

The consequences of leaving these questions unanswered became clear in 1995. The then Chancellor of the California State University (CSU) system ignited a controversy by questioning the need for a physical library and print collections at CSU's new Monterey Bay campus (Ober, 2000). He suggested that investments in computers and electronic resources might serve the campus as well as a library facility would. After further discussion and planning a library was built for the campus, but the controversy made it clear that the justification for academic library facilities needed to go beyond simply housing collections and accommodating readers.

Shortly thereafter several articles were published in the library literature in an effort to justify the continued relevance of academic library buildings (Bahr, 2000; Hardesty, 2000). Scott Carlson (2001, Nov 16) galvanized this discussion in an article in

The Chronicle of Higher Education where he described empty reading rooms and attempts by librarians to draw users back into the library, notably by offering food and coffee services. The examples he cited were offered against a backdrop of a reported ten-year decline in gate counts in ARL libraries. Carlson's article prompted widespread discussion on academic library listserves and at both national and regional conferences around the broad theme of the library as place.

Miller (2002) summarized many of the sub-themes of the *Library as Place* discussion:

- the traditional library role is not obsolete, because people still need access to print collections;
- the academic library is a campus center for information technology, often in partnership with other university departments;
- it is a growing site for instructional activity;
- it is a multi-purpose gathering place; and
- it is a key partner in the learning process.

In one of many examples of professional debate on the relationship between new types of library spaces and new academic teaching and learning strategies, a 2004 symposium on the "Library as Place" was convened by the National Library of Medicine and the Association of Academic Health Sciences Library Directors (Dev, 2003; Dugdale, 2003; Jenkins, 2003). A primary theme of the symposium was the importance of providing spaces that support a variety of collaborative activities. However, there were few, if any, published studies that documented this perceived trend.

Authors have, rather, challenged the supposition that physical libraries are relics of the print era by pointing out numerous examples of new library construction to underscore the commitment of colleges and universities to libraries (Bahr, 2000; Miller,

2002). In 2003 two studies of academic library building construction were published which supported those claims about academia's commitment to libraries. Bennett (2003) found a substantial and sustained investment in academic libraries. Over a ten-year period (1992-2002) academic institutions invested $449 million per year in their libraries, involving 2.9 million gross square feet of space, of which 40% represented new construction. Shill and Tonner (2003) found similar results in their study of academic library construction. They also characterized several features of new library spaces. These libraries allocated greater portions of their space to users in new or renovated spaces; and new construction also created more types of user spaces. New facilities typically offered more group study and meeting rooms, expanded public computing, and new lounge and café spaces.

These studies have provided evidence that new library construction results in higher use. In a follow-up study Shill and Tonner (2004) reporting that 80% of new and renovated facilities reported substantial increases in gate counts (median increase 37%), and that gains in gate count were sustained over time. These broad-based findings are supported by other articles describing new academic libraries as popular, active, and busy facilities (Albanese, 2004; Church, Vaughan, & Starkweather, 2002; Sutton, 2000; Wooliscroft, 2003). They highlight new collaborative spaces as successful features of these new facilities. This literature suggests that library use today (as defined by gate count) may have less to do with the collections and more to do with the types of facilities the library offers. A conclusion that many have drawn is that if the library offers the right

kinds of spaces and services, along with their collections, then people will continue to need library facilities, despite the prevalence of online content.

Shill and Tonner (2004) noted that the traditional metrics for measuring in-library activity have shown a decade-long decline: reference transactions, circulation, re-shelving data, and gate count all showed decreases. Of all these measures only gate count data showed an overall increase in new and renovated facilities. Other metrics continued to decline, although at a slower rate than the national average. Yet Miller (2002, p.1) questioned the continued relevance of gate count:

> *What should we use as measures of success for libraries today? Are gate counts and circulation figures the ultimate measure of success (and were they ever?), or should we be more interested in what happens while people are in libraries (or out of them, for that matter, but still using their services)?*

The fact is that we know very little about what happens while people are in academic libraries, particularly about how people use library spaces. The earliest studies of seating behavior were done in libraries that were designed and managed to support individual research and study (Sommer, 1966, 1969). Three decades later, Young (2003) revived the use of observational studies in academic libraries to study learning environments.

Given the huge investments that library spaces represent, it is critical that librarians understand the kinds of spaces that members of their community want and need. Given a choice of spaces to work in within a library, or beyond it, why do they select the spaces they use? What do they do in those spaces? With the design of new libraries increasingly emphasizing support for collaborative activity, are there unique

qualities to spaces that libraries can offer that will justify an institution's commitment to supporting those spaces?

Problem Statement

No published studies quantify the impact of collaborative spaces in academic libraries on student learning behaviors. Without research, librarians can rely only on anecdotal evidence and their own personal experiences to make planning and management decisions. We do not know who is using these spaces, why they are using these spaces, or what they are doing in them. Without this knowledge librarians cannot be sure that the spaces are being used as the designers and managers intended, if the spaces meet the needs and expectations of the people who use them, or if the activity in these spaces relates to academic goals and mission of their institution.

With more knowledge about activity in collaborative spaces librarians may be able to manage these spaces better, and improve existing spaces. They will be able to make informed decisions when planning for future use of spaces. If it is shown that collaborative spaces in libraries have a positive impact on student learning this data will justify their institution's investment in existing and new library facilities. If librarians are able to apply this knowledge then academic libraries will provide facilities that better meet the needs of their community and by doing so can become better partners in their institution's educational mission.

Definitions

The following definitions describe collaborative activity and collaborative spaces for the purposes of the study.

Collaborative activity: Two or more people working together towards a common goal. Collaborative activities include group study, tutoring, group projects for classes, extra-curricular projects, and planning meetings, and interviews.

Collaborative space: Space designed for use by groups for self-directed activity, and spaces administered as suitable for self-directed group activity by design or custom. These include study rooms, conference rooms, information commons, or sections of such. The study excludes spaces that are used for directed group activity (e.g., electronic classrooms).

Objectives

The following objectives were developed to guide the design of the field study research.

1. Describe the physical and demographic characteristics of the study site;
2. describe the collaborative spaces at the study site;
3. describe the original and current intent for the spaces by the people who planned and administer them;
4. describe the populations that use collaborative spaces;
5. describe the occupancy patterns of collaborative spaces;
6. describe the activities that occur in the collaborative spaces and the resources used by the occupants of the spaces;
7. identify the reasons that bring the occupants into the spaces;

8. compare the profile of the people using collaborative spaces with the overall campus population; and
9. compare the observed activity with the intended activity in the collaborative spaces.

Research Questions

Based on these objectives the following research questions were developed.

1. **Who uses the collaborative spaces in the library?** Are the people using these spaces representative of the overall campus population? Are the spaces being used for group work, and if so, what are the characteristics of the groups? Of the available collaborative space how much is used?
2. **What are they doing in those spaces?** What types of activities are taking place? What kinds of resources are they using? Are the resources they use provided by the library, or brought by the occupants?
3. **Why are they using these spaces?** Are the occupants engaged in activity driven by coursework demands, research projects, or other activities not directly related to academic requirements? For the groups who are using the spaces, is group work a requirement or an option for the activities they are engaged in?

Chapter 2: Literature Review

Libraries and Learning

The shift in emphasis from teaching to learning has been a dominant theme in higher education since the 1990s (Barr & Tagg, 1995). Librarians recognized that this shift in focus created opportunities for libraries to become more actively engaged at the center of the academic enterprise (Dowler, 1997).

Bennett (2003) discusses two conceptions of library as place. The first is collections-focused. The second (p.4)

> *Conceives of libraries as spaces where learning is the primary activity and where the focus is on facilitating the social exchanges through which information is transformed into the knowledge of some person or group of persons.*

Bennett suggests that library spaces developed in the 1990s were responding to fundamental changes in learning modes and information technology. He describes the change in learning modes as a student-driven process of forming collaborative study groups that allowed group members a deeper level of engagement with their coursework. This influenced faculty to modify their coursework to include experiential and problem-solving materials. The described outcome is a quiet and powerful engagement with the social dimensions of learning and knowledge in American higher education.

As technology enabled people to use library collections outside the library it also enabled the movement to extend learning beyond the classroom. Mitchell (2004) discusses an academic environment where learning is pervasive and occurs throughout the institution. He asserts that the library is an important component within this environment. Mitchell's example is the University of Virginia, designed by Thomas

Jefferson, where the library acts as the central anchor of the main complex. He notes one measure of the design's success is that central placement of the main library has been emulated at a number of other institutions. Simmons *et al.* (2000) advocates for libraries to develop a central role in the educational process. Both authors emphasize the social nature of learning and the importance of interactions of a wide variety in that process.

In Powell's (2002) review of library space developments in the United Kingdom (UK) he emphasized that new spaces were funded, planned, designed, and developed specifically to support efforts to create a student-centered learning curriculum. UK centers of higher education needed to develop spaces outside the classroom to support student-directed and collaborative learning. Libraries able to create a learning environment that combines access to collections, a technology infrastructure, and a variety of spaces for students to work in are well suited to adopt this role. Group study areas are specified as important to facilitate collaborative learning. The connection between curricula that focus on group learning and the development of collaborative spaces in new libraries was noted in a survey of new academic health sciences libraries (Nelson, 2003).

User-Centered Library Buildings

The design of academic libraries in the United States up until the 1990s emphasized the housing of collections, and increasing accommodations for new technologies (Kaser, 1997; Toombs, 1992). Two articles by architect Steven Foote, written a decade apart, show a shift in thinking about academic libraries from collections-focused to user-focused facilities (1995; 2004). In his 1995 article he emphasizes that

"the housing of print collections and readers remains the primary function of libraries today and will for the foreseeable future." In 1995 Foote discusses designing libraries to support both print collections and technology and his conclusion reinforces the central role of the academic library in supporting the social and intellectual growth of college students, but his underlying assumption is that this growth is largely achieved through individual interactions with the collections. In 2004 Foote thinks other issues more critical for the design of new libraries than collection storage. Foremost amongst them is the shift towards increased collaborative learning. He notes that *"every librarian I know has been asked to examine their building with an eye to providing more seminar rooms or group studies."* The later article reviews historical approaches towards accommodating users and contrasts them to new approaches that emphasize collaborative activity and partnerships. Programs for new libraries need carefully to consider who will be using the spaces the library develops and try to anticipate the needs of those users.

Crosbie and Hickey (2001) critiqued seven new and renovated libraries and reported on the factors that affected their design. They describe nine factors that shaped these projects, with the top four items reflecting a focus on a user-centered environment.

1. The growing importance of electronics;
2. the shift from exclusively individual learning to individual and collaborative learning;
3. community and institutional pride;
4. the emerging role of libraries as campus centers and information commons;
5. the need for less expensive ways to store print;
6. the importance of historical materials;
7. differing concepts about staff-staff and staff-user relationships;
8. uncertainty about the future; and
9. site, budget, and design considerations.

Tom Findley, architect for University of Nevada Las Vegas (UNLV) Lied Library, suggests that the library is becoming a center for community and social interactions, and that collaborative learning spaces are one of the features that contributes to this new role. He describes the library as an exciting and interactive learning environment with technology-rich collaborative learning spaces (Boone, 2002). King (2000) described a process of engaging the community in developing the planning criteria for a new library at Latrobe University, Australia. Specifically mentioned is the need for spaces to support group activity, project work, and social interaction.

Collaborative Spaces

The most visible manifestations of academic libraries creating spaces and organizing services to combine support for technology and collaborative work are Information Commons. These appeared first in the late 1990s, and featured large public computing facilities that supported both research and applications software. They were developed as partnerships between libraries and academic computing units, and were co-staffed and managed by staff from both units (Halbert, 1999; Holmes-Wong, Afifi, Bahavar, & Liu, 1997). From the beginning these facilities supported collaborative work. The Leavey Library at University of Southern California (USC) designed its workstations to seat two or more people at a computer, and provided twenty-one collaborative workrooms.

Information Commons present libraries with significant organizational and technical challenges (Albanese, 2004; Bailey & Tierney, 2002; Cowgill, Beam, & Wess, 2001; Crockett, McDaniel, & Remy, 2002; Halbert, 1999; McKinstry & McCracken,

2002; Oxnam, Talamonti, & Mills, 2003). These facilities continue to grow and spread in academic libraries because of their popularity with the user community and their success in helping schools achieve their academic missions (MacWhinnie, 2003). Information Commons improve gate counts (Holmes-Wong et al., 1997; Pierce, 2004), but their primary goal is to create a technology-intensive environment that supports student learning (Church et al., 2002; Cowgill et al., 2001; MacWhinnie, 2003). All the authors who discuss the user experience in an Information Commons environment note that to some degree group activity is a basic component of this learning environment (Albanese, 2004; Church et al., 2002; Cowgill et al., 2001; Halbert, 1999; Holmes-Wong et al., 1997; MacWhinnie, 2003; Pierce, 2004).

Not all collaborative activity in academic libraries is technology-based and Information Commons are not the only collaborative spaces that libraries support. The University of Otago, New Zealand provides a variety of formal and informal group study areas in addition to a large Information Commons facility (Wooliscroft, 2003). Sutton (2000) describes spaces intended to support collaborative learning at Detroit's Wayne State University's, undergraduate library, including a twenty-four-hour study center, a community room, and study rooms.

Observational Research

The literature cited in this review is evidence of change in teaching and learning in academic institutions. In this environment students need spaces outside classrooms to work in groups. Many colleges and universities have invested heavily in new library facilities that can support group activity and these new facilities seem to be very

successful (Bennett, 2003; Shill & Tonner, 2003, 2004). What is not known is who is using them and what these people are doing in these new environments since there have been few recent studies of user behavior in libraries.

The original work in this area studied seating behaviors in large library reading rooms (Sommer, 1966, 1969). Sommer used observational methods to study how individuals chose and claimed territory in environments designed for people to work alone in the company of others. Sommer's work was replicated by Fishman and Walitt (1972) with similar findings. Although Sommer was studying environments designed and managed to discourage group activity, he suggested that libraries and their user communities might benefit from the addition of spaces that supported group learning and social interaction. He went so far as to suggest that providing food services would facilitate social interaction (Sommer, 1966). A more recent study of territorial behavior in libraries studied students in Israeli high schools (Shoham & Shemer-Shalman, 2003). The authors used observations and questionnaires, combined with interviews of library staff. The students who came to work individually showed seating behaviors similar to those observed in previous studies. Approximately a third of the students observed were seated with others.

Campbell and Shlechter (1979) used observational methods, behavioral diaries, and interviews to study user behavior at Watson Library, University of Kansas. Their study indicated several kinds of activities that users engaged in, and which parts of the library they chose to use. Six types of activities were observed: reading, writing, searching, passive behavior, talking, and other. The talking category was only 6% of the

observed behavior. Not surprisingly the primary activity observed was reading (54% of observations), the busiest floor was the first floor, and the busiest location was the current periodicals room. The authors justified their methodologies by noting that while "*library staff are already exposed to user behavior in terms of daily contacts and observations ...* h*owever, these casual contacts tend to be unsystematic and can yield a distorted view of the behavior and needs of library users."*

Potthoff and Montanelli (1990) reviewed behaviorally-based studies of library space issues. They advocated greater use of these methods because the physical features of a library have a great impact on the experience of library users. Their review found few research studies in the library literature. Potthoff *et al.* (2000) in a behaviorally-based evaluation of user perceptions of library space, used a role repertory grid procedure methodology.

In 1999 a large-scale behavioral research study was conducted in the central public libraries of Toronto and Vancouver (Given & Leckie, 2003; Leckie & Hopkins, 2002). The focus of the study was on how these relatively new buildings functioned as public space. The new libraries had high gates counts, with well over three million visitors a year, and the authors looked for additional evidence to determine if they were successful public spaces,. The researchers used four methodologies: a literature search to determine the intent of the building designers; a written survey; interviews; and unobtrusive observational surveys. The researchers found that the both libraries were active centers of the community and used by a broad cross section of the community. Over 75% of the visitors arrived as individuals, and over 80% of observed activity

involved people working as individuals. The predominant activity was reading (51-64% of observations), followed by writing (12-24%). Talking accounted for 12-20% of observations, despite an overall policy (and design?) discouraging that activity. The authors observed that *"talking as a behavior was often part of the patrons' generally studious activities in that the research team frequently observed a small group of patrons reading aloud from books, sharing written notes, and other 'talking' activities that were clearly conducive to research work"* (Given & Leckie, 2003). They concluded that the libraries studied may need to become more interactive places.

The McGraw-Page Library, at Randolph-Macon College, Virginia is the most recent site of an observational seating study in an academic library (Young, 2003). This study used interviews and unobtrusive observational methods to map the location and furniture preferences of library users. Young found that students were unevenly distributed throughout the library and had clear preferences in both furniture and location. One of the study's initial goals was to observe the relationships between student behavior, public space qualities, and learning. The author was forced to drop this part of the study because of the difficulty in distinguishing between different types of social behaviors using unobtrusive methods. Occupants of group study rooms, though counted, were also excluded from the observational study for similar reasons. Although many of the students were seated in groups, group activity went unreported on.

While researchers have successfully studied public group behavior using unobtrusive methods (Oldenburg, 1997; Whyte, 1980) it would be difficult to take a similar approach to study the activity that takes place in the collaborative spaces of an

academic library. Under circumstances where the researcher cannot be unnoticed and where so little is known about the activity of the study population an ethnographic-based methodology is called for (Creswell, 2003, p. 23). Ethnographic methods are carried out in a natural setting. They involve face-to-face interaction with participants, and accurately reflect the participants perspectives and behaviors (LeCompte & Schensul, 1999).

Chapter 3: Research Design and Methods

Case Study, Single Site

An objective of the study is to understand the nature of activity at a single study site. By concentrating on a single location, it was possible to maximize data collection at that site and gain a better understanding of the overall study and learning environment that existed on the campus. If the study used multiple study locations it could have diluted its focus both by emphasizing differences between different locations and generating less data at each location. The study itself provides a baseline of information and a tested methodology for comparing activity at other locations. The study used two principal data collection methods: observation and interviews. Additional sources of data included university publications, library building planning documents, and library-supplied metrics and survey data.

Institutional Site Criteria

The search for a study site focused on small to mid-sized schools with a population dominated by undergraduate students. The physical scale of the library on a small campus made it possible to observe all suitable locations in that facility instead of a sample of suitable locations that would have been necessary in a larger facility. The interpretation of the data would not be confounded by the possibility that students were in alternate library locations, as might happen in a multi-library system. It would also be easier to define and describe non-library space options for similar activities on campus. The preference for an institution that emphasizes undergraduate education also reflects an

interest in a study location with limits on the variables that influence student study patterns and study location selections. It is assumed that undergraduate research and study behavior is largely driven by coursework.

Library Site Criteria

The search for a campus with a suitable library focused on buildings designed after 1995. As Steven Foote's writings make clear, only after 1995 were librarians and architects able to factor the emerging web environment into facilities planning (Foote, 1995; 2004). Additionally, acquiring planning documents and gathering input from the planners of recent building projects would be easier.

Candidate sites for the field study were identified by reviewing the building issues of *Library Journal* and *American Libraries* from 1995-2005. Thirty two projects were identified and, from this list, ten potential sites in New England were identified (Appendix I). The short list was prioritized, with higher rankings given to newer facilities, facilities with published information about their spaces, and facilities which included collaborative spaces in their design. The size of the campus and characteristics of the campus population were also considered in the ranking process. The library directors at the four highest-ranked institutions were contacted about their willingness to participate in the study. Three responded and agreed to host a site visit. The three facilities were visited in August and September 2005. All three sites met the basic criteria for the study and all were willing to participate. The Douglas and Judith Krupp Library at Bryant University, Smithfield, Rhode Island (formerly Bryant College) was

chosen as the study site. See Chapter Four for a fuller description of Bryant University and the Krupp Library.

Observation

Observations were conducted by performing periodic *sweeps* of the library over the course of a day, between 10:00 am to 9:30 pm. A sweep is an observation method that uses a pre-determined schedule of sampling times instead of a randomized schedule. A modified version of Given and Leckie's (2003) checklist of possessions, activities and user characteristics was used to record observations (Table 1). The nature of the spaces chosen for study made it impractical to observe people using unobtrusive methods. The study employed a more participatory style of data collection typical in ethnographic studies (LeCompte & Schensul, 1999). Library management circulated a campus-wide announcement describing the study and posted signs and tent-notices in the study area. Emails and notices provided a URL to a web page that described the research project and researcher contact information. The observer was clearly identified with a name-tag.

Sweeps were conducted at fixed times throughout the day, covering the library's operating hours between opening and midnight: 10:30 am; 2:30 pm; 5:30 pm and 8:30 pm. Using pre-determined observation periods has been an accepted approach in recent academic library seating studies (Linn, personal communication 2005; Young, 2003). Eight days of observations were scattered throughout the Fall, 2005 semester. There was no intent to compare activity levels and patterns between different parts of the academic term. The days and dates selected avoided less active calendar dates and days of the week, and were determined in consultation with library staff. The beginning and end of

the semester were not sampled, because atypical activity patterns were expected. Moreover, end-of-term data collection would have been too disruptive to the user community.

Table 1. Sweep instrument

Location	Date	Time	Occupants	Interview	
	1st	2nd	3rd	4th	5th
Gender					
Activities					
Reading					
Writing					
Computing					
Phone					
Watching/sitting					
Eating/Drinking					
Sleeping					
Conversation					
Presentation					
Assembling					
Viewing					
Other					
Possessions					
Computer					
Notebooks					
Books					
Photocopies/ Handouts/posters					
Writing materials					
Food/drink					
Objects (list):					
Other (specify)					
Notes:					

All sweeps followed the same route through the library. The route began at one of four different starting points for each sweep. The four starting points were: first floor, north side; first floor, east side; first floor, couches; and second floor, first study room. The sweep starting cycle was determined prior to the start of data collection, by randomly picking numbers corresponding to shifts. Further details about data collection procedures are described in Appendix 2.

Interviews

Interviews were conducted during the observation sweeps. All occupants at a selected location were interviewed. The interview consisted of eleven questions, and allowed for follow-up and clarification questions (Table 2). Interviews took between two and five minutes per location. Any user or group was interviewed only once during a day, but some individuals were interviewed more than once during the study. The sampling strategy provided nine to ten potential interview locations per sweep, with a minimum of six locations interviewed per sweep.

The sampling pattern for interviews was determined during a pre-sweep inventory of occupied spaces. If the pre-sweep scan had thirty-six occupied locations, then every fourth occupied station was approached for an interview. The location of the station for the first interview was also randomized, using a pre-determined randomly-selected number between one and four. Interviews were recorded with a digital voice recorder, and transferred to a laptop at the end of each day. Appendix 3 contains additional information about the interview procedure.

Table 2. Interview instrument

Observed Information
- Date
- Time
- Location
- Size of Group
- Gender

Personal and Demographic Information
- Enrollment status?
- Are you a transfer student, and if so how long have you been here?

General patterns of library use
- How often do you come?
- Estimate what percentage of your overall study takes place in the library? [*added to instrument, October 24, 6th sweep of study*]
- Where do you generally like to work in the library? Second choice?
- Where else do you do school work besides the library?

This visit:
- Why are you here?
- Including time spend already how long do you expect to be here? [*added to instrument, October 17th, 3rd sweep of study*]
- Why did you select this specific spot?
- What do you like about this space?
- What would make this spot better, or the library in general a better place to study?

Other thoughts and comments.

Field Study Site Preparation

After the first site visit, a second pre-study site visit to Krupp Library took place in September, 2005. Staff were interviewed about library use in general and use of collaborative spaces specifically. A detailed seating inventory was done. The sampling route was determined. The observation instrument was pre-tested, and the interview script was pre-tested with library staff. Library administration provided workspace in the staff area to use between sweeps.

Data Collection Strategy

Sweep data were collected during eight days scattered between October 17 and December 7, 2005 (Appendix 2). Sample days were Sunday to Wednesday with two dates of each weekday sampled during the study. Interviews of library staff indicated that Friday and Saturday had less activity that other weekdays and the researcher was unable to schedule Thursdays during the sample period. The library opened at 12 pm on Sundays, and only three sweeps were done on the Sunday site visits.

A pre-sweep scan began twenty minutes prior to the sweep starting time. Location occupancy was recorded on a sweep summary form and interview sample frequency was determined. During each sweep occupied stations were marked on a floor map and an observation form completed for each occupied stations. Interviews were recorded with the voice recorder along with notes taken on the observation form. At the end of a sweep the sweep summary form was completed and data forms were cross-checked with the floor maps (Appendix 4). Notes about the sweep, independent of individual station observations were also recorded on the summary sheet.

In addition to observations and interviews, additional data was acquired from the Bryant University Fact Book (2004-2005), library supplied activity and facilities metrics, the Bello Center building program document, and the comments from a library-sponsored LibQUAL survey from Spring, 2005.

Methods of Data Analysis

The researcher entered data from the observation sheets and interviews into an Excel spreadsheet with a separate worksheet for each sweep. Each observed individual

was a separate entry. If there was a group of three people at a location, three entries for that location and sweep would be entered. Open-ended interview responses were entered while simultaneously listening to recordings and reading notes from the observation sheets. Several types of open-ended responses were converted to coded responses: non-library study locations, reasons for being in library, preferred locations, and why respondents chose the location they occupied. Of fifty data fields, forty-three called for coded responses and seven requested open-ended responses (Appendix 5). Of the forty-three coded fields, five were constant for each observed station.

Nine interviews were lost in the recording and downloading process, leaving only notes for analysis. The sound quality was generally good for most interviews but for some of the group interviews individual respondents were more easily identified through the notes. Worksheets were consolidated, at first by day and finally into a master worksheet containing all observed individuals. The master worksheet was imported into the Statistical Package for the Social Sciences (SPSS for Windows, version 12). All of the descriptive and comparative statistical analyses were run in SPSS.

A second Excel spreadsheet was created using the sweep summary data. This data set was used to analyze occupancy patterns using the station observed rather than the individuals present at each station as the unit of analysis. This data was also imported into SPSS to describe and analyze station occupancy patterns.

Open-ended responses that fell into *Other* categories (Other Possessions, Other Activities, Other Places, and Other Why-are-you-here) were summarized, grouped, and are described in the results sections. Open-ended responses to questions about likes and

dislikes of the spaces and library were numerous but the majority could be grouped into categories and are summarized in the results section. The notes field contained both observation notes and interview response data. Information in these notes were consolidated and selectively mined for use in the results and discussion sections.

Study Limitations

This study is limited to a single site. It does not lead to generalizations about collaborative activity patterns at other libraries, since the activities observed were influenced by the nature and curriculum of the particular institution, and by the physical attributes of its library. The study's duration was a single semester, and the sampling strategy deliberately avoided both the beginning and end of the academic term. The researcher had no control over a variety of factors that might influence library use, such as unanticipated events in the academic calendar. There were no weather or news events during the study that had a noticeable impact on library use. The study examined a subset of the library's public space, and few conclusions can be drawn about activity that occurs in the other public spaces in the library.

Interview subjects were limited to willing participants, but with an acceptance rate of 92%, the interview population is likely to be very similar to the observed population.

The facility had excellent sightlines for observations, but it could be difficult to record accurately possessions and behaviors in group settings, particularly for groups in study rooms.

Human Subjects Review

All research involving human subjects must be reviewed and approved by the Simmons College Institutional Review Board. The investigator completed the appropriate procedures for Human Subject Review at Simmons College. There was no stipulated requirement for informed consent because no personal information was collected from project participants. The library director at Bryant College also received permission from Bryant University to waive a formal informed consent process.

Chapter 4: Site Selection and Description

Study Site Selection

The Douglas and Judith Krupp Library at Bryant University, Smithfield, Rhode Island was the selected study site. Both the library and the university are a good fit to with the site selection criteria described in the previous chapter. A primary factor favoring this site was the scale and layout of the library. About 70% of its seating is allocated to collaborative space, and the library's layout clusteres different seating types in different zones. An open floor plan and sight lines made the space well suited for observational research.

Bryant University

Bryant University was founded in 1863. A university since 2004, it offers both bachelor's and master's degree programs and is organized into a College of Arts and Sciences and College of Business. Over 3,000 undergraduates and close to 500 graduate students were enrolled at the time of the study (Bryant University, 2005). The College of Business awards over 95% of undergraduate degrees. Seventy-eight percent of undergraduate students live on campus. The male to female enrollment ratio is 60:40. The average combined SAT scores for incoming freshmen are 1114. The campus was first occupied in 1971 when Bryant College moved from Providence to Smithfield. It occupies nearly 400 acres and the central building complex is surrounded by open green space. The campus quad contains the Bello Center, an athletic facility, a student center and the largest building on campus - the Unistructure - includes administrative offices

and programs and most classrooms. The George E. Bello Center for Information and Technology, which contains the library, is the newest major facility on the campus. Table 3 summarizes selected statistics about Bryant University.

Bryant University has given all full-time undergraduates laptop computers for at least four years and the entire undergraduate student body has them.

Table 3: Bryant University statistics, from 2004-2005 Fact Book.

Bryant University		
Total Enrollment	3,518	
Undergraduates	3,047	87%
Graduate Students	471	13%
Male	2,111	60%
Female	1,407	40%
On Campus *	2,377	78%
Off Campus*	670	22%
Average SAT Score**	1114	
Campus Occupied	1971	

* Undergraduates only
** Freshman class

Krupp Library and Bello Center

The George E. Bello Center for Information Technology and the Douglas and Judith Krupp Library opened in 2002. Built by Gwathmey, Siegel & Associates, the Center occupies a total of 72,000 square feet, and had a construction cost $26 million. The Krupp Library is the largest unit within the Bello Center. The combined facility contains administrative offices, the library, conference rooms, dedicated classrooms, a café, and a multi-purpose Grand Hall/rotunda. The conference rooms and classrooms are housed within the library. The Krupp Library occupies 62,000 square feet and has 446

public seats. Information technology and library services are combined in a single administrative unit.

The building program document for the Bello Center and Krupp Library is explicit about creating student-centered learning spaces and places for collaboration. The group study rooms are described in the building program as collaborative studies (Michaels Associates, 2000). In addition, the large tables on the main floor are designed for group work. The architects justified the deployment of oversized four-person tables, because the more typical footprint of a four-person table does not support multiple users working with a combination of computers, notebooks and books at the same time:

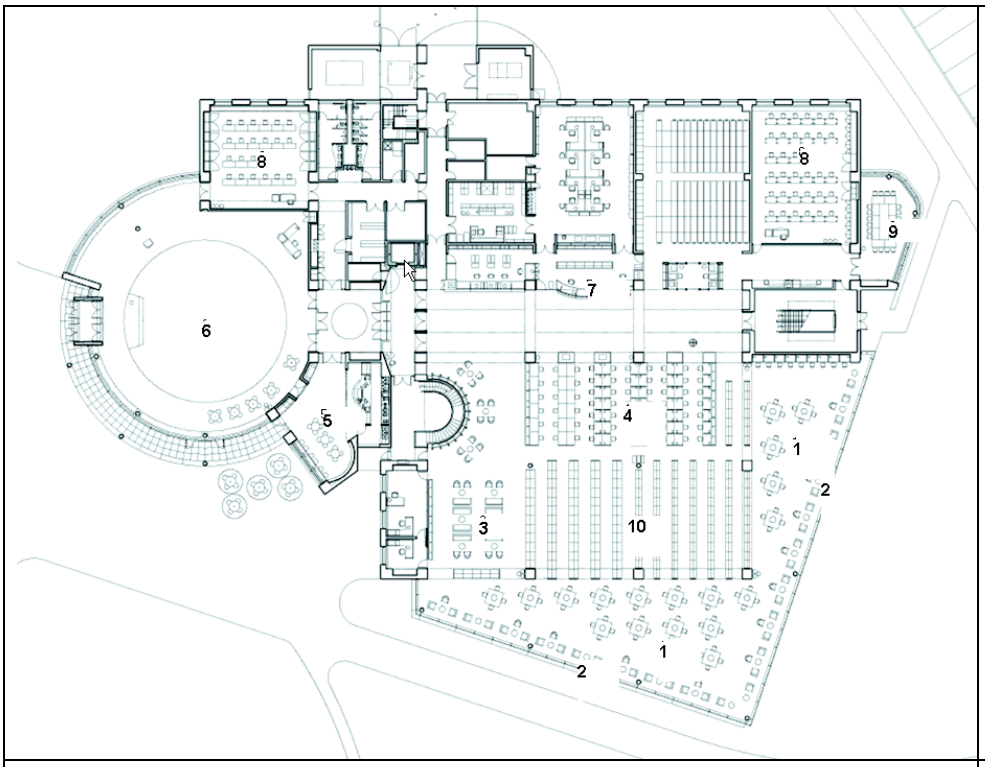
> *One of the reasons, besides pure territoriality, for a single user to consume one-half or an entire four-place table is that a typical four-place table allows only a two foot by three foot space per person for materials.*

The program offers a variety of public seating types to accommodate differing learning styles.

> *Learning may take place in discussions over coffee in the café, while watching late–breaking news on a large screen, while taking a break from reading or searching the web with a friend around the mezzanine of the Grand Hall, or while perusing the latest issue of a popular magazine. In the new Bryant library, a wide variety of client seating is suggested which should satisfy the needs for . . . different learning styles for individuals and for groups.*

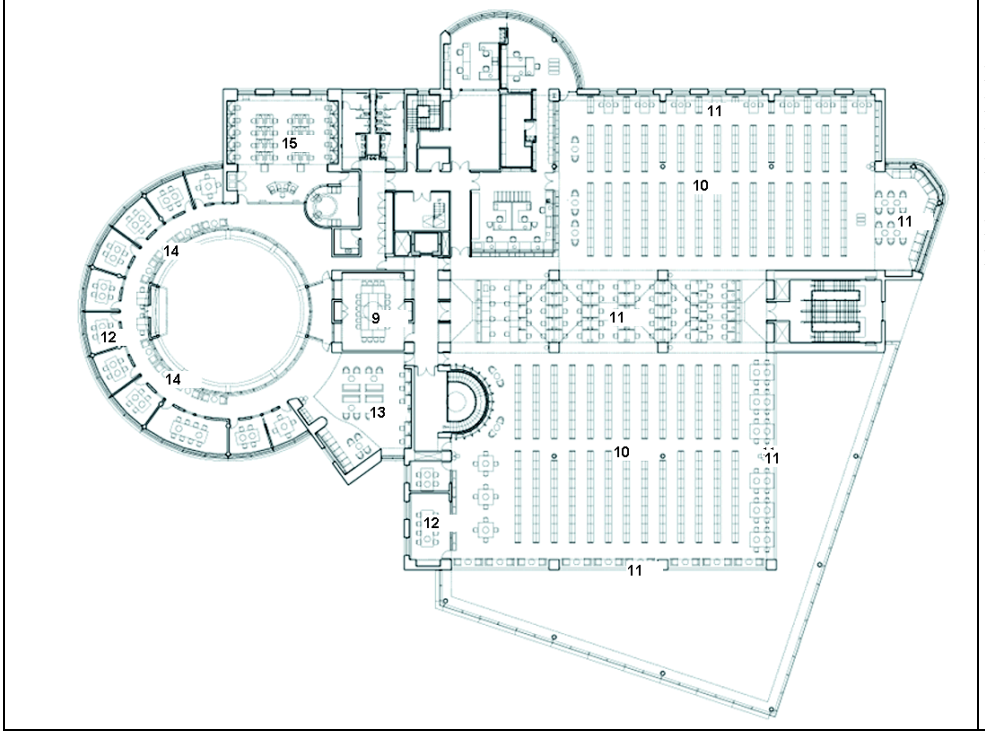
The library occupies two floors. Two outside walls are glass, with blinds starting at six feet above the floor. The view looks out onto a grassy quad with a pond, fountain, and views of the other academic building complexes. The outer section of the first floor is a two-story atrium. The second floor opens into the atrium like a balcony overlooking the first floor (Figure 1). The balcony proved to be an excellent vantage point for observing activities on the first floor. Table 4 summarizes selected library statistics.

Figure 1: Bello Center and Krupp Library floor plans, first and second floor



First Floor

1. Tables
2. Window Seats
3. 1st Floor Couches
4. Information Commons
5. Café
6. Grand Hall
7. Service Desk
8. Classrooms
9. Conference Rooms



Second Floor

10. Collections
11. Quiet Seating
12. Study Rooms
13. 2nd Floor Couches
14. Soft Seats
15. Financial Markets Center

The library's first floor houses service desks and staff offices, two dedicated classrooms, and one classroom/conference room. The first floor contains current journals, the reference collection, and microforms. Public seating is organized into four zones: Information Commons, large tables, soft window seats, and a soft seating area adjacent to the reference collection and current journals. The library's entrance opens into the multi-purpose Grand Hall and a small café.

The second floor houses staff offices and a conference room, and contains circulating book collections. Public seating around the collections is a mix of long tables with individual seating stations, tables suitable for small groups, pairs of soft seats around the edge of the balcony, and clusters of soft seating. All seating in the collections area is designated for quiet study. Students refer to it as the *super quiet* study space. Around the Grand Hall are study rooms. Pairs of soft seats line the inside wall of the study room corridor. A dedicated computing facility called the Financial Markets Center (FMC) operates as both a classroom and lab space. Another soft seating area is located between the Grand Hall and the main reading area on the second floor.

Table 4: Krupp Library statistics. 2005-2006

Krupp Library	
Opened	2002
Size	62,000 sq ft
User Seating	446
Cost	26 million
Print Volumes	144,000
Journal Subscriptions	550
Electronic Journals	26,000
Staff	13 FTE
Gate Count	368,409
Circulation	25,000

Krupp Library's Collaborative Spaces

Types of spaces: The collaborative spaces selected for study were of three types: table seating, soft seating, and study rooms. Organized into six zones they contained seventy-two locations and 282 seats, sixty-three percent of all library public seating. Figure 2 shows each type of seating zone.

Total First Floor seating: Three collaborative seating zones, forty-five locations, 168 seats.

- **Window seats:** These are arranged around the perimeter windows**:** seventeen clusters and fifty seats. Sixteen have three seats and one low table. One had two seats and two tables. Each table has two network and two power outlets.
- **Couches:** These are arranged near offices and current periodicals: nine clusters, forty-two seats. Three have two seats and one table; four have a sofa, three chairs and one table. Two clusters had two sofas and one table.
- **Reading room tables:** These are arranged between outside walls and stacks area: nineteen tables, seventy-six seats; four seats per table.

Figure 2: Collaborative seating zones.

Figure 2a: 1st Floor Tables

Figure 2b: 2nd Floor Couches

Figure 2c: 1st Floor Window Seats

Figure 2d: Study Rooms

Figure 2e: 1st Floor Couches

Figure 2f: Seats Outside of Study Rooms

Second Floor: Three collaborative seating zones, twenty-seven locations, 114 seats.

- **Study & Seminar Rooms.** Thirteen rooms, sixty-two seats. Eleven are around the Grand Hall, with ten rooms seating four, and one room seating eight. Two additional rooms are located off second floor stacks. One seats four, and the other seats ten. Study rooms were highly valued and sought after by students. Library policy gives groups priority for these spaces to help manage demand for them. In mid-November, 2005 signs specifying the policy were posted on the doors of all the study rooms.
- **Seats outside of study rooms:** Eight pairs with small table, sixteen seats. The pairs are arranged along the wall overlooking the Grand Hall across the hall from study rooms.
- **Couches:** Six clusters, thirty-six seats; one four chair and two end tables; four clusters containing one sofa, two chairs, and one table; one soft bench with six seats and no power outlets or tables. Ceilings are eight to ten feet in height.

Possible Collaborative Spaces Excluded from Study

Café: A small space with tables for individuals and small groups, used for social activity and study, the café lies outside the library's security gates and was an awkward space for both observation and interviews. Although study and learning occurs in the café, it is mostly a social space.

Grand Hall: A large open, multi-use space, the Grand Hall, often used for organized functions, also functions as an overflow and after-hours work area. Group tables for the

Grand Hall were sporadically deployed in an inconsistent pattern. The Grand Hall lies outside the library's security gates.

First floor seminar room: This room, a multi-use facility, is used for both classes, and made available to individuals and groups when not otherwise scheduled. It normally seats thirteen, but additional seating is available in the room. This location, originally part of the observation study, was later excluded because of the frequency of scheduled activity in the space.

Information Commons: The Information Commons, a cluster of sixty stations, located in the middle of the first floor of the library, was actively used, and often contained small groups of people working together. The library administration considered the space suitable for collaborative activity, and it was so described in the building program. Ultimately, the area was excluded from the study because the station placement and design were based on a one user/one computer arrangement. While this arrangement did not prevent people from working together, it made it difficult to incorporate this area into the study design.

Financial Markets Center: This specialized computer lab is used for both classes and lab activity. The FMC is a supervised space and open only when staff are present. The study guidelines exclude supervised spaces.

Chapter 5: Observation and Interview Results

Table 5 summarizes the scale of the data sample. Of the 2160 station observations, 50% were occupied, and groups were using 50% of the occupied stations. There were 1937 individuals observed, and 71% of the individual observed were in groups. Twenty-one percent (403) of the individuals observed were interviewed.

Table 5: Study results summary

	Number	Percent
Sample days	8	
Sweeps	30	
Stations observed per sweep	72	
Total station observations	2160	
Occupied locations	1084	50% of locations
Unoccupied stations	1076	
Individuals observed	1937	
Groups	537	
Individuals in groups	1379	71% of observed individuals
Individuals interviewed	403	21% of observed individuals
Locations interviewed	217	20% of occupied locations
Locations declining interviews	18	8%
Males	1130	58%
Females	807	42%

Population Characteristics

The observed population in the collaborative spaces is similar to the overall campus student population in a number of ways. Within SPSS, Chi-square was used to compare observed and expected frequencies and there were no significant differences between the collaborative space sample and the campus population when compared by gender or by residence (on-campus or off-campus). The Chi-square test comparing enrollment status against expected proportions of campus population revealed that first-

year and second-year students were underrepresented, third-year students were over-represented and fourth-year students were at expected numbers (Table 6). Because of the small sample size graduate students were not tested by Chi-square, but were also underrepresented (3% observed % *vs* 14% of campus population).

Only two percent of the individuals interviewed (9) were not Bryant students. These individuals included students at other schools who liked to study in the facility, friends of students who were visiting or helping them, and alumni. No faculty or staff were interviewed during the study. Observed, but not interviewed was a father, who appeared to be doing his school work while supervising his children. On a few other occasions there were study room occupants who seemed to be staff or faculty, but were not part of the interview rotation, so their status remains unknown.

Table 6: Enrollment status of observed population, with Chi-square comparison of expected frequency.

Enrollment Status	**Frequency**	**Percent**	**Expected**	**Residual**
Freshman	70	17%	98	-27.5
Sophomore	80	20%	98	-17.5
Junior	145	35%	98	47.5
Senior	95	23%	98	-2.5
Graduate	11	3%		
Other	9	2%		
Total	**410**	**100%**		

	Undergraduates
Chi-square	34.103
Degrees of Freedom	3
Significance	.000

Occupancy

Overall occupancy of the collaborative spaces was high, with 50% of the observed stations occupied during the study (Table 7). Groups occupied 25% of all

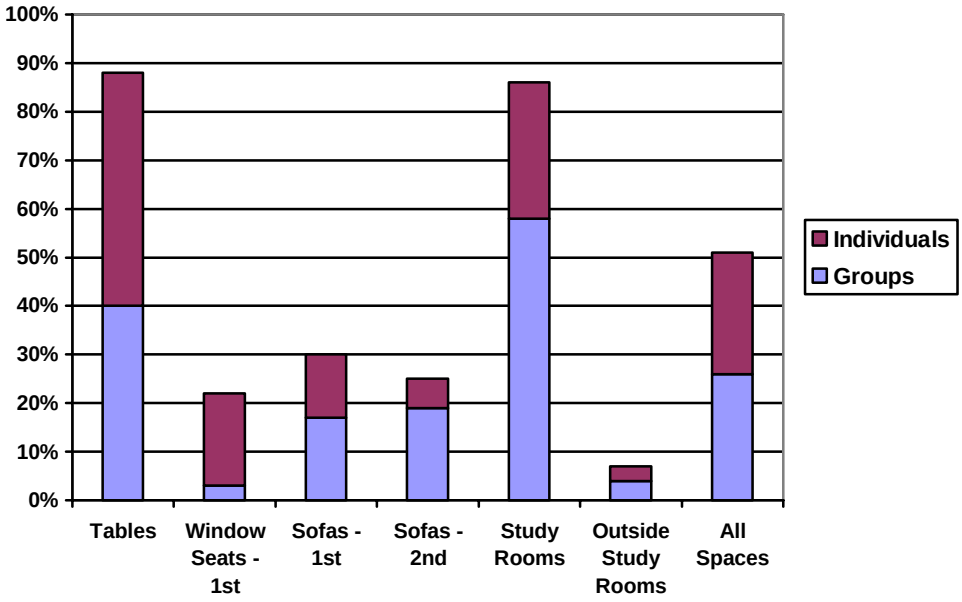
stations (half of the occupied stations). Occupancy counts include stations that were claimed by possessions but lacking individuals at the time of observation. When data for individuals was entered, these stations were marked as unoccupied creating minor discrepancies in occupancies when comparing station data and individual data (eight more individual records, and 24 fewer groups when only stations with people present were counted).

Table 7: Summarized occupancy patterns by seating zone.

Zone	Stations	Individual	Groups	Unoccupied	% Individual	% Group	% Occupied	% Unoccupied
Tables	570	274	229	67	48%	40%	88%	12%
Window seats	510	98	13	399	19%	3%	22%	78%
1st floor couches	270	51	28	191	19%	10%	29%	71%
2nd floor couches	180	11	26	143	6%	14%	21%	79%
Study rooms	390	105	227	58	27%	58%	85%	15%
Seats outside study rooms	240	10	12	218	4%	5%	9%	91%
Total	**2160**	**549**	**535**	**1076**	25%	25%	**50%**	**50%**

Figures 3 and 4 illustrate overall occupancy patterns by zone and the zone occupancy patterns by sweep. Occupancy rates of zones varied from a low of 9% for the soft seats outside the study rooms to 85% and 88% for the study rooms and the tables respectively. Substantial variation characterized the balance between individual and group use between zones. For example, a 2:1 ratio of groups to solitary users in the study rooms, contrasts markedly to a 1:6 ratio of groups to solitary users in the first-floor window seats.

Figure 3: Summarized occupancy by zone.



Using One-way ANOVA comparisons there were statistically significant variations in occupancy patterns between zones in both overall occupancy and occupancy by groups ($p<.001$). No significant differences were found in overall station occupancy between sweeps, but Table 8 shows that there were significant differences in station occupancy by groups between sweeps ($p<.001$). There were fewer groups in the morning sweep with occupancy at 8% of all stations. By the evening sweep the group occupancy rate had increased to 31%. The afternoon sweeps had group occupancy rates of 22% at 2:30 pm, and 25% group occupancy at 5:30 pm

Figure 4: Zone occupancy by sweep

Figure 4a: Occupancy by zone, 10:30 am

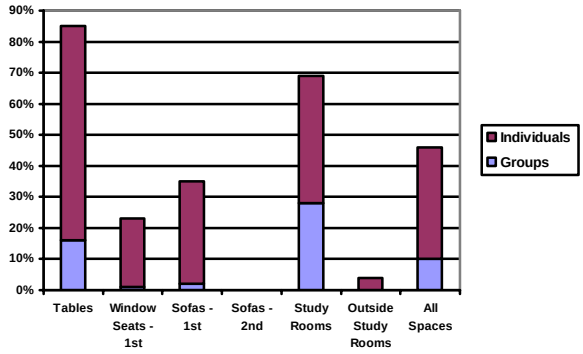


Figure 4c: Occupancy by zone, 5:30 pm

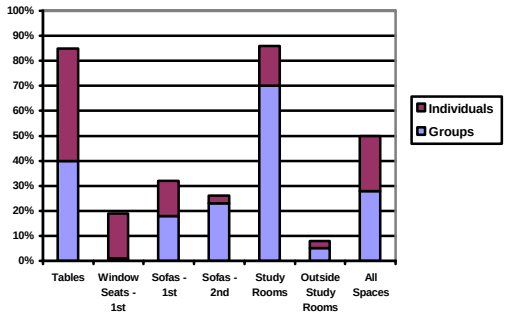


Figure 4b: Occupancy by zone, 2:30 pm

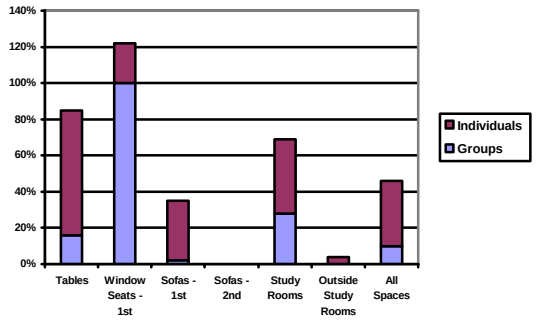
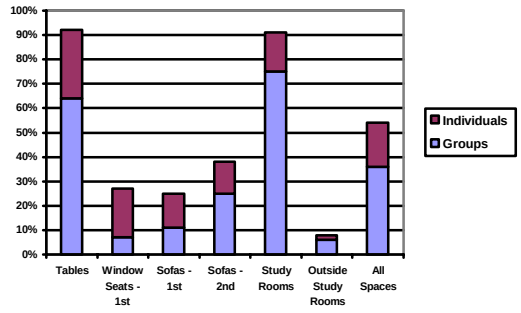


Figure 4d: Occupancy by zone, 8:30 pm



Occupancy by individual location is summarized in Appendix 6. The occupancy patterns within each zone were generally consistent. An exception was the relatively low occupancy of study room 215, which at 57% was substantially less than the 86% mean for the study rooms. Room 215 was the largest study room, seating ten people, and its size may have made it less attractive for communal work to smaller groups.

Table 8: One-way ANOVA comparing variation in station occupancy by groups between sweeps.

Descriptives
Percent Locations Group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
10:30 am Sweep	36	.07804	.127907	.021318	.03477	.12132	.000	.539
2:30 pm Sweep	48	.21793	.227999	.032909	.15173	.28413	.000	.769
5:30 pm Sweep	48	.24824	.257131	.037114	.17357	.32290	.000	.846
8:30 pm Sweep	48	.31371	.324277	.046805	.21955	.40787	.000	1.000
Total	180	.22358	.261589	.019498	.18510	.26205	.000	1.000

ANOVA
Percent Locations Group

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.183	3	.394	6.273	.000
Within Groups	11.066	176	.063		
Total	12.249	179			

Preferred Location

Interview data about preferred seating locations closely matches the most frequently occupied seating locations; the study rooms (35%) and the first floor tables (39%). The second floor quiet zone (11%) and the Information Commons (8%) were also mentioned by a number of interviewees as their first-choice seating location. Figure 5 shows the distribution of stated seating preferences of people interviewed. Interviewees were asked to state a second choice for seating preference (Figure 6). The

second floor quiet zone (27%) was most frequently mentioned, followed by the study rooms (26%), tables (21%), and the Information Commons (16%). First floor window seats were mentioned as a second choice by 5% of people, while the couch zones on the first and second floor and soft seats outside of the study rooms were mentioned by fewer than 2% of individuals.

Figure 5: Preferred working locations of collaborative space users.

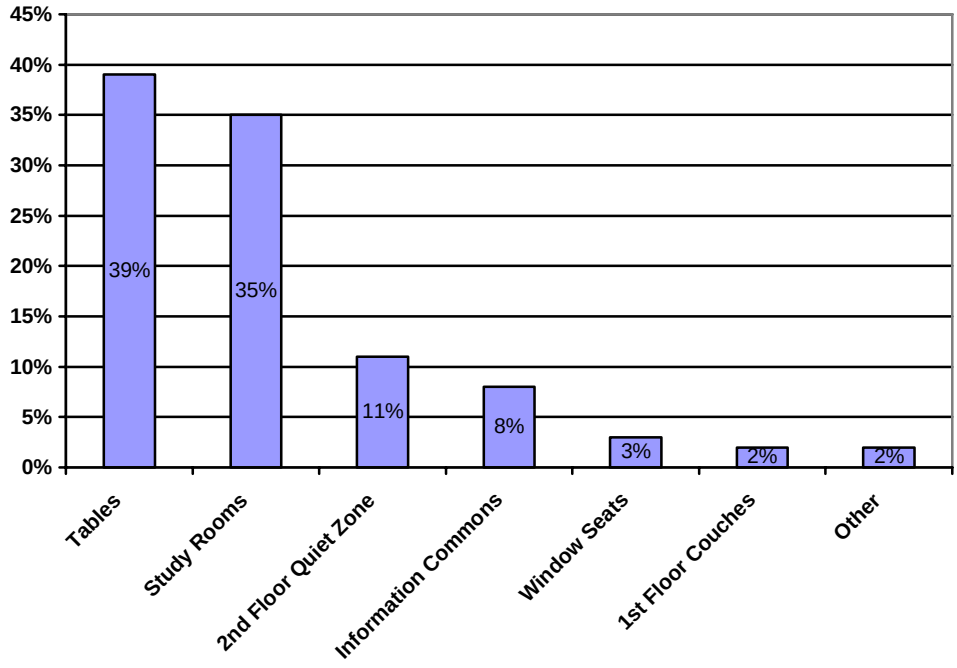
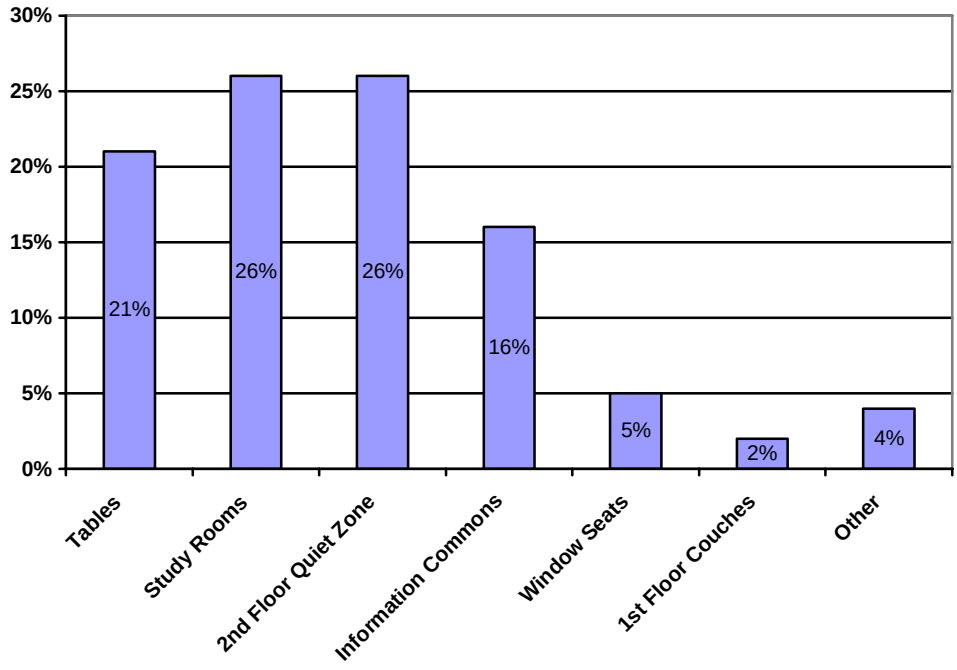
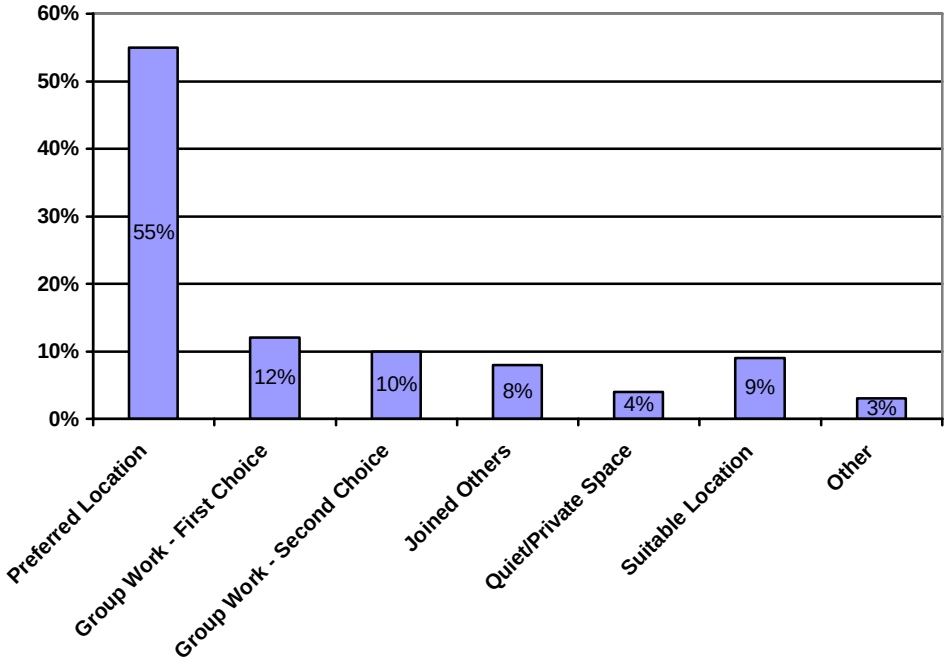


Figure 6: Secondary preferences for working locations by collaborative space users.



Fifty-five percent of those interviewed chose their location because it was their preferred working location (Figure 7). The need for group work space drove the location choice of 22% of people interviewed, with 12% occupying their first choice for group activity and 10% choosing their group work location because their first space option was full. Other reasons provided for choice of work locations included locations they considered suitable, but not their preferred location (9%), joining others who has already selected a space (8%), the need for a quiet or private space (4%); the rest provided some other explanation (3%).

Figure 7: Why did you select this spot?



User responses to what they liked and what could be improved about the spaces they were using provides explanations about and context for preferred seating choices (Tables 9 and 10). Respondents could provide multiple answers to each question, so the number of responses exceeds the number of interviewees. Users liked spaces that were quiet, private, and with limited distractions. They also needed spaces that supported group work and discussion. They valued the generous workspace provided at the oversized work tables and in the study rooms, as well as the network and power support for personal computing provided in these spaces. Several mentioned proximity to a variety of library-supported services, such as the collections, copiers, and public printing as an attractive aspect of their selected location.

Table 9: Positive aspects of the facility and collaborative spaces.

Likes	**Responses**	**Percent**
Quiet location	64	14%
Can talk	63	14%
Good workspace. Can spread out	58	13%
Lack of distractions or private	49	11%
Comfortable space and furniture	40	9%
Laptop support – power, wireless, network jacks	31	7%
Can work in group	24	5%
View	23	5%
Study ambience	21	5%
Good meeting location, visible to others, and others visible	18	4%
Access to library resources – books, copiers, computers, printing, whiteboard, cafe	17	4%
Good light, lack of glare	14	3%
Open floor space	13	3%
Suitable or available space	12	3%
Not isolated, or some welcome distraction	8	2%
Variety of space options	4	1%
Total	**459**	100%

Interviewees noted that the library facility as a whole supported their work and study. They described it as a central location, where it was easy to find and meet others engaged in similar work. The open sight lines of the facility helped them to find and meet others easily. Many respondents mentioned that they liked the views and the overall study ambience that existed in the library. Some found a certain level of distraction useful. Students were comfortable in the spaces provided, and liked the variety of space options available.

The majority of suggestions for facility improvements related directly and indirectly to building capacity. Forty-four percent of suggested improvements were for increased study space, the majority mentioning either study rooms or tables. Specific capacity issues generally concerned a perceived need for additional group space. Many

respondents noted the privacy value of the study rooms. Some suggested creating smaller cubicle-style spaces to accommodate solitary users and pairs.

A majority of the indirect negative responses about building capacity involved suggestions about noise and crowding. The noise issue derives from both capacity and building design. Study rooms in particular are not as quiet as people have would liked because connecting air flow vents between rooms also carry sound. Similarly, the open floor plan of the library allows sound to carry from the first floor up to the quiet reading areas on the second. The noise issue also relates to the number of people using the library. In the mornings, with fewer people and fewer groups, the library is much quieter than in the evening when occupancy is higher and there are more groups. The resulting increase in conversation among these groups increases overall noise levels in the library. The tension between solitary users and groups produced numerous suggestions about improved enforcement of study room policies. These policies gave room use priority to groups but were sometimes disregarded by solitary users. Remaining comments about facilities improvements concern issues of hours, climate control, lighting issues, building and furniture design, and a small number of miscellaneous issues.

The comments about the facilities, both positive and negative are echoed by the comments supplied in Bryant Library's LibQUAL survey from Spring, 2005. That survey's 114 open-ended comments about the facilities tended to be more negative (87%). Unlike the study interview which explicitly asked for both positive and negative comments, the LibQual survey did not solicit open-ended responses about the facility. In the LibQual survey the primary concerns about the facility were space capacity and

configuration (25% of all facilities responses), noise problems (24%) and hours (21%). Positive comments were generally non-specific, and the comments about hours were indirectly positive about the facility itself, since users were asking for increased access to the library.

Table 10: Suggested improvements for the library and collaborative spaces.

Category	Responses	Percent
Capacity issues	**126**	**45%**
More study rooms	54	19%
More tables	29	10%
More user space	14	5%
More space for group work	13	5%
More space for individuals	10	4%
Small rooms for individuals and small groups	6	2%
Management and infrastructure issues	**131**	**47%**
Noise in library	39	14%
More hours or 24 hours space	21	7%
Climate control	16	6%
Crowding and distractions	16	6%
More power jacks, improve computer support for wireless, printing, Information Commons layout and capacity	16	6%
Manage use of study rooms	14	5%
Sun glare issues, improve lighting	9	3%
Other	17	6%
No complaints/suggestions	**24**	**9%**
Total	**281**	**100%**

Possessions

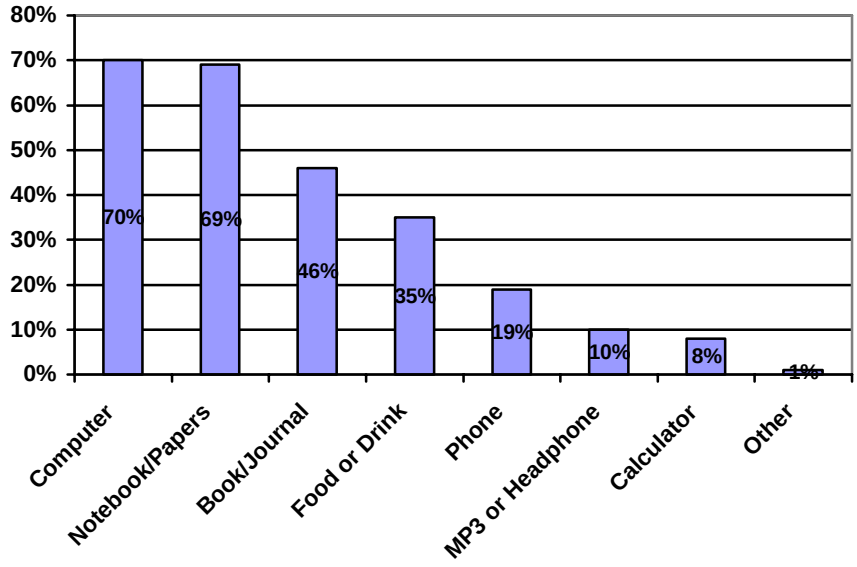
Figure 8 shows the distribution of the visible possessions users had in their workspace. All full-time undergraduates at Bryant are given laptop computers and 70% were observed with laptops. A similar percentage of users had notebooks or papers (69%), and 46% had books. Notebooks and papers is a large category that includes loose-leaf and spiral-bound notebooks, printed handouts, written notes, and note cards. It was not possible to reliably distinguish between personally-owned and library-owned books, but most of the books appeared to be student-owned textbooks.

Drinks and food were frequently observed possessions (35%), with drinks more common than food. Cell phones were also frequently observed (19%), while 10% had MP3 players or headphones, and 8% had calculators. Posters (9 observations) were the most frequently noted possession on the *Other Possessions* category.

Using SPSS's cross tabulation analysis the Pearson Chi-square test compared the frequency of possessions against both zone and sweep time. These comparisons were run for the most commonly observed possessions: computers, notebooks or papers, and books or journals. When compared by zone, there were significant differences in the patterns of possessions for all three categories of possessions: computers ($p=.024$), notebooks or papers ($p<.001$), and books or journals ($p<.001$). The differences in expected frequencies were between the tables and study rooms compared with the soft seating zones. The soft seats had less working space and people in them generally had fewer possessions on display, so they might have a book or they might have a computer, but were less likely to have both. People working at tables and in study rooms were more

likely to have multiple possessions on display, and thus a higher percentage of any given item.

Figure 8: Observed possessions



A Pearson Chi-square cross tabulation compared the same categories of possessions with sweep time and a significant difference emerged in computer possession (p=.039). The observed differences between sweeps was due to the lower percentages of computers observed in the morning sweep (59%) compared with the numbers observed in the later shifts (67-69%). There were no significant differences between shifts in the observed numbers of notebooks or papers, and books or journals. More results from the cross tabulation comparisons of possessions for both zone and sweep are found in Appendix 7.

Activities

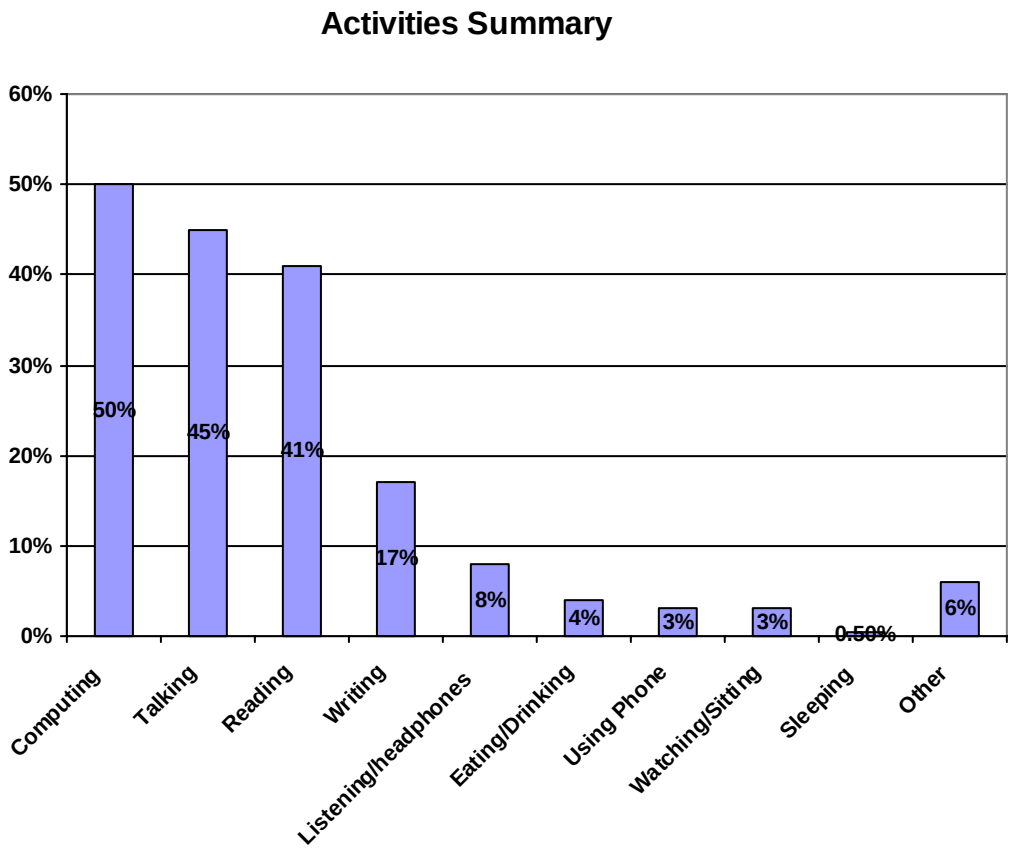
Laptop computers were the most commonly observed possession and computing the most commonly observed activity (50%). Figure 9 lists the distribution of observed activities. Personal computing could cover a wide range of actions including reading, writing, browsing, and recreational use, and no attempt was made to distinguish between these activities. Conversation was the second most commonly observed activity with 45% of individuals observed in conversation. Conversation was limited to individuals in groups and 58% of individuals who were part of groups were engaged in conversation (797 observations).

Pearson Chi-square cross tabulations compared the frequencies of the four most commonly observed activities (computing, talking, reading and writing) against both zone and sweep time. There were no significant differences in the frequency of computing either by zone or sweep time. There were significant variations in writing frequency by zone, with high frequencies observed at tables and in study rooms compared with the soft seating zones ($p<.001$). There was no significant variation in writing frequency by sweep time.

There were significant variations in talking and reading frequency compared against both zone and sweep time ($p<.001$ for all comparisons). Talking was most commonly observed in the study rooms and the couch zones on both floors, and least frequently observed at the study tables and first floor window seats. Comparing sweep times, talking frequency was lowest in the morning and increased throughout the day. Conversely, reading activity was highest where talking was lowest, at the first floor

window seats. It was more frequent in the morning when compared with the afternoon and evening sweeps. The full results of the activities cross tabulation comparisons for both zone and sweep are found in Appendix 8.

Figure 9: Observed activities



Eight percent of observed individuals were listening on headphones connected to MP3 players or their computers. It was not determined if this activity was recreational or educational in nature. While food or drinks were a common possession, only 4% of individuals were observed eating or drinking, while 3% were observed using a cell phone, and 3% were observed quietly watching and sitting. Only nine individuals

(0.5%) were observed sleeping. Other observed activities included leaving the location (43 observations), using a calculator, presenting to other group members, and standing at a location. The types and frequency of actions in the *Other* category are listed in Appendix 9.

Groups

Groups were characterized by size, gender mix, and group type. Gender mix patterns in group types were not unusual, with 50% of individuals in mixed gender groups and 50% in single gender groups (30% male, 20% female). Table 11 shows the distribution of individuals by group size. Most groups were small in size, with 72% of individuals in groups of two or three individuals.

Table 11: Group population by group size.

Group size	No of individuals	No of groups	Percent of individuals
2	552	276	40%
3	436	145	32%
4	244	61	18%
5	115	23	8%
6	30	5	2%
7	7	1	0.5%
Total	1384	511	100%

Groups were also characterized by the type of activity. Initially all group types were characterized through interviews, but starting with the November 6 sample period enough observations and interviews had been conducted that it became possible to characterize accurately many groups by observation only. Table 12 shows the distribution of individuals by group type. Thirty-six percent of individuals in groups

were engaged in separate study, sharing space but working on different tasks. Groups that were engaged in cooperative study were actively working together but doing work that was individually assessed, such as a test or homework. The largest cohort of group participants were individuals engaged in group projects, school work that had a group assessment component: 39% of individuals observed.

Table 12: Group population by group type

Group type	**No of individuals**	**Percent of individuals**
Study separately	315	36%
Study cooperatively	212	24%
Group work	338	39%
Social group	14	2%
Total	879	100%

Pearson Chi-square cross tabulations compared group types (excluding social groups) against both zone and sweep times. There was significant variation in the frequency of group types compared against zone ($p<.001$). Table 13 summarizes the comparisons for the zone and sweep frequencies. In the zone comparison, the frequency of project groups was lowest at the first floor tables and window seats (19-20%), and highest in the first and second floor couch areas (63-80%). The highest percentage of groups engaged in separate study was at the first floor tables (56%) and lowest in the first and second floor couch areas (5-8%). The least variation between zones was observed for groups engaged in cooperative study and ranged from a low of 12% at the first floor couches to 40% at the first floor window seats. Figure 10 shows the summarized distribution of group type by seating zone.

When compared by sweep time there was also a significant variation between group types (p=.037). The frequency of project groups was highest during the two afternoon shifts (42-45%), and lowest during the morning shift (30%). The range of variation between sweep times for groups engaged in individual study was small (34-39%), and the variation in groups engaged in cooperative study varied from a low of 20% (2:30 pm sweep) to a high of 34% (10:30 am sweep).

Figure 10: Group type by seating zone.

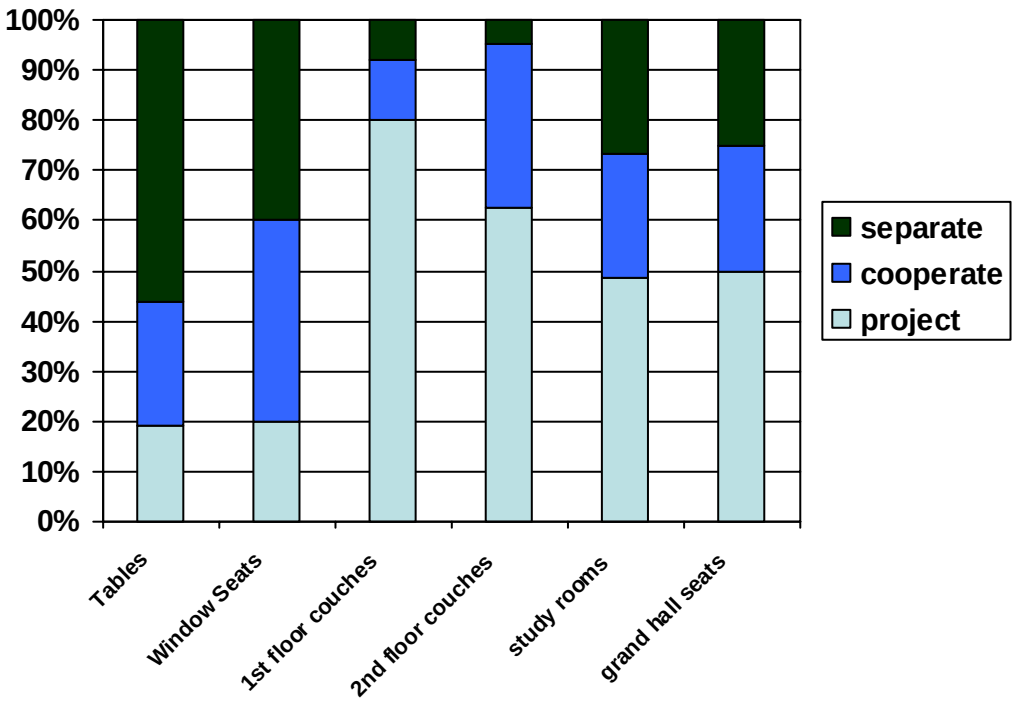


Table 13: Cross tabulation comparison of group type with zone and sweep time. Group type excludes the social group category.

Library Zone * Group Type - Non Social

Crosstab						
			Group Type - Non Social			Total
			study separately	study cooperatively	group work	
Library Zone	tables	Count	201	90	68	359
		% within Library Zone	56.0%	25.1%	18.9%	100.0%
	window seats	Count	4	4	2	10
		% within Library Zone	40.0%	40.0%	20.0%	100.0%
	1st floor couches	Count	5	8	52	65
		% within Library Zone	7.7%	12.3%	80.0%	100.0%
	2nd floor couches	Count	2	14	27	43
		% within Library Zone	4.7%	32.6%	62.8%	100.0%
	study rooms	Count	101	94	185	380
		% within Library Zone	26.6%	24.7%	48.7%	100.0%
	rotunda soft seats	Count	2	2	4	8
		% within Library Zone	25.0%	25.0%	50.0%	100.0%
Total		Count	315	212	338	865
		% within Library Zone	36.4%	24.5%	39.1%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	162.393(a)	10	.000
Likelihood Ratio	173.816	10	.000
Linear-by-Linear Association	93.034	1	.000
N of Valid Cases	865		

a 6 cells (33.3%) have expected count less than 5. The minimum expected count is 1.96.

Sweep Time * Group Type - Non Social

Crosstab

			Group Type - Non Social			Total
			study separately	study cooperatively	group work	
Sweep Time	morning	Count	22	21	18	61
		% within Sweep Time	36.1%	34.4%	29.5%	100.0%
	early afternoon	Count	87	49	112	248
		% within Sweep Time	35.1%	19.8%	45.2%	100.0%
	late afternoon	Count	83	57	102	242
		% within Sweep Time	34.3%	23.6%	42.1%	100.0%
	evening	Count	123	85	106	314
		% within Sweep Time	39.2%	27.1%	33.8%	100.0%
Total		Count	315	212	338	865
		% within Sweep Time	36.4%	24.5%	39.1%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	13.376(a)	6	.037
Likelihood Ratio	13.344	6	.038
Linear-by-Linear Association	1.745	1	.187
N of Valid Cases	865		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.95.

Case Processing Summary

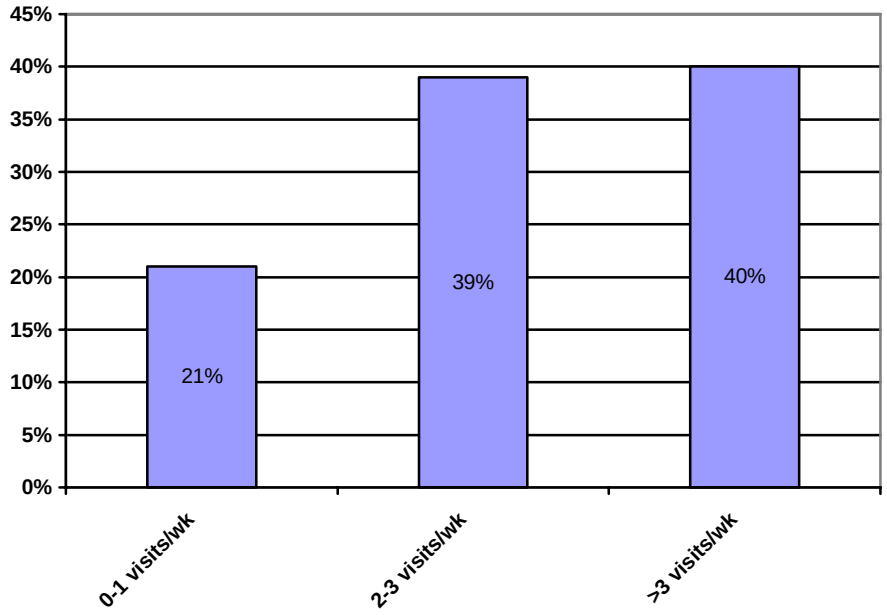
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Library Zone * Group Type - Non Social	865	28.5%	2171	71.5%	3036	100.0%
Sweep Time * Group Type - Non Social	865	28.5%	2171	71.5%	3036	100.0%

Frequency of Visits, Length of Stay, and Percentage of Study

Figure 11 shows user-estimated frequency of library visits. Seventy-nine percent of interviewees estimated that they visited the library two or more times per week during the semester. Visit frequency was compared against several variables: gender, on-

campus or off-campus residence, enrollment class, and groups or solitary visitors using Pearson Chi-square cross tabulations. No statistically significant differences in frequency of visits emerged for either gender or housing.

Figure 11: Reported frequency of library use



There were significant variations in frequency patterns by both enrollment status, and for solitary versus group respondents. The enrollment status Pearson Chi-square cross tabulation is shown in Table 14. First-year students reported more frequent library visits. Second-year students reported less frequent library visits. Table 15 compares solitary versus group visitors. Solitary users were more frequent library users compared to individuals in groups (p=.007). There were no significant differences in frequency of visitation when compared with zone or sweep time.

Table 14: Cross tabulation comparison of enrollment class and frequency of visitation.

			Frequency of Library Use			Total
			0-1 visits/wk	2-3 visits/wk	>3 visits/wk	
Undergraduates	freshman	Count	11	22	37	70
		% within Undergraduates	15.7%	31.4%	52.9%	100.0%
		% within Frequency of Library Use	14.9%	14.4%	23.9%	18.3%
	sophomore	Count	14	41	20	75
		% within Undergraduates	18.7%	54.7%	26.7%	100.0%
		% within Frequency of Library Use	18.9%	26.8%	12.9%	19.6%
	junior	Count	24	52	66	142
		% within Undergraduates	16.9%	36.6%	46.5%	100.0%
		% within Frequency of Library Use	32.4%	34.0%	42.6%	37.2%
	senior	Count	25	38	32	95
		% within Undergraduates	26.3%	40.0%	33.7%	100.0%
		% within Frequency of Library Use	33.8%	24.8%	20.6%	24.9%
Total		Count	74	153	155	382
		% within Undergraduates	19.4%	40.1%	40.6%	100.0%
		% within Frequency of Library Use	100.0%	100.0%	100.0%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	17.541(a)	6	.007
Likelihood Ratio	17.341	6	.008
Linear-by-Linear Association	2.849	1	.091
N of Valid Cases	382		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.56.			

Not only were library users frequent visitors, but also they also stayed in the library for a long time. The mean time estimated for library visits was 3.9 hours. Initial

data review of visit frequency and length of stay prompted the addition of a question to the interview on October 24. Users were asked to estimate the overall percentage of non-classroom study that they did in the library. The mean estimate for 297 undergraduates was that 55% of their overall study took place in the library.

Table 15: Cross tabulation comparison of frequency of visitation and group or solitary users.

			Group or Individual?		Total
			Group	Individual	
Frequency of Library Use	0-1 visits/wk	Count	63	20	83
		% within Group or Individual?	21.2%	19.4%	20.8%
	2-3 visits/wk	Count	128	29	157
		% within Group or Individual?	43.1%	28.2%	39.3%
	>3 visits/wk	Count	106	54	160
		% within Group or Individual?	35.7%	52.4%	40.0%
Total		Count	297	103	400
		% within Group or Individual?	100.0%	100.0%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	9.825(a)	2	.007
Likelihood Ratio	9.843	2	.007
Linear-by-Linear Association	4.593	1	.032
N of Valid Cases	400		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.37.			

Both length of stay and percentage of study for undergraduate students were compared, using a One-way ANOVA with enrollment status, frequency of visitation, group versus solitary visitor, group type, and zone. These comparisons reveal interesting patterns of activity in the collaborative spaces.

Enrollment classes differed significantly in both length of stay and percentage of study. The most frequent library visitors also stayed longer per visit and did a greater

percentage of their overall study in the library. No significant differences in length of stay or percentage of study emerged between group and solitary visitors, but group types did differ significantly. Project groups had the shortest average visit, and project group members did the smallest percentage of their schoolwork in the library. There were also significant variations in length of stay by occupants of different seating zones. These results are discussed in greater detail below.

Enrollment class: There were significant differences between enrollment classes for both length of stay (p=.002) and percentage of study (p=.003). Post Hoc analysis showed significant differences in length of stay between first-year and fourth-year students (p=.029), and second-year compared with both third-year (p=.032) and fourth-year students (p=.018), with second-year students having the shortest overall visits and fourth-year students the longest. For percentage of study done in the library, significant differences emerged between third-year, first-year (p=.009), and fourth-year students (p=.015), with third-year students doing the greatest percentage of their schoolwork in the library and first-year students doing the smallest percentage. Table 16 presents the key results of the analysis.

Table 16: One-way ANOVA comparing length of stay and percent of study *vs* class.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Length of Stay	**freshman**	59	3.356	2.0845	.2714	2.813	3.899	1.0	10.0
	sophomore	70	3.343	1.4079	.1683	3.007	3.679	1.0	7.0
	junior	120	4.271	2.1291	.1944	3.886	4.656	1.0	10.0
	senior	82	4.421	2.9736	.3284	3.767	5.074	1.0	12.0
	Total	331	3.949	2.2841	.1255	3.702	4.196	1.0	12.0
% of Overall Study	**freshman**	50	.4802	.29533	.04177	.3963	.5641	.01	.95
	sophomore	69	.5429	.25090	.03020	.4826	.6032	.01	1.00
	junior	102	.6281	.26398	.02614	.5763	.6800	.02	1.00
	senior	76	.5046	.27751	.03183	.4412	.5680	.05	1.00
	Total	297	.5518	.27506	.01596	.5204	.5832	.01	1.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Length of Stay	**Between Groups**	77.147	3	25.716	5.114	.002
	Within Groups	1644.480	327	5.029		
	Total	1721.627	330			
% of Overall Study	**Between Groups**	1.025	3	.342	4.687	.003
	Within Groups	21.369	293	.073		
	Total	22.394	296			

Multiple Comparisons
Tukey HSD

Dependent Variable	(I) Undergraduates	(J) Undergraduates	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Length of Stay	**freshman**	**sophomore**	.0131	.3963	1.000	-1.010	1.037
		junior	-.9149	.3566	.052	-1.836	.006
		senior	-1.0648(*)	.3828	.029	-2.053	-.076
	sophomore	**freshman**	-.0131	.3963	1.000	-1.037	1.010
		junior	-.9280(*)	.3373	.032	-1.799	-.057
		senior	-1.0779(*)	.3649	.018	-2.020	-.136
	junior	**freshman**	.9149	.3566	.052	-.006	1.836
		sophomore	.9280(*)	.3373	.032	.057	1.799
		senior	-.1499	.3213	.966	-.980	.680
	senior	**freshman**	1.0648(*)	.3828	.029	.076	2.053
		sophomore	1.0779(*)	.3649	.018	.136	2.020
		junior	.1499	.3213	.966	-.680	.980

% of Overall Study	**freshman**	**sophomore**	-.06270	.05016	.595	-.1923	.0669
		junior	-.14794(*)	.04662	.009	-.2684	-.0275
		senior	-.02441	.04918	.960	-.1515	.1027
	sophomore	**freshman**	.06270	.05016	.595	-.0669	.1923
		junior	-.08524	.04209	.181	-.1940	.0235
		senior	.03829	.04491	.829	-.0777	.1543
	junior	**freshman**	.14794(*)	.04662	.009	.0275	.2684
		sophomore	.08524	.04209	.181	-.0235	.1940
		senior	.12353(*)	.04092	.015	.0178	.2293
	senior	**freshman**	.02441	.04918	.960	-.1027	.1515
		sophomore	-.03829	.04491	.829	-.1543	.0777
		junior	-.12353(*)	.04092	.015	-.2293	-.0178

* The mean difference is significant at the .05 level.

Visit frequency: Significant differences emerged between visit frequency categories and both length of stay (p=.001) and percentage of overall study done in the library (p<.001) Table 17 shows the results. Post-hoc analysis of length of stay shows that the most frequent visitors (>3 visits per week) stayed longer per visit than visitors from both other visit categories, 0-1 visits per week (p=.001), and 2-3 visits per week (p=.028). The estimates of overall study vary significantly between all frequency categories (p<.001).

Table 17: One-way ANOVA comparing length of stay and percent of study *vs* frequency of visits.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Length of Stay	**0-1 visits/wk**	68	3.213	2.0936	.2539	2.706	3.720	1.0	10.0
	2-3 visits/wk	141	3.755	2.1652	.1823	3.395	4.116	1.0	12.0
	>3 visits/wk	136	4.460	2.4616	.2111	4.042	4.877	1.0	12.0
	Total	345	3.926	2.3161	.1247	3.681	4.171	1.0	12.0
% of Overall Study	**0-1 visits/wk**	68	.2925	.24399	.02959	.2334	.3516	.01	.90
	2-3 visits/wk	119	.5538	.23544	.02158	.5110	.5965	.05	1.00
	>3 visits/wk	121	.6979	.21741	.01976	.6588	.7371	.20	1.00
	Total	308	.5527	.27583	.01572	.5218	.5837	.01	1.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Length of Stay	**Between Groups**	77.371	2	38.686	7.483	.001
	Within Groups	1767.994	342	5.170		
	Total	1845.365	344			
% of Overall Study	**Between Groups**	7.156	2	3.578	67.360	.000
	Within Groups	16.201	305	.053		
	Total	23.358	307			

Multiple Comparisons
Tukey HSD

Dependent Variable	(I) Frequency of Library Use	(J) Frequency of Library Use	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Length of Stay	**0-1 visits/wk**	**2-3 visits/wk**	-.5421	.3357	.241	-1.332	.248
		>3 visits/wk	-1.2463(*)	.3377	.001	-2.041	-.451
	2-3 visits/wk	**0-1 visits/wk**	.5421	.3357	.241	-.248	1.332
		>3 visits/wk	-.7042(*)	.2733	.028	-1.348	-.061
	>3 visits/wk	**0-1 visits/wk**	1.2463(*)	.3377	.001	.451	2.041
		2-3 visits/wk	.7042(*)	.2733	.028	.061	1.348
% of Overall Study	**0-1 visits/wk**	**2-3 visits/wk**	-.26128(*)	.03504	.000	-.3438	-.1788
		>3 visits/wk	-.40543(*)	.03493	.000	-.4877	-.3232
	2-3 visits/wk	**0-1 visits/wk**	.26128(*)	.03504	.000	.1788	.3438
		>3 visits/wk	-.14415(*)	.02976	.000	-.2142	-.0741
	>3 visits/wk	**0-1 visits/wk**	.40543(*)	.03493	.000	.3232	.4877
		2-3 visits/wk	.14415(*)	.02976	.000	.0741	.2142

* The mean difference is significant at the .05 level.

Groups and solitary users: No significant differences emerged between group and solitary users compared with both length of stay and percentage of overall study in the library. There were, however, significant differences between group types in both length of stay and percentage of study (Table 18). Four types of groups were identified, via either observation or interview: groups in which people studied separately, others in which they studied cooperatively, groups working on a joint project, and social groups. Because of the small number of social groups identified, the One-way ANOVA was run using the three larger groups. This comparison showed significant differences in both length of stay ($p<.001$) and percentage of study ($p<.001$) between group types. Post-hoc tests for length of stay showed that project groups differed significantly from both of the other study groups, with shorter average lengths of stay (study separate $p<.001$; study cooperatively $p=.014$). Post-hoc test for percentage of study showed the study separate groups with a greater percentage of overall on-site study per group member than either the cooperative study groups ($p=.008$) or the project groups ($p<.001$).

Zone: Significant differences in mean length of stay and percentage of study emerged between different zones ($p<.001$ and $p=.006$). Table 19 shows the variation in means between zones. Length of stay was highest for people using tables and study rooms (4.3-4.4 hours per visit), and lower for people using soft seating areas (2.4-3.1 hours per visit). The estimated percentage of overall study was highest at the study tables (61%), and lowest at the nearby window seats (38%).

Table 18: One-way ANOVA comparing length of stay and study percent *vs* group type.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Length of Stay	study separately	75	4.600	2.2026	.2543	4.093	5.107	1.0	10.0
	study cooperatively	76	4.164	2.3894	.2741	3.618	4.710	1.0	12.0
	group work	103	3.165	2.4126	.2377	2.694	3.637	1.0	12.0
	Total	254	3.888	2.4175	.1517	3.589	4.187	1.0	12.0
% of Overall Study	study separately	70	.6679	.22166	.02649	.6150	.7207	.10	1.00
	study cooperatively	67	.5357	.28519	.03484	.4661	.6052	.01	1.00
	group work	96	.4563	.25894	.02643	.4038	.5087	.01	1.00
	Total	233	.5427	.27026	.01771	.5078	.5775	.01	1.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Length of Stay	Between Groups	97.664	2	48.832	8.876	.000
	Within Groups	1380.888	251	5.502		
	Total	1478.552	253			
% of Overall Study	Between Groups	1.817	2	.909	13.815	.000
	Within Groups	15.128	230	.066		
	Total	16.945	232			

Multiple Comparisons
Tukey HSD

Dependent Variable	(I) Group Type - Non Social	(J) Group Type - Non Social	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Length of Stay	study separately	study cooperatively	.4355	.3818	.490	-.465	1.336
		group work	1.4350(*)	.3560	.000	.596	2.274
	study cooperatively	study separately	-.4355	.3818	.490	-1.336	.465
		group work	.9994(*)	.3547	.014	.163	1.836
	group work	study separately	-1.4350(*)	.3560	.000	-2.274	-.596
		study cooperatively	-.9994(*)	.3547	.014	-1.836	-.163
% of Overall Study	study separately	study cooperatively	.13219(*)	.04383	.008	.0288	.2356
		group work	.21161(*)	.04031	.000	.1165	.3067
	study cooperatively	study separately	-.13219(*)	.04383	.008	-.2356	-.0288
		group work	.07942	.04083	.128	-.0169	.1757
	group work	study separately	-.21161(*)	.04031	.000	-.3067	-.1165
		study cooperatively	-.07942	.04083	.128	-.1757	.0169

* The mean difference is significant at the .05 level.

Table 19: One-way ANOVA comparing length of stay and study percent with seating zone.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Length of Stay	**tables**	140	4.368	2.2285	.1883	3.995	4.740	1.0	12.0
	window seats	19	2.789	1.4749	.3384	2.079	3.500	1.0	7.0
	1st floor couches	38	3.000	2.0566	.3336	2.324	3.676	1.0	10.5
	2nd floor couches	24	2.375	1.5054	.3073	1.739	3.011	1.0	6.0
	study rooms	115	4.274	2.5463	.2374	3.804	4.744	1.0	12.0
	rotunda soft seats	9	3.056	.8079	.2693	2.435	3.677	2.0	5.0
	Total	345	3.926	2.3161	.1247	3.681	4.171	1.0	12.0
% of Overall Study	**tables**	128	.6087	.27639	.02443	.5604	.6571	.02	1.00
	window seats	18	.3833	.27706	.06530	.2456	.5211	.05	.90
	1st floor couches	35	.5406	.23780	.04019	.4589	.6223	.01	.95
	2nd floor couches	18	.4422	.29531	.06960	.2954	.5891	.01	1.00
	study rooms	105	.5290	.26734	.02609	.4772	.5807	.02	1.00
	rotunda soft seats	9	.5222	.26471	.08824	.3188	.7257	.05	.80
	Total	313	.5493	.27510	.01555	.5187	.5799	.01	1.00

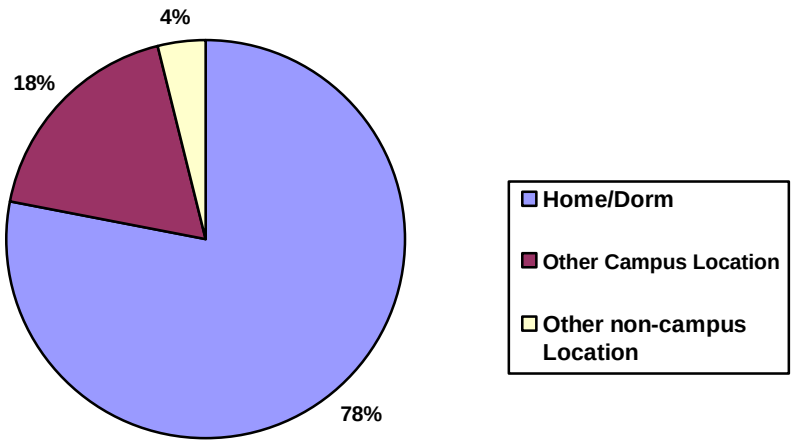
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Length of Stay	**Between Groups**	162.933	5	32.587	6.566	.000
	Within Groups	1682.432	339	4.963		
	Total	1845.365	344			
% of Overall Study	**Between Groups**	1.207	5	.241	3.309	.006
	Within Groups	22.405	307	.073		
	Total	23.612	312			

Non-Library Study Locations

The interview format asked subjects to identify other locations where they did schoolwork. Figure 12 shows the response summary, with 78% of respondents listing their home or dorm as the primary alternative location for study. All of the dorms have study lounges or other common spaces suitable for study, and these were mentioned by many who studied at home. Other campus locations were suggested by 18% of respondents; 4% listed an alternative non-campus location. The Bello Center's Grand Hall was the most frequently mentioned. Other locations included the Bryant Center, the Koffler computer lab, the athletic study hall, and empty classrooms (Appendix 10). Many respondents cited their alternative study locations as places to work after the library had closed.

Figure 12: Primary non-library study locations

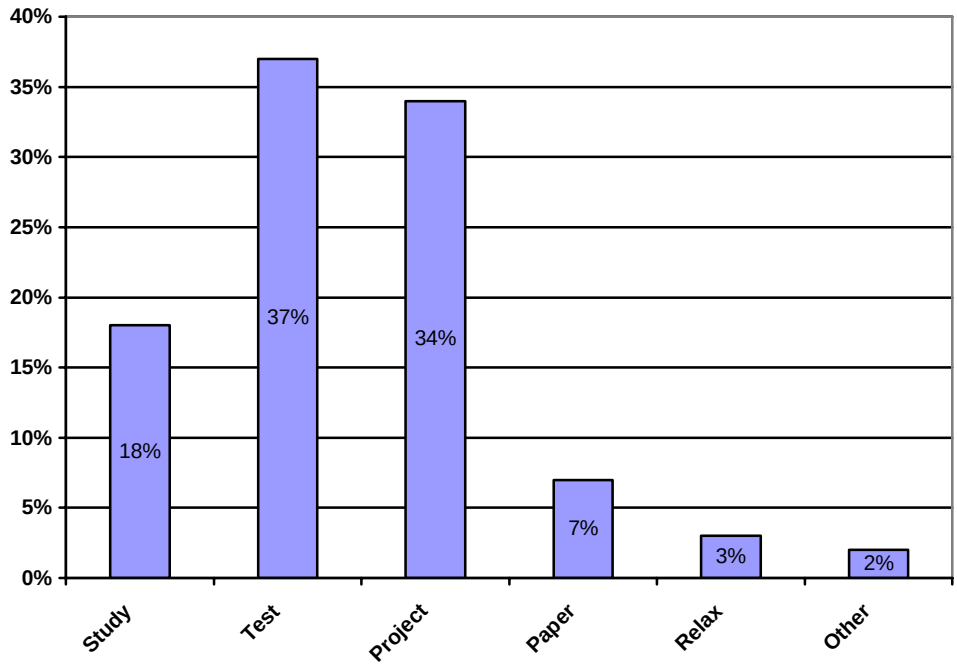


Reasons for Coming

Figure 13 shows the categories of reasons offered by users for visiting the library. The results are consolidated from open-ended responses to the question: "Why are you here today?"

The most commonly cited reason for visiting the library was to prepare for a test (37%), with project work the second most common reason (34%). General study assignments (18%) and work on papers (7%) were the next most common reasons. Relaxation and other activities accounted for the remaining 5% of reasons for visiting the library.

Figure 13: Reasons for visiting the library.



The number of people in the library for group study reflects an emphasis on group and project work in the Bryant University curriculum. The numbers also fit well with the observed group types (39%). Many interviewees reported being involved in multiple group projects and some reported having more than one project meeting scheduled for the library in a single day. A number of solitary individuals were either doing work in the library prior to a meeting, had been in a meeting and remained to work, or were between meetings.

Chapter 6: Discussion

Building Design and Building Use

Bennett's (2003) assertion that new library spaces are being built to accommodate fundamental changes in learning styles and information technology was echoed in the vision driving the building program for the Bello Center and Krupp Library. The opening paragraph of the program document embraces both technology and learning.

> *As the leaders of Bryant College formed a Vision Statement for a world-class new information center, they recognized that the facility must incorporate and support current, leading-edge information technology as well as traditional collections of print materials, … While technology and its use are at the forefront of planning discussions, the building housing Bryant's information services must be designed as a series of welcoming spaces for scholarship, not just as space for access to materials in digital formats. It must be designed as a true center of learning.* (Michaels Associates, 2000, p.2)

In designing a new facility for learning and scholarship, the planners allocated most of the library's public seating to spaces designed and managed to support collaborative activity. The seating area included in the study accounted for 59% of the public seating. If the sixty computer stations in the Information Commons are included, 72% of the library public seating is allocated to collaborative space, with the rest allocated to quiet seating areas on the library's second floor. Using gate count as a measure, the types of spaces and their design had attracted users to the library. The old library had a similar number of public seats, but the average gate count for the current facility is 72% higher than for the older one (1998-2003 average: 203,598; 2002-2006 average: 351,079).

The first-floor reading room tables and the second-floor study rooms were heavily used and highly valued spaces. The value of these spaces is reflected in their high occupancy rates, high ranking in user preference, numerous positive comments about the spaces, and frequent suggestions that the quantity of study rooms and tables should be increased. Both solitary users and groups value these spaces because they find them to be great places to work. The spaces provide room to spread out, power and network connectivity, and offer comfortable seating. Groups value the spaces because they allow them to talk amongst themselves without having to worry about disturbing other library users and also offer ample room for a variety of possessions. Young (2003) found a similar preference for tables among library users at Randolph-Macon College and noted their preferences for spaces with room for possessions.

The chief criticisms of the study rooms included an insufficient quantity of rooms; sound and climate control problems; and failure to enforce group room-use policies. The first-floor tables were also in short supply, and people mentioned distracting levels of noise when the library was busiest. Some noted that noise from the tables was a problem for them in the quiet study areas on the second floor, where noise generated on the first floor became a distraction.

Usage patterns between the study rooms and the first-floor tables differed principally in types of group activity in each location. The majority of groups using the first-floor tables were studying separately, and only 19% of the students were engaged in project work. In the study rooms, 49% of the groups were involved in project work, and

only 27% of group members were studying individually. Both locations had similar proportions of students engaged in cooperative study, with 25% at both.

Other seating zones did not get the same type or intensity of use. The first-floor window-seat clusters were most frequently used by solitary users (88%). Only two of the few groups that were observed in that zone were actively working together. Users of the window seats reported the shortest average visit, 2.8 hours per visit, compared with an overall mean of 3.9 hours. The window-seat users also differed from other solitary users who reported a mean library visit of 4.1 hours. This zone was often occupied by individuals who were taking a break between classes, waiting for transportation, or needed a place to relax.

The majority of people using the couch locations on both floors were involved in project work. The first floor couches were a very convenient location for a rendezvous, being the closest seating location to the entrance. Eighty percent of the group members in that space were involved in project work. It was a comfortable space and people felt free to talk. Some of the occupants would have liked the space more if there were larger tables. People generally did not spend a great deal of time working in this area, although many would remain in the library to work in other locations after their project meeting ended.

The second-floor couch area had the highest proportion of occupied locations used by groups, and 95% of the people in those groups were involved in group projects (62%) or cooperative study (33%). This area was mostly an overflow study area, used by people who couldn't find an open study room, or occasionally when the climate control

problems in the study rooms made them too uncomfortable for groups to work in. This area was never occupied in the morning and early afternoon throughout the entire study. The seat clusters outside the study rooms had the lowest use, evenly divided between groups and individuals. Small groups would work in this space while waiting for a study room to become available.

It should be noted that the amount of floor space allocated for each zone varied. While the seats outside the study rooms had low occupancy, they also didn't take up much space. The study rooms, which were heavily used, also took up the largest floor space per seat. While occupancy patterns per unit of floor space might be an interesting building design factor, it was not considered in the research design.

Collaborative Space and Collaborative Activity

In Powell's (2002) review of library space improvements in the United Kingdom, he quotes managers of these new spaces describing them as *"becoming noisier places as teaching and learning methods change, and group interactions and discussion emerge as important components of the learning process."* A principal question entering this study was: Are the collaborative spaces in the library used for collaborative activity? Would the results from the study support anecdotal accounts from Krupp Library staff? The results of this study provide clear evidence that collaborative spaces support collaborative activity.

Half of the locations observed in the study were occupied, and half of the occupied locations contained groups. Seventy-one percent of individuals observed in the study were in groups. This figure underestimates the amount of group activity in two

ways: (1) seats that were occupied by possessions but where the individual was absent, were not counted as occupied seats; (2) a number of observed individuals were part of groups during their library visit, although they were not in a group when observed. Observations of behavior showed that 58% of individuals in groups were engaged in conversation. The overall percentage of users engaged in conversation was 45%, a substantial increase in the reported conversational levels observed at the University of Kansas (6%), or in the Canadian public library study (12-20%) (Campbell & Shlechter, 1979; Given & Leckie, 2003).

Most of the groups were small in size, with 72% of group members belonging to groups of two or three people. Thirty-nine percent of people in groups were engaged in project work and another 24% of group members were actively studying together. Members of both group types repeatedly mentioned the importance of having work space where conversation was acceptable. The large cohort of individuals working on collaborative projects may also explain the preponderance of third-year students in the study sample. Both third-year and fourth-year students noted that large amounts of project-related work were assigned in the third year. Third-year students cited such projects as a primary reason for using the library, whereas several fourth-year students cited the reduction in course-related projects in the current term as a reason for not visiting the library as often as they had in previous years.

Thirty-six percent of group members were engaged in separate study, sharing space but working on different tasks. This behavior was both social and in some cases territorial. Students who liked using study rooms would share that space with others to

comply with the library's room's use policies. In other cases, people coming to study would join friends who had already occupied a location. Much of the behavior and activity that took place within these groups is typical of behavior observed and described in traditional reading rooms (Sommer, 1966, 1969). These individuals were less likely than those in project or collaborative study groups to share materials or talk to each other.

Patterns of group behavior varied through the day. The numbers of groups and the numbers of people working in groups increased throughout the day, with the most group activity observed in the evening sweep. The frequencies of observed group types also showed significant variation during the day, with the highest incidence of project group activity observed during the two afternoon sweeps (45% and 42%). The highest frequency of group members engaged in separate study occurred during the evening sweep (39%).

Possessions and Activities

It is not surprising that, in a school with universal laptop ownership by undergraduates 70% of individuals had computers and 50% of individuals were working with computers. Computing activity can encompass a variety of actions, such as reading, writing, listening to music, and other recreational activity. As a result, there were no significant variations in computing activity between zones or between sweeps.

Reading (41%) and writing (17%) were associated with the use of printed materials. Sixty-nine percent of individuals had some kind of handouts, or notebooks, and 46% had a book or journal. It appeared that the most of the books observed were textbooks, owned by the students, rather than books from the library's collections. This

was consistent with the primary reasons cited for being in the library, where 55% of interviewees explained that they were either engaged in general study or studying for a test. The amount of writing activity across zones varied significantly, with most of the observed activity taking place in the study rooms and first floor tables. The percentages of people writing did not vary between sweeps. Reading activity showed significant variation compared with both seating zone and sweep time. Reading activity was highest in the window seats (57%) and lowest at the first floor and second floor couches (28% and 37%). Likewise, reading varied across sweep times with the highest percentage of reading activity observed in the morning and the lowest in the late afternoon sweep. The highest percentage of reading activity corresponds with the lowest percentage of talking activity and the lowest percentage of group project activity.

Possessions not directly associated with academic work included cell phones, headphones, MP3 players, and food or drinks. While these possessions were frequently observed, eating and drinking (4%), and cell phone use (3%) were not commonly observed activities. Only visible possessions were recorded and the numbers do not accurately reflect overall ownership. Listening on headphones, commonly observed (8%) seemed equally prevalent among solitary users and in groups. Numerous calculators, often in use, were observed. Their prevalence reflects the business focus of the school's curriculum. Very few individuals were observed sleeping, somewhat surprisingly since the furniture was comfortable and people spent a lot of time in the library. Perhaps the open floor plan and high occupancy in the study areas discouraged sleeping, and sleeping may be more common in quieter, more private locations in the library.

A Place to Work

Interviewees perceived the library as a key resource supporting their studies. Seventy-nine percent of the students visited the library two or more times a week during the semester, spending an average of 3.9 hours per visit estimating that 55% of their overall study effort took place in the library. As a comparison, 52% of the students interviewed at the University of Kansas spent less than 1.5 hours per week in the library (Campbell and Shlechter, 1979). Reasons cited by the University of Kansas respondents for low use included a general dislike of the library (20%) or no need to use the library (21%).

Beyond the library most other study took place at home or in campus residences. Students lived in two types of on-campus housing, dorms and townhouses, with townhouses available primarily to seniors. Both types of on-campus housing have common spaces for study. Several seniors noted that the shared spaces in the townhouses were better study spaces than the common rooms in the dorms.

In comparing library with dorm and townhouse study spaces, students often discussed the library as a favorable location for work in both negative and positive terms. Several individuals mentioned that their home environments had too many distractions. Either these environments were too noisy or the students needed to work in a location other than home to concentrate. Others discussed the library as a place for “serious work”; where they went for harder study; and a place to go when they “really need to get work done”. The library was described as a place to concentrate, a place that facilitates learning, and that “most important work is done in the library”.

Many students identified the library as the best location on campus for group work. Other group work locations students mentioned included empty classroom space in the Bryant Center and common space in the dorms and townhouses, but no one suggested that the majority of their meetings took place in these other spaces. The library had good spaces for group work, and more group spaces than any other location on campus. It was an easy and convenient rendezvous location, especially for commuters. Many people liked meeting in the library because they could do other school work before or after meeting with their groups.

Group projects brought in some students unlikely to use the library under other circumstances. This includes individuals who preferred to study in other locations and a few who, by their own estimate, did not do much schoolwork outside the classroom. This helps explain why projects group members had the shortest mean time for library stay (3.2 hours *vs* 3.9 hours) and the smallest estimated percentage of overall study taking place in the library (46% *vs* 55%).

The improvement opportunities identified by users also highlight the desirability of the library as a place for study in general and group work in particular. Seven percent of suggestions called for more hours. Forty-five percent of comments asked for additional capacity, especially study rooms (19%). Many people who mentioned alternative work locations on campus, such as the Grand Hall, the Unistructure's rotunda, or the Bryant Center, used them for schoolwork after the library closed.

Library's Contribution to Non-Classroom Learning

One of this study's more interesting results was the mean estimate that 55% of overall study outside of the classroom took place in the library. Based on this data it is possible to consider the overall contribution of the library to undergraduate education at Bryant University. This estimate, however, can not be directly applied to the entire student body because there is a strong and direct correlation between frequency of library use and percentage of overall study that takes place in the library. As a result, the mean estimate from the library would overstate the contribution of the library to non-classroom study because frequent library visitors are over-sampled in this study.

To address this sampling imbalance, a correction factor based on visitation frequency was applied to the data sample (Table 20). The correction factor was developed by assigning a midpoint value to the visit frequency estimates, and dividing the number of respondents by the number of visits per week. This increased the impact on the mean percentage for the low frequency visitors and similarly reduced the contribution of the high frequency visitors. Based on this calculation the corrected estimate is that 41% of all student study outside of the classroom takes place in the library. This corrected calculation represents a low-end estimate of the library's contribution to non-classroom study and it is reasonable to estimate the library's contribution falls between 41 – 55% of all non-classroom study.

Students' estimates of frequency of visits were compared with the library's reported gate count. The total gate count in the 2005-06 academic was 368,409. Based on the observed distribution of students in the study (95%) it would be reasonable to

assume at least 90% of the gate count can be attributed to students. This equals 331,568 visits per year, and 94.25 annual visits per student. Across a full year of fifty weeks, this figure suggests that students average 1.88 visits to the library per week.

Table 20: Estimated library contribution to the non-classroom learning.

Average visits per week	Number of respondents	Corrected value (respondents/average visits per week)	% of Library contribution to study	Corrected Value * % Contribution
Range 0-1/wk = 0.5	68	134	.2925	39.20
Range 2-3/wk = 2.5	119	47.6	.5538	26.36
Range >3/wk = 4.5	121	26.9	.6979	18.77
Total	**308**	**208.5**		**84.33**
(% of Contritution * corrected value)/total corrected value			**84.33/208.5**	**41%**

Chapter 7: Conclusions and Recommendations for Further Study

Value of Collaborative Space

Shill and Tonner (2003) and Bennett (2003) described a movement in academic libraries to create new types of spaces to support changing learning patterns in academic communities. The undergraduate curriculum at Bryant University emphasizes group and collaborative learning and group projects were not limited to business courses. The Bello Center and Krupp Library were designed to support this activity. The collaborative spaces in the Krupp Library successfully support the learning needs of the student community. These spaces are the primary locations for non-classroom collaborative study on the campus. Students also value these spaces for non-collaborative communal study. As a result more non-classroom learning takes place in the library than in any other location on campus. Although the Bello Center and Krupp Library greatly increased the amount of collaborative space available to students the demand for these spaces often exceeds the amount of space available.

Having the right kind of spaces attracts users to the library. If there were fewer collaborative spaces, or if the spaces had been less suitable, students would have sought out other locations to do their work. At Bryant University students have a generous allocation of high-quality group space and their study location choices demonstrate that libraries are good places for collaborative activity. Having a wide variety of resources available in libraries supports collaborative work: space, the provision of electrical power and network connectivity, access to printing, supplies, and library collections. Students at the Krupp Library also shift in and out of different work modes. In a single

library visit a student might shift between being a solitary user, to a member of a project team, to a member of a study group. Comments from some students about the library as a workplace also suggested that the social support of peers studying also make this library a good place to work.

Collaborative activity involves conversation and computing. Students need spaces where they can actively work together without disturbing people around them. Soundproofed space was desirable, but many students were satisfied working in areas were noise was acceptable to the other occupants of that space. Dissatisfaction with noise levels seemed to arise due to shortcomings in noise management in space design, and also between people engaged in different types of work. Solitary users and groups engaged in communal study were disturbed by other groups actively working together.

Observation and Interview Methods

The sweeps methods developed by Given and Leckie (2003), and the adaptations applied in this study may be a useful approach for learning about both user behavior and use of library space. Administrators in academic libraries may find these methods yield useful results and knowledge about their user communities with studies of more limited duration and limited to smaller subsections of a library. These methods might be adaptable to study service desk interactions and other types of library activities.

Having a non-participatory direct observer engaged in data collection did not affect user behavior. The researcher was not in any area for very long, and the brief interviews were not disruptive to work that students were engaged in. On a number of occasions student would ask the researcher about the project and about its progress.

Students were generally pleased that the library was interested in their thoughts about the space, and about their work.

Suggestions for Additional Research

While this study provides a wealth of data about use of collaborative spaces at the Krupp Library, a more complete picture of library-based student learning could be gained by studying user behavior and occupancy patterns in the remaining public spaces in the library. Further studies could examine study behavior and space use in student dorms and other locations on campus; or take a closer look at the interaction between elements of the curriculum, such as group projects, and library use.

It would be useful to study use of collaborative spaces at other academic libraries, to determine the similarities and differences in usage patterns, and to compare factors that affect activity patterns. It would be particularly interesting to study collaborative behavior in an Information Commons setting.

There are also research opportunities to test the applicability of combining observation and interview techniques to study other types of user activity and behavior in libraries.

References

Albanese, A. R. (2004). Campus library 2.0. *Library Journal, 129*(7), 30-33.

Bahr, A. H. (2000). Library buildings in a digital age, why bother? *College & Research Libraries News, 61*(7), 590.

Bailey, R., & Tierney, B. (2002). Information commons redux: Concept, evolution, and transcending the tragedy of the commons. *Journal of Academic Librarianship, 28*(5), 277.

Barr, R. B., & Tagg, J. (1995). From teaching to learning--A new paradigm for undergraduate education. *Change, 27*(6), 12-25.

Bennett, S. (2003). *Libraries designed for learning*. Washington, DC: Council on Library and Information Resources.

Boone, M. D. (2002). Library design--the architect's view. A discussion with Tom Findley. *Library Hi Tech, 20*(3), 388-392.

Campbell, D. E., & Shlechter, T. M. (1979). Library design influences on user behavior and satisfaction. *Library Quarterly, 49*(1), 26-41.

Carlson, S. (2001, Nov 16). The deserted library. *The Chronicle of Higher Education,* pp. A35-A38.

Church, J., Vaughan, J. B., & Starkweather, W. M. (2002). The information commons at Lied Library computer center. *Library Hi Tech, 20*(1), 58-70.

Cowgill, A., Beam, J., & Wess, L. (2001). Implementing an information commons in a university library. *Journal of Academic Librarianship, 27*(6), 432.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Crockett, C., McDaniel, S., & Remy, M. (2002). Integrating services in the information commons: Toward a holistic library and computing environment. *Library Administration and Management, 16*(4), 181-186.

Crosbie, M. J., & Hickey, D. D. (2001). *When change is set in stone: An analysis of seven academic libraries designed by Perry Dean Rogers & Partners: Architects*. Chicago, IL: Association of College and Research Libraries.

Dev, P. (2003). *The library as a place for discovery, learning and education: Transforming teaching and learning: The SMILE program.* Paper presented at The Library as Place: Symposium on Building and Revitalizing Health Sciences Libraries in the Digital Age, November 5-6, 2003, Bethesda, MD.

Dugdale, S. (2003). *The library as a place for discovery, learning and education: New settings for new activities.* Paper presented at The Library as Place: Symposium on Building and Revitalizing Health Sciences Libraries in the Digital Age, November 5-6, 2003, Bethesda, MD.

Fishman, D., & Walitt, R. (1972). Seating and area preferences in a college reserve room. *College & Research Libraries, 33*, 284-297.

Foote, S. M. (1995). An architect's perspective on contemporary academic-library design. *Bulletin of the Medical Library Association, 83*(3), 351-356.

Foote, S. M. (2004). Changes in library design: An architect's perspective. *Portal: Libraries and the Academy, 4*(1), 41-59.

Given, L. M., & Leckie, G. J. (2003). "Sweeping" the library: Mapping the social activity space of the public library. *Library & Information Science Research, 25*(4), 365-385.

Halbert, M. (1999). Lessons from the information commons frontier. *Journal of Academic Librarianship, 25*(2), 90-91.

Hardesty, L. (2000). Do we need academic libraries? *A Position Paper of the Association of College and Research Libraries (ACRL)* Retrieved March 13, 2005, from http://www.ala.org/ala/acrl/acrlpubs/whitepapers/doweneedacademic.htm

Holmes-Wong, D., Afifi, M., Bahavar, S., & Liu, X. (1997). If you build it, they will come: Spaces, values, and services in the digital era. *Library Administration & Management, 11*(2), 74-85.

Jenkins, C. (2003). *Renovation for innovation: The library as a place for discovery, learning and education.* Paper presented at The Library as Place: Symposium on Building and Revitalizing Health Sciences Libraries in the Digital Age, November 5-6, 2003, Bethesda, MD.

Kaser, D. (1997). *The evolution of the American academic library building*. Lanham, MD: Scarecrow Press.

King, H. M. (2000). *The academic library in the 21st century--What need for a physical place?* Paper presented at the IATUL, July 3-7, 2000, Brisbane, Australia.

Leckie, G. J., & Hopkins, J. (2002). The public place of central libraries: Findings from Toronto and Vancouver. *Library Quarterly, 72*(3), 326-372.

LeCompte, M. D., & Schensul, J. J. (1999). *Designing and conducting ethnographic research*. Walnut Creek, CA: AltaMira Press.

MacWhinnie, L. A. (2003). The information commons: The academic library of the future. *Portal: Libraries and the Academy, 3*(2), 241-257.

McKinstry, J. M., & McCracken, P. (2002). Combining computing and reference desks in an undergraduate library: A brilliant innovation or a serious mistake? *Portal: Libraries and the Academy, 2*(3), 391-400.

Michaels Associates, D. C. (2000). *Bryant Center for Information and Technology Building Program* (unpublished report).

Miller, W. (2002). The library as a place: Tradition and evolution. *Library Issues, 22*(3), 1-4.

Mitchell, W. J. (2004). Places for learning: New functions and new forms (MIT World Video Lecture). Cambridge, MA: MIT. Retrieved Febrary 16, 2005 from http://mitworld.mit.edu/video/69/.

Nelson, P. P. (2003). Current issues in the design of academic health sciences libraries: findings from three recent facility projects. *Journal of the Medical Library Association, 91*(3), 347-351.

Ober, J. (2000). Library services at California State University, Montery Bay. In T. Webb (Ed.), *Building libraries for the 21st century: The shape of information* (pp. 122-137). Jefferson, N.C.: McFarland.

Oldenburg, R. (1997). *The great good place: Cafés, coffee shops, community centers, beauty parlors, general stores, bars, hangouts, and how they get you through the day*. New York, NY: Marlowe.

Oxnam, M., Talamonti, L., & Mills, V. (2003). Around the world to the University of Arizona: One year of lessons learned in the new information commons. *Library Hi Tech News, 20*(6), 38-40.

Pierce, J. B. (2004). Grassroots report: Next stop, information commons. *American Libraries, 35*(4), 87.

Potthoff, J. K., & Montanelli, D. S. (1990). Use of library facilities: Behavioral research as a tool for library space planning. *Journal of Library Administration, 12*(1), 47-61.

Potthoff, J. K., Weis, D. L., Montanelli, D. S., & Murbach, M. M. (2000). An evaluation of patron perceptions of library space using the role repertory grid procedure. *College & Research Libraries, 61*(3), 191-203.

Powell, M. (2002). Designing library space to facilitate learning: A review of the UK higher education sector. *Libri, 52*(2), 110-120.

Shill, H. B., & Tonner, S. (2003). Creating a better place: Physical improvements in academic libraries, 1995-2002. *College & Research Libraries, 64*(6), 431-466.

Shill, H. B., & Tonner, S. (2004). Does the building still matter? Usage patterns in new, expanded, and renovated libraries, 1995-2002. *College & Research Libraries, 65*(2), 123-150.

Shoham, S., & Shemer-Shalman, Z. (2003). Territorial behavior in the school library. *School Libraries Worldwide, 9*(2), 1-23.

Simons, K., Young, J., & Gibson, C. (2000). The learning library in context: Community, integration, and influence. *Research Strategies, 17*(2-3), 123-132.

Sommer, R. (1966). The ecology of privacy. *Library Quarterly, 36*(3), 234-248.

Sommer, R. (1969). *Personal space: The behavioral basis of design*. Englewood Cliffs, NJ: Prentice-Hall.

Sutton, L. (2000). Imagining learning spaces at Wayne State University's new David Adamany Undergraduate Library. *Research Strategies, 17*(2-3), 139-146.

Toombs, K. E. (1992). The evolution of academic library architecture: A summary. *Journal of Library Administration, 17*(4), 25-36.

Whyte, W. H. (1980). *The social life of small urban spaces*. Washington, DC: Conservation Foundation.

Wooliscroft, M. (2003). Challenge, stimulation and ultimate fulfillment: The development of the information services building at the University of Otago 1993-2002. *Australian Academic & Research Libraries, 34*(2), 114-149.

Young, V. E. (2003). *Can we encourage learning by shaping environment? Patterns of seating behavior in undergraduates.* Paper presented at the Eleventh National Conference of the ACRL, April 10-13, 2003, Charlotte, NC.

Appendix 1: Library Building Projects in New England: 1995-2005

Library	School	Type of School	Type of Project	Year	Seating	Size	Cost
Middlebury College Library	Middlebury College, VT	College	New	2005	750	143,700	
Widner Memorial Library	Harvard, MA	University	Renov	2005			
George I Alden Library and Learning Center	Quinsigamond Community College	Community College	New	2004	650	56,000	11,700,000
WEB DuBois Library	U Mass, Amherst	University	Renov	2004	635	40,000	853,000
Mt Holyoke College Library	Mt Holyoke College, MA	College	Renov	2004	115	5,000	335,000
Krupp Library & Bello Center	Bryant College	College	New	2003	571	75,000	26,000,000
Wallage E Mason Library	Keene State College, NH	College	Add & Renov	2003	750	71,577	9,800,000
Hayden Library	MIT, MA	University	Renov	2003	n/a	4,900	1,004,000
Wunsch Preservation Lab, Hayden Library	MIT, MA	University	Renov	2003	n/a	3,350	900,000
Aero Astro Library	MIT, MA	University	New	2002	24	2,200	900,000
Hawthorne-Longfellow Library	Bowdoin College, ME	College	Renov	2002		33,000	6,400,000
Library	New Hampshire Technical Institute	Community College	New	2001	198	23,629	3,157,000
Library	UNH, Manchester	University	Renov	2001	144	9,691	960,000
Schow Science Library	Williams College, MA	College	New	2000	200	30,000	9,559,000
Margaret Clapp Library	Wellesley College, MA	College	Renov	2000	175	38,000	7,399,000
Fine Arts Center Music Reserve Lab	U Mass, Amherst	University	Renov	2000	16	690	97,000

Library	School	Type of School	Type of Project	Year	Seating	Size	Cost
Diamond Library	UNH, Durham	University	Add & Renov	1999			
Library	Stonehill College, MA	College	New	1999	500	60,000	9,000,000
Homer D Baggidge Library	U Conn, Storrs	University	Add & Renov	1999	2,330	393,000	40,150,000
Lewis Music Library	MIT, MA	University	Renov	1998			
Law School Library	Boston College, MA	University	New	1998	530	84,500	13,872,000
Library	Champlain College, VT	College	New	1998	326	29,500	5,800,800
Law School Library	Harvard, MA	University	Add & Renov	1998	621	180,000	35,900,000
Lamson Library	Plymouth State College, NH	College	Add & Renov	1998	1,000	88,000	10,100,000
Sterling Memorial Library	Yale, CT	University	Renov	1998	532	229,644	n/a
Pardee Management Library	Boston University, MA	University	New	1997	320	25,000	8,200,000
Library	Johnson State College, VT	College	New	1997	210	40,000	4,805,000
Library	Wheelock College, MA	College	Renov	1997	22	1,120	90,000
Law School Library	U Conn, Hartford	University	New	1996	797	127,000	22,740,000
Thomas J Dodd Research Center	U Conn, Storrs	University	New	1996	50	55,000	10,363,000
Library	Quinnipiac College School of Law, CT	College	New	1996	400	51,000	9,645,000
Tisch Library	Tufts University, MA	University	Add & Renov	1996	1325	184,000	19,820,000
Library	New Hampshire College	College	Add & Renov	1995	189	5,100	519,000

Appendix 2: Observation Procedure

Prepare

- Prior to sweep, have data forms labeled and in order.
- Scan overall facility, count occupied spaces, and take preliminary notes.
- Determine interview sampling strategy: Four starting points were identified, 3 at different locations on the first floor, and one on the second floor. The starting points were selected randomly (numbers picked from a hat) prior to the study.
- Have supply of blank forms for mistakes and overflow.

Sweep

- At each observation station check-off station against floor map.
- Have separate floor map for each sweep.
- Select an observation point for data collection.
- When observations are complete (one minute or less per station), approach selected interview locations.
- Record interview and take notes.
- Prepare for next observation station.

Form

- Record total number of occupants.
- If there are more than 5 users in a group, use 2nd page.
- Mark M/F to note gender. Use gender block on form to record interview demographic data.

Notes about activities

- Reading: Printed materials, books, magazine, papers…… If viewing a computer screen – goes under computing.
- Writing: by hand. Keyboarding goes under computing activity.
- Computing: Any use of computer, typing or viewing. Includes person looking at someone else's activity.
- Talking/listening: people in conversation.
- Presentation: one person addressing a group.
- Phone: Cell phone activity.
- Watching/sitting: Applies to an individual occupant – deep in thought….
- Sleeping:
- Eating/drinking: must observe. Presence/absence of food noted elsewhere.
- Other: Possibility of romantic behavior – how to handle? Could include staff interactions and a variety of other categories. Make notes.

Notes about possessions

- Specific ownership of possessions is not critical. Presence or absence of possessions is the space is important.
- Notebooks: Student possessions.
- Books: Includes any published materials: books, journals bound or unbound, newspapers. May not be possible to distinguish between library owned and user owned materials.
- Papers: Photocopies, handouts and similar materials.
- Writing materials: Pads and papers, pens, glue, scissors, for writing and note taking.
- Laptop:
- Objects: Palm type device, calculator, projector, other electronics, cameras, physical objects. Of interest are possessions that are incorporated into the work of the occupants. Backpacks, clothing, umbrellas are not relevant. Things that people bring to work with are.
- Food/drink: People who write about collaborative space frequently mention the importance of food as a social lubricant.
- Other: Again note possessions that are relevant to the activity taking place in the space.

Sample Dates

- Monday, October 17, 2005
- Monday, October 24, 2005
- Tuesday, November 1, 2005
- Wednesday, November 2, 2005
- Sunday, November 6, 2005
- Sunday, November 13, 2005
- Tuesday, December 6, 2005
- Wednesday, December 7, 2005

Appendix 3: Interview Procedure

Interview Sampling

- Develop a route through the space.
- Begin the route at different spots each time. There are four different starting points: 1st floor, north side; 1st floor, east side; 1st floor, zone 3; and 2nd floor, first study room. The sweep starting cycle was determined prior to the start of data collection, by randomly picking 30 numbers corresponding to shifts.
- The initial station for the first interview was also randomized, by pulling a book from the stacks and using the first cutter number between 1-4 as a starting point.
- The goal was to have 9-10 interview candidates per sweep, with a target of at least six completed interviews per sweep.
- The number of interviews conducted per shift were determined during the pre-sweep inventory of occupied spaces. If the pre-sweep scan had 36 occupied locations, then every 4th occupied station would be approached for an interview.

Introduce myself: Hi, my name is Howard Silver. I'm doing a research study on how people use libraries. Would you mind if I asked you a few questions? It should take less than 5 minutes, and there won't be any personal questions. Would it be OK if I record your responses?

Personal and demographic information:

- Record on the form.
- Enrollment status?
- How long at this school?

General patterns of use: record and make notes

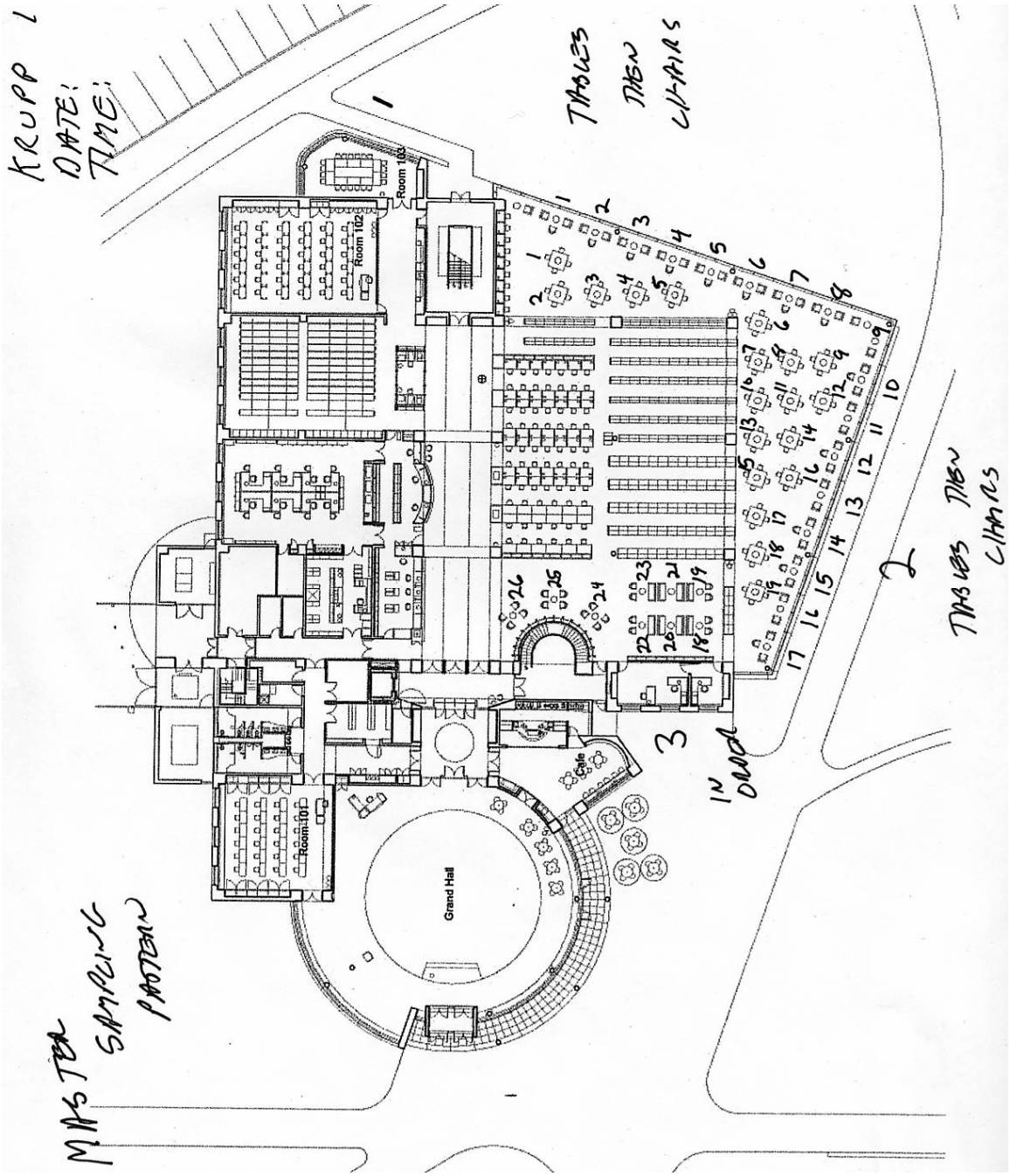
- How often do you come?
- Where do you generally sit/work in the library?
- What other places, besides the library, do you do your schoolwork?
- Could you estimate what percentage of your overall study is done in the library?

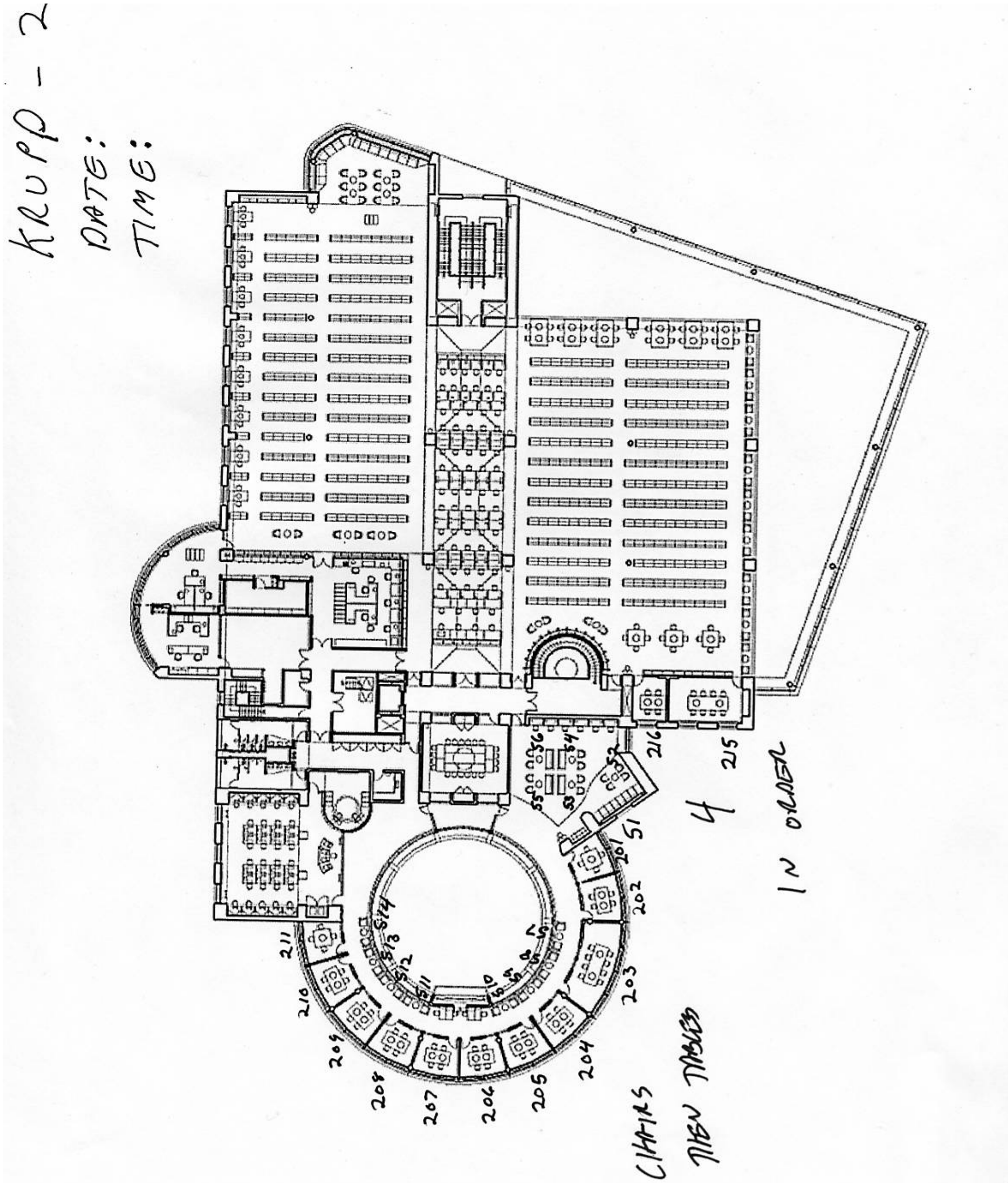
Visit specific information: record and make notes

- Why are you here today?
- Why did you pick this specific location?
- Are there any specific features about this place that make it better/or worse than other spaces for your work?
- [if group] Are you part of a group/team or have you chosen to work together?

Depart: Thank you for your cooperation. If you have any questions about the project there is information posted on the library's web site, or you could contact me directly via email.

Appendix 4: Floor Maps with Marked Locations.




KRUPP – 2
DATE:
TIME:
216
215
4
IN ORDER
51
201
202
203
204
205
206
207
208
209
210
211
CHAIRS
THEN TABLES

Appendix 5: Data Fields.

Bryant Field Study: Data Fields and Descriptions			
Field Name	**Type**	**Values**	**Notes**
LocNo	Numerical	1-72	Sequential number assigned to each unique location
LoCode	Alphanummeric	72 letter number combinations	Alphanumeric code assigned on floor map, includes floor number, seating type, and number
Floor	Numerical	1-2	First or Second Floor
Type	Numerical	1-3	1=table; 2=soft; 3=room
Zone	Numerical	1-6	Section of library characterized by location and furniture type: 1=tables; 2=window seats; 3=1st couches; 4=2nd couches; 5=rooms; 6=rotunda soft
Date	Date	8 dates	Sample Dates: Oct 17; Oct 24; Nov 1; Nov 2; Nov 6; Nov 13; Dec 6; Dec 7
Shift	Numerical	1-4	Sample period: 1=10:30; 2=2:20; 3=5:30; 4=8:30
Gender	Binary	M/F	Male or Female
Interview	Binary	Y/N	Was the individual interviewed?
Class	Numerical	1-6	Enrollment status: 1=Frosh; 2=Soph; 3=Jun; 4=Snr; 5=grad; 6=other
Home	Numerical	1-2	Where individual lives: 1=on campus; 2=off-campus
Group	Binary	Y/N	Is the person part of a group?
GrpSize	Numerical	1-n	How many people are in the of group (only assigned to groups)
GrpGend	Numerical	1-3	Gender mix of group: 1=male; 2=female; 3=mixed
Computer	Binary	Y/N	Computer
NoteB	Binary	Y/N	Notebook, handouts
Book	Binary	Y/N	Bound book, magazine, journal
Phone	Binary	Y/N	Cell Phone
Calc	Binary	Y/N	Calculator
Music	Binary	Y/N	Ipod, MP3 player, headphones
Food	Binary	Y/N	Food or beverage
OtherP	Binary	Y/N	Other Possession - complete open ended field - OthPos
Read	Binary	Y/N	Reading printed material
Write	Binary	Y/N	Writing
Comput	Binary	Y/N	Any computer use - typing, or viewing
PhoneUse	Binary	Y/N	Actively using cell phone
WatSit	Binary	Y/N	Watching and sitting - alone or in group
Eat	Binary	Y/N	Actively eating or drinking
Sleep	Binary	Y/N	Sleeping
Talk	Binary	Y/N	Talking (group only)
Listen	Binary	Y/N	Actively listening using headphones

OtherA	Binary	Y/N	Other Activity - Complete open ended field OthAc
Field Name	**Type**	**Values**	**Notes**
GroupT	Numerical	1-4	1=study separate; 2=study group; 3=project; 4=social
Freq	Numerical	1-3	1=0-1x/wk; 2=2-3x/wk;3=>3x/wk
Length	Numerical	1-n	number of hours
Pct	Percent	0-100	Percentage of total study in library
StudySpt	Numerical	1-3	Places besides library where person studies: 1=home/dorm; 2=other campus location; 3=other location(work). For 2 or 3 response enter on OthPlac field
Pref1	Numerical	1-11	Preferred Location in library for work/study - first response: 1=tables; 2=window seats; 3=1st couches; 4=2nd couches; 5=rooms; 6=rotunda soft; 7=computers; 8=2nd quiet zone; 9=rotunda; 10=coffee; 11=other
Pref2	Numerical	1-11	Preferred Location in library for work/study - second response: 1=tables; 2=window seats; 3=1st couches; 4=2nd couches; 5=rooms; 6=rotunda soft; 7=computers; 8=2nd quiet zone; 9=rotunda; 10=coffee; 11=other
ThisSpot	Open	Alpha	Why did you pick this spot - likely to convert to numerical coded response, based on opend ended answers (eg: preferred location, suitable location, convenient location….
Why1	Numerical	1-7	Why are you're here - first response: 1=study; 2=test; 3=homework; 4=project; 5=PAPER, 6=relax; 7=social; 8=other (3 never used - 1 instead)
Why2	Numerical	1-7	Why are you're here - 2nd response: 1=study; 2=test; 3=homework; 4=project; 5=PAPER, 6=relax; 7=social; 8=other (3 never used - 1 instead)
OthPos	Open	Alpha	Other Posessions - open response - see OtherP
OthAc	Open	Alpha	Other Activity - open response - See OtherA
OthPlac	Open	Alpha	Other Place - Open response - see StudySpt
OthWhy	Open	Alpha	Other Why are you here, see Why1 & Why2
Like	Open	Alpha	What do you like about this spot, why did you pick it? Open response from interviews
Improve	Open	Alpha	What can be improved? This spot and library in general? Open response from interview
Note	Open	Alpha	Other notes and comments from interviews.
Int#	Alphanummeric	Alphanumeric	Code related to shift and sequence, number tracks back to stored interview on computer

Appendix 6: Occupancy by Location

Location	# of shifts unoccupied	% of Sweeps Occupied
Window Seats		
1S1	23	23%
1S2	22	27%
1S3	19	37%
1S4	26	13%
1S5	21	30%
1S6	26	13%
1S7	24	20%
1S8	27	10%
1S9	28	7%
1S10	28	7%
1S11	28	7%
1S12	24	20%
1S13	24	20%
1S14	17	43%
1S15	18	40%
1S16	21	30%
1S17	21	30%
First Floor Couches		
1S18	22	27%
1S19	21	30%
1S20	23	23%
1S21	16	47%
1S22	22	27%
1S23	21	30%
1S24	18	40%
1S25	18	40%
1S26	26	13%
First Floor Tables		
1T1	3	90%
1T2	2	93%
1T3	3	90%
1T4	4	87%
1T5	9	70%
1T6	3	90%
1T7	3	90%
1T8	9	70%
1T9	5	83%
1T10	6	80%

1T11	4	87%
1T12	6	80%
1T13	6	80%
1T14	3	90%
1T15	5	83%
1T16	6	80%
1T17	6	80%
1T18	4	87%
1T19	2	93%
2nd Floor Study Rooms		
2R201	5	83%
2R202	4	87%
2R203	4	87%
2R204	3	90%
2R205	3	90%
2R206	4	87%
2R207	5	83%
2R208	3	90%
2R209	5	83%
2R210	4	87%
2R211	5	83%
2R215	13	57%
2R216	7	77%
2nd Floor Couches		
2S1	28	7%
2S2	22	27%
2S3	21	30%
2S4	27	10%
2S5	24	20%
2S6	23	23%
Study Room Corridor Soft Seats		
2S7	29	3%
2S8	24	20%
2S9	28	7%
2S10	27	10%
2S11	26	13%
2S12	30	0%
2S13	29	3%
2S14	27	10%

Appendix 7: Cross Tabulation Comparisons of Possessions (computers, notebooks or papers, and books or journals) with Zone and Sweep Time.

Library Zone * Computer

Crosstab

			Computer		Total
			Yes	No	
Library Zone	tables	Count	556	270	826
		% within Library Zone	67.3%	32.7%	100.0%
	window seats	Count	69	57	126
		% within Library Zone	54.8%	45.2%	100.0%
	1st floor couches	Count	92	50	142
		% within Library Zone	64.8%	35.2%	100.0%
	2nd floor couches	Count	48	27	75
		% within Library Zone	64.0%	36.0%	100.0%
	study rooms	Count	503	217	720
		% within Library Zone	69.9%	30.1%	100.0%
	rotunda soft seats	Count	18	13	31
		% within Library Zone	58.1%	41.9%	100.0%
Total		Count	1286	634	1920
		% within Library Zone	67.0%	33.0%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	12.972(a)	5	.024
Likelihood Ratio	12.557	5	.028
Linear-by-Linear Association	1.135	1	.287
N of Valid Cases	1920		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.24.

Library Zone * Notebook/papers

Crosstab					
			Notebook/papers		Total
			Yes	No	
Library Zone	tables	Count	632	193	825
		% within Library Zone	76.6%	23.4%	100.0%
	window seats	Count	61	64	125
		% within Library Zone	48.8%	51.2%	100.0%
	1st floor couches	Count	53	89	142
		% within Library Zone	37.3%	62.7%	100.0%
	2nd floor couches	Count	32	43	75
		% within Library Zone	42.7%	57.3%	100.0%
	study rooms	Count	487	233	720
		% within Library Zone	67.6%	32.4%	100.0%
	rotunda soft seats	Count	21	10	31
		% within Library Zone	67.7%	32.3%	100.0%
Total		Count	1286	632	1918
		% within Library Zone	67.0%	33.0%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	130.041(a)	5	.000
Likelihood Ratio	125.039	5	.000
Linear-by-Linear Association	14.124	1	.000
N of Valid Cases	1918		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.21.

Library Zone * Book/journal

Crosstab					
			Book/journal		Total
			Yes	No	
Library Zone	tables	Count	434	391	825
		% within Library Zone	52.6%	47.4%	100.0%
	window seats	Count	59	66	125
		% within Library Zone	47.2%	52.8%	100.0%
	1st floor couches	Count	35	107	142
		% within Library Zone	24.6%	75.4%	100.0%
	2nd floor couches	Count	29	46	75
		% within Library Zone	38.7%	61.3%	100.0%
	study rooms	Count	300	416	716
		% within Library Zone	41.9%	58.1%	100.0%
	rotunda soft seats	Count	12	19	31
		% within Library Zone	38.7%	61.3%	100.0%
Total		Count	869	1045	1914
		% within Library Zone	45.4%	54.6%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	47.586(a)	5	.000
Likelihood Ratio	49.044	5	.000
Linear-by-Linear Association	20.274	1	.000
N of Valid Cases	1914		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.07.

Sweep Time * Computer

Crosstab					
			Computer		Total
			Yes	No	
Sweep Time	morning	Count	148	101	249
		% within Sweep Time	59.4%	40.6%	100.0%
	early afternoon	Count	348	165	513
		% within Sweep Time	67.8%	32.2%	100.0%
	late afternoon	Count	340	170	510
		% within Sweep Time	66.7%	33.3%	100.0%
	evening	Count	450	198	648
		% within Sweep Time	69.4%	30.6%	100.0%
Total		Count	1286	634	1920
		% within Sweep Time	67.0%	33.0%	100.0%

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	8.376(a)	3	.039
Likelihood Ratio	8.191	3	.042
Linear-by-Linear Association	5.224	1	.022
N of Valid Cases	1920		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 82.22.			

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Library Zone * Computer	1920	63.2%	1116	36.8%	3036	100.0%
Library Zone * Notebook/papers	1918	63.2%	1118	36.8%	3036	100.0%
Library Zone * Book/journal	1914	63.0%	1122	37.0%	3036	100.0%
Sweep Time * Computer	1920	63.2%	1116	36.8%	3036	100.0%
Sweep Time * Notebook/papers	1918	63.2%	1118	36.8%	3036	100.0%
Sweep Time * Book/journal	1914	63.0%	1122	37.0%	3036	100.0%

Appendix 8: Cross Tabulation Comparisons of Activities (talking, reading, writing and computing) with Zone and Sweep Time.

Library Zone * Talking

Crosstab

			Talking		Total
			Yes	No	
Library Zone	tables	Count	273	552	825
		% within Library Zone	33.1%	66.9%	100.0%
	window seats	Count	16	110	126
		% within Library Zone	12.7%	87.3%	100.0%
	1st floor couches	Count	68	74	142
		% within Library Zone	47.9%	52.1%	100.0%
	2nd floor couches	Count	47	28	75
		% within Library Zone	62.7%	37.3%	100.0%
	study rooms	Count	421	307	728
		% within Library Zone	57.8%	42.2%	100.0%
	rotunda soft seats	Count	14	17	31
		% within Library Zone	45.2%	54.8%	100.0%
Total		Count	839	1088	1927
		% within Library Zone	43.5%	56.5%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	158.154(a)	5	.000
Likelihood Ratio	166.068	5	.000
Linear-by-Linear Association	115.268	1	.000
N of Valid Cases	1927		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.50.

Library Zone * Reading

Crosstab

			Reading		Total
			Yes	No	
Library Zone	tables	Count	396	428	824
		% within Library Zone	48.1%	51.9%	100.0%
	window seats	Count	71	53	124
		% within Library Zone	57.3%	42.7%	100.0%
	1st floor couches	Count	40	102	142
		% within Library Zone	28.2%	71.8%	100.0%
	2nd floor couches	Count	28	47	75
		% within Library Zone	37.3%	62.7%	100.0%
	study rooms	Count	274	453	727
		% within Library Zone	37.7%	62.3%	100.0%
	rotunda soft seats	Count	14	17	31
		% within Library Zone	45.2%	54.8%	100.0%
Total		Count	823	1100	1923
		% within Library Zone	42.8%	57.2%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	41.054(a)	5	.000
Likelihood Ratio	41.515	5	.000
Linear-by-Linear Association	20.008	1	.000
N of Valid Cases	1923		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.27.

Library Zone * Writing

Crosstab

			Writing		Total
			Yes	No	
Library Zone	tables	Count	189	636	825
		% within Library Zone	22.9%	77.1%	100.0%
	window seats	Count	13	113	126
		% within Library Zone	10.3%	89.7%	100.0%
	1st floor couches	Count	6	136	142
		% within Library Zone	4.2%	95.8%	100.0%
	2nd floor couches	Count	7	68	75
		% within Library Zone	9.3%	90.7%	100.0%
	study rooms	Count	127	600	727
		% within Library Zone	17.5%	82.5%	100.0%
	rotunda soft seats	Count	1	30	31
		% within Library Zone	3.2%	96.8%	100.0%
Total		Count	343	1583	1926
		% within Library Zone	17.8%	82.2%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	45.634(a)	5	.000
Likelihood Ratio	54.311	5	.000
Linear-by-Linear Association	10.142	1	.001
N of Valid Cases	1926		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.52.

Sweep Time * Talking

Crosstab

			Talking		Total
			Yes	No	
Sweep Time	morning	Count	56	193	249
		% within Sweep Time	22.5%	77.5%	100.0%
	early afternoon	Count	201	316	517
		% within Sweep Time	38.9%	61.1%	100.0%
	late afternoon	Count	240	271	511
		% within Sweep Time	47.0%	53.0%	100.0%
	evening	Count	342	308	650
		% within Sweep Time	52.6%	47.4%	100.0%
Total		Count	839	1088	1927
		% within Sweep Time	43.5%	56.5%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	73.672(a)	3	.000
Likelihood Ratio	76.925	3	.000
Linear-by-Linear Association	68.570	1	.000
N of Valid Cases	1927		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 108.41.

Sweep Time * Reading

Crosstab

			Reading		Total
			Yes	No	
Sweep Time	morning	Count	130	119	249
		% within Sweep Time	52.2%	47.8%	100.0%
	early afternoon	Count	222	293	515
		% within Sweep Time	43.1%	56.9%	100.0%
	late afternoon	Count	189	321	510
		% within Sweep Time	37.1%	62.9%	100.0%
	evening	Count	282	367	649
		% within Sweep Time	43.5%	56.5%	100.0%
Total		Count	823	1100	1923
		% within Sweep Time	42.8%	57.2%	100.0%

Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-square	16.003(a)	3	.001
Likelihood Ratio	15.987	3	.001
Linear-by-Linear Association	3.817	1	.051
N of Valid Cases	1923		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 106.57.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Library Zone * Talking	1927	63.5%	1109	36.5%	3036	100.0%
Library Zone * Reading	1923	63.3%	1113	36.7%	3036	100.0%
Library Zone * Writing	1926	63.4%	1110	36.6%	3036	100.0%
Library Zone * Computing	1927	63.5%	1109	36.5%	3036	100.0%
Sweep Time * Talking	1927	63.5%	1109	36.5%	3036	100.0%
Sweep Time * Reading	1923	63.3%	1113	36.7%	3036	100.0%
Sweep Time * Writing	1926	63.4%	1110	36.6%	3036	100.0%
Sweep Time * Computing	1927	63.5%	1109	36.5%	3036	100.0%

Appendix 9: Other Observed Actions

Action	Times Observed
Leaving	45
Using calculator	23
Sharing computer	11
Presentation	9
Standing	9
Joined others	8
Sharing papers	7
Arriving and unpacking	6
Left and returned	5
Poster making	4
Sharing books	2
Browsing journal display	2
Tearing paper	2
Organizing notecards	1
Tutoring	1
Moved to avoid glare	1
Playing game	1
Total	**137**

Appendix 10: Other Non-Library Study Locations

Location	**Times Mentioned**
Grand Hall	31
Common Room/Dorm Study Lounge	21
Unistructure	19
Only Library	15
Academic Center for Excellence Lab/Athletic Study Hall	15
Empty Classroom	7
Bryant Center	6
Koffler Computer Lab	6
Workplace/Office	5
Other School or Public Library	3
Café	2
Outside	2
Any Uncrowded Place	2
Total	**134**