

Some Like it Quiet: Using a Heat Map to Study Space Use in a Health Sciences Library

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Objective: This method is used to identify preferred seating locations within the library.

Approach: This method involves counting where patrons are situated in the library at different times of the day, at different times of the year, and using that data to generate heat maps.

Data type(s) used: The data consisted of locations and counts of patrons around the library at different time points.

Strengths: Provides a granular look at space use in the library.

Limitations: It is difficult to know why patrons prefer different sections of the library.

Overview

As with all libraries, health science libraries want to know how their patrons use their space so changes can be made to help create a welcoming and useful experience. To keep track of library use, our library regularly counts the total number of patrons in the library and the number on each floor throughout the day. There is no record, however, of *where* on each floor patrons choose to study, read, and congregate. Nor are there any records of how those behaviors vary over the course of an academic school year, a week, or hour by hour.

A literature review of space use studies in academic and health sciences libraries was conducted and served as the basis for the work described in this article. Khoo^{1,3} and Gullikson² described studying space use in academic libraries using heat maps, and this option was chosen for several reasons. First, it allowed for collecting granular data about how patrons were using the space at a particular time instead of relying on those who are motivated to respond to surveys or participate in focus groups. Additionally, heat maps are easy for the viewer to parse and give immediate information about how different spaces are used. Library staff also wanted to create visualizations of how the library was used as part of a 10-year review of the library's operations, and the data collection could be conducted using existing staff time and operations.

The method described below makes it possible to quickly generate heat map images from any number of time points by loading data and variables into Adobe Photoshop. Since data was collected four times a day, five days a week, over the course of two weeks, we wanted to generate heat maps for each time point – forty times overall – with minimal manual effort. This process allows users to generate a heat map for each of those time points quickly and easily and one can modify the data if needed without any manual image manipulation. Methods for this study were adapted from Khoo¹ and Gullikson² such as recommendations on how to divide up sections of the library space into zones that could be analyzed together.

Example

In the fall of 2018, a health sciences library in a large, urban research university conducted a space use study by creating a series of heat maps. The intent was to determine usage levels of different areas of the library daily for two one-week periods at the beginning and end of the semester.

Working with library circulation staff, a plan was developed to modify pre-existing patron counts to record the exact patron seating locations during specific times throughout the day. Using the methods described by Khoo,¹ each floor of the library was divided into zones based on furniture groupings and separation barriers. To gather more granular data, we decided to follow Gullikson's² example and count the occupied seats in each zone as well.

Using modified paper floor plans, which detailed the different zones and seats on each floor, we tested the data collection process in late November 2018. Library staff counted patrons by marking each occupied seat in some zones and tallying the total number of patrons in others. After feedback from library staff, the floor plans were modified to improve usability and include orientation instructions.

The library's regular weekday hours of operation are 7:30AM-10PM. Staff counted library patrons four times a day every weekday for one week at 9:30AM, 12:30PM, 3:30PM, and 5:30PM. These data collection times were chosen so the data from different dates could be compared easily and to fit with existing staff counts of patrons. Although our library is open in the evening (and overnight during finals weeks) and on weekends, counts could not be done at those times due to staffing limitations.

The first set of data was collected during a week near the end of the semester with an expected high occupancy rate. The second set of data was collected during a traditionally low occupancy week following the winter break.

Data was transferred from the paper templates into spreadsheets that mimicked the layout of the floor plans, as outlined in Gullikson.² Calculations were performed to derive an occupancy percentage based on a hypothetical 100 percent occupancy.

To create the heat maps, we used Adobe Photoshop⁴ and instructions from Rich Media⁵ to overlay color-coded boxes on the library floor plans. Occupancy percentages were translated into colors using a gradient of blue (low occupancy) to red (high occupancy) based on those used in Khoo³ and Gullikson.²

Results

Studying the use of space in a library over two weeks does not give a complete picture of how the space is used throughout the entire academic year. However, using heat maps allowed us to identify some interesting trends.

Table 1 illustrates the total use of the library by floor during both the high occupancy week and the low occupancy week. In general, use of the library was slightly more than double during the high occupancy week compared to the low occupancy week.

The Second Floor was the most used area of the library, regardless of the time of day. Compared to the low occupancy week, the First and Second Floors were nearly twice as

popular as the high occupancy week, and the Lower Level was nearly three times as popular. The heat maps made these differences easily visible.

Table 1. Occupancy counts and percentages from two one-week periods

	High occupancy week count	Occupancy percentage		Low occupancy week count	Occupancy percentage
2 nd Floor	1,854	20.74%		846	9.46%
1 st Floor	743	14.04%		417	7.87%
Lower Level	1,145	17.04%		457	6.80%
Total	3,742	17.85%		1,720	8.21%

As seen in the heat map below (figure 1), the Lower Level was quite popular during the high occupancy week, with some surprising findings. The study tables in Zones 6, 7 and 8 were very popular. Our assumption was that this was due to their proximity to the only sources of natural light on this level. However, the carrels in Zone 2 - which are furthest from all natural light sources - were almost as popular, if not more so, during the same time period. Additionally, patrons seemed to prefer more secluded areas of the floor with less foot traffic, such as near the stacks. Figure 1 clearly shows the study rooms in Zone 3 and carrels in Zone 2 were used more often than other areas on the Lower Level. Perhaps the Lower Level is more popular during times of intense studying overall due to its seclusion and the large number of seats located near natural light.

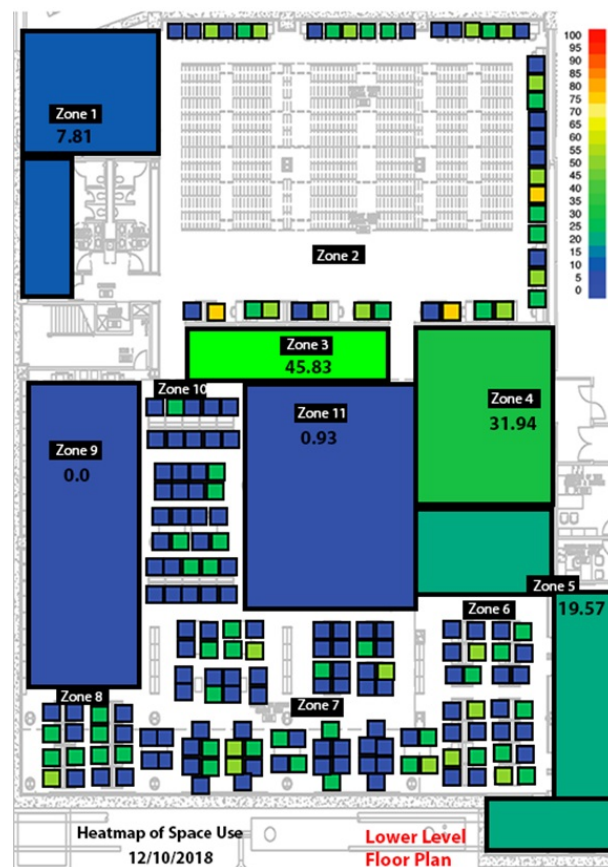


Figure 1: Lower Level during high occupancy time period

Figure 2, illustrating the data on the Lower Level from the low occupancy week at the beginning of the semester, appears much cooler (more blue areas) than in figure 1. By comparing the two figures, the difference in colors clearly illustrates how the same library space is populated at different times of the year. Of particular interest is that Zone 3 was popular during both times of the year indicating a strong preference for this location.

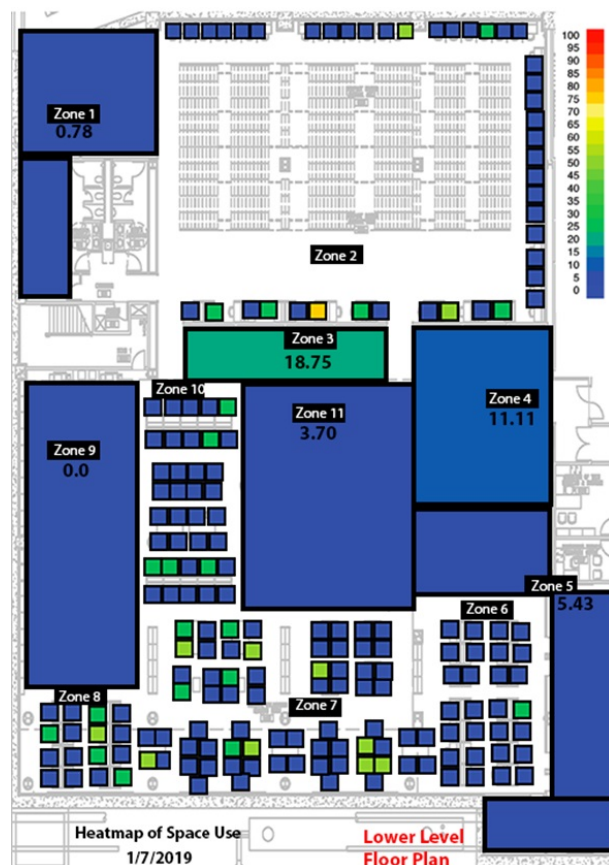


Figure 2: Lower Level during low occupancy period

Using heat maps also made it clear that some high-traffic areas were never popular. Zone 11 contains a large circular staircase that runs through all three floors with nearby seating. That seating was not popular in either week, perhaps due to the disruptions from people using the stairs.

One of the key benefits of using heat maps is the ability to easily identify which areas of a library are popular or unpopular just by noting how 'hot' (bright green/yellow) or 'cool' (dark blue) an area is colored. Analyzing the maps and the underlying data also identifies other potential topics for more study and consideration.

The key limitation of the heat map method is understanding *why* a particular space in the library is popular or unpopular with patrons. Given this limitation, the heat maps generated in this study will be used to help inform space use decisions, but only in conjunction with direct feedback from library users gathered via focus groups and advisory groups.

This method did not answer all our questions, and often raised more, but provided a visual way to easily understand library space usage across multiple time points.

Further Reading

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