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The Library's Impact on University Students' Academic Success and Learning

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Article abstract

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Methods – A survey was distributed during the Spring 2018 semester to graduate and undergraduate students at a large public research institution. Survey responses consisted of two types of data: (1) quantitative data pertaining to multiple choice questions related to the student library experience, and (2) qualitative data, including open-ended questions, regarding students' perceptions of the library's impact on their learning. Quantitative data was analyzed using Spearman's rank correlations between students' library experience and their GPAs, whereas qualitative data was analyzed employing thematic analysis.

Results – The key findings from the quantitative data show that student library visits and library space satisfaction were negatively associated with their GPA, whereas most students' use of library resources (e.g., journal articles and databases) was positively associated with their GPAs. The primary findings from the qualitative data reveal that students perceived the library as a place where they can concentrate and complete their work. Additionally, the students reported that they utilize both the quiet and collaborative study spaces interchangeably depending on their academic needs, and expressed that the library provides them with invaluable resources that enhance their coursework and research.

Conclusions – While the findings show that the student library experience was associated with their academic achievements, there were mixed findings in the study. The findings suggest that as a student's GPA increases, their in-person library visits and library space satisfaction decrease. On the other hand, as a student's GPA increases, their library resource usage increases. Further investigation is needed to better understand the negative relationship between students' library visits, library space satisfaction, and their GPAs.

Evidence Based Library and Information Practice

Research Article

The Library's Impact on University Students' Academic Success and Learning

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Abstract

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Introduction

Academic libraries exert great effort to demonstrate with empirical evidence that library use has an impact on students' academic success and learning. Our public research university library is no exception and considers this an important task. We conducted a locally developed survey to examine how students' library experiences (e.g., frequency of library visits, library resource use, and satisfaction with library spaces) are associated with their academic achievement. At the same time, we further asked how they perceived the library's impact on their learning, using an open-ended question. By integrating and comparing quantitative data with qualitative data, we aim to gain a broader understanding of the influence of students' library experiences on academic achievement and learning. In this manner, this study aspires to provide a deeper understanding of how an academic library demonstrates the impact of the library on students' learning, using their self-reported data and institutional data (e.g., Grade Point Average or GPA).

Literature Review

Academic libraries are under constant pressure to prove their value. To demonstrate their value in a "clear, measurable and [meaningful]" way using existing information, the Association of College & Research Libraries' (ACRL) Value of Academic Libraries Initiatives issued *Value of Academic Libraries: Comprehensive Review and Report* (Oakleaf, 2010, p.8) suggesting several possible correlations between students' academic success (e.g., GPA) and their library data (e.g., checkouts, database use, and library instructions). Since then, college and university libraries have increasingly dedicated resources to reveal the library's impact on students' academic success using various assessment measurements.

In an effort to demonstrate the library's impact on students' learning and academic achievement, many researchers have used their library data such as online library resource use and library instructional workshops. More than 200 higher educational institutions, from community colleges to doctorate/research universities, participated in the Assessment in

Action (AiA) Project between 2013 and 2016 and provided compelling evidence regarding the relationship between library use and students' learning and outcomes (Brown, 2018). For example, Eastern Kentucky University, one of the participants in the AiA Project, examined undergraduate students' online library resource use and their GPAs. The results showed that students who logged into online library resources had a higher GPA than their peers who did not access its online resources (Brown & Malenfant, 2018a). In addition to the Eastern Kentucky University study, similar results from other institutions in the AiA Project (e.g., Murray State University, York University, California State University-East Bay) showed a positive relationship between students' library use and their GPAs (Brown & Malenfant, 2018a, 2018b).

A study undertaken at the University of Minnesota by Soria, Fransen, and Nackerud (2013) measured whether the use of library resources and services (e.g., databases and library workshops) was associated with student retention and GPA for first-year undergraduate students. Using student database login information and student instructional and reference interactions, they demonstrated that students' GPAs were positively associated with students' library use (e.g., database use, electronic journals, and book loans), but students' GPAs were negatively associated with course-integrated instruction sessions. A two-year study at the University of Nebraska-Lincoln examined whether use of library resources activities (e.g., circulation checkouts and off-campus access to databases) were related to both undergraduate and graduate students' GPAs (Allison, 2015). Data was employed from student information systems, including students' identification number, GPA, and class information (e.g., undergraduate and graduate students). A positive correlation between variations of library use and changes in GPA was found for two years for both undergraduate and graduate students. While Soria and colleagues (2013) focused only on first-year undergraduate students and used internal data from their institutions and one year of library data, Allison included undergraduate students beyond the first year and examined two years of library data.

The studies above (Allison, 2015; Soria et al., 2013) focused on the correlations between students' use of library resources and their academic achievements to examine academic libraries' impact on students' academic success. Other academic libraries have examined other types of library usage data, including use of library space and technology (e.g., checking out laptops). For instance, the Illinois Institute of Technology (IIT) from the AiA project, examined the relationships between library use (e.g., entering the library, checking out laptops, and using study rooms) and students' GPAs. The results showed that students who used these library resources and services had a higher GPA than their peers (Brown & Malenfant, 2018a). Massengale, Piotrowski, and Savage (2016) used library usage data such as entry into the library by collecting students' ID numbers at the building entrance and when reserving study rooms, and manually collected data (e.g., borrowing laptops) in addition to institutional data (e.g., GPA and students' participation in extracurricular activities). They found that students who reserved group study rooms had the highest GPAs, followed by those who used their laptop in the library.

Other institutions also used library and institutional data to explore the impact of libraries not only on students' GPAs but also their learning. At the University of Minnesota, Soria, Fransen and Nackerud (2017) used the Student Experience in the Research University (SERU) survey, a campus-wide survey measuring the students' educational experience and academic engagement. The survey data was used in addition to library data (e.g., students' library use in collections, web-services, and online chat with librarian) and institutional data (students' demographic information and GPA) to examine whether first-year college students'

use of academic libraries was associated with students' academic outcomes (e.g., students' academic engagement, academic skills and GPA). Soria and colleagues found that students who consulted or met with reference librarians had higher academic engagement and academic skills. In addition, they found that students who used web-based services (e.g., databases or library websites) and engaged in library instruction (e.g., workshops or course integrated instruction) had a higher GPA in comparison to students who did not use these services (Soria et al., 2017).

While the above-mentioned studies demonstrated a correlation between library use and students' academic success by utilizing a wide range of data sources collected from libraries and institutions, academic libraries face challenges to gathering and accessing this data (Oakleaf, 2016; Oakleaf, Whyte, Lynema & Brown, 2017). Depending on the academic institution's policies (e.g., data privacy), capability (e.g., data analysis), or capacity (e.g., recording data), not all academic institutions provide access to this data. Given these limitations, what types of assessment methods could institutions use to measure the library's value in students' academic success when the data is not accessible, or the data is accessible but cannot be used for research studies?

To get around these difficulties, some libraries have developed their own survey instruments and examined whether or not students' library space usage has an impact on their learning needs and their academic achievements. For instance, Montgomery (2014) created an ethnographic survey regarding library space to examine whether or not students' behaviours using library spaces changed (e.g., spaces for working alone or working with other students), and how these decisions impacted students' learning before and after renovation. She found that students' use of library spaces for working with others before and after the renovation were unchanged, while students using library spaces to work alone increased after the renovation.

While Montgomery's study contributed to measuring how students perceived the library space, and how this perception affected learning behaviours, this study did not attempt to directly link these decisions to students' academic achievement, such as GPA. Other researchers attempted to examine how students used the library space, and the relationships between the students' library space use and their learning. Using survey questions including self-reported GPA and observational sweep seating, a method observing students' use of the library space, May and Swabey (2015) found that students used the library space to do their academic work. However, self-reported GPAs were not correlated with their number of visits to the library nor the amount of academic work completed in the library.

Aims

By considering what types of data were available to our institution, and our university library's desire to measure the impact of the library on students' success, the current study used survey questions locally developed by the university's library and examined how students' library visits, use of library resources, and library space satisfaction are associated with students' GPAs. Unlike previous studies assessing only the correlations of limited resources (e.g., books or multimedia checkout and GPA; library instruction and GPA), the current study aims to examine the comprehensive picture of the student library experience (e.g., library visits, use of library resources, and library space satisfaction) and its influence on GPA. Furthermore, students' open-ended responses to the one survey question were further analyzed to better understand how students perceived that the academic library has an impact on their learning. Open-ended survey responses give respondents an opportunity to explain and express themselves in a narrative form, which is very helpful for organizations to gain insight and better understand users' needs (Jackson & Trochim, 2002). Additionally, having a key open-ended question in online surveys can

increase the richness of responses, especially for respondents interested in the question topic (Holland & Christian, 2009). As such, this study aims to address the following questions:

- Question 1 from the quantitative data: What are the relationships among student library visits, resource use, library space satisfaction, and their academic achievement (GPA)?
- Question 2 from the qualitative data (open-ended): How do students perceive the library's impact on their learning experiences?

Using both quantitative and qualitative data can assist library staff with developing a better understanding of how students consider the benefits of using the library for their own learning, and what types of resources are associated with their learning.

Methods

In this study, a survey was distributed collecting both quantitative data and qualitative data through the use of an open-ended question. After analyzing the quantitative and qualitative data separately, the results were used to address the two research questions above.

Institutional Setting

The institution is a public research university in the Midwest serving approximately 29,000 students who are enrolled in 15 different colleges. It offers hundreds of degree programs at a bachelor's, master's and doctoral degree level, and has more than 80 undergraduate majors and 60 minors. At this academic institution, a total of 5 libraries are located across multiple campuses.

Measures

The student survey was developed in 2015 by the Library's Assessment Advisory Committee (AAC) in collaboration with an outside research consultant with expertise in library assessment and experience in developing library surveys. The AAC consisted of seven library faculty who represented various units at the university library. Hiring a research consultant ensured that the type of survey and content were appropriate to guiding the university library in the right direction. The role of the AAC was to ensure that all of the survey questions pertain to our organization's information needs by focusing on users' satisfaction and library usage. The first locally developed survey was distributed to the institutions' students in 2016. For the 2018 student survey, AAC reviewed the 2016 student survey questions and findings, and revised some scales (converting dichotomous to interval scales) and questions focusing on five areas: (1) frequency of in-person or online library visits; (2) frequency of library resource use; (3) what the library is doing well; (4) identifying areas to improve students' experiences; and (5) how the library might contribute to student success (see the Appendix for the survey questions). To address the research questions for this study, four variables were selected from the 2018 student survey questions: multiple choice questions related to student library visits, either in-person or online; use of resources; student library space satisfaction; and an open-ended question regarding students' perceptions of the library's impact on their learning. In both 2016 and 2018, the surveys were piloted with six to eight students who read the questions and shared their thoughts aloud to allow the research team to observe if there were any issues of interpretation with the questions. Adjustments to the questions were made accordingly. To avoid any confusion of the library terms, we also provided links to these within the survey. To measure the library's impact on students' academic achievements, students' cumulative GPAs were provided by the Office of Institutional Research.

Quantitative Data

Student Library Visits Either in Person or Online

The frequency of student library visits, either in-person or online, was assessed by the following question: "Last semester, how often did you visit the library (1) in-person and (2) online." The responses were coded as: 0 (never), 1 (once a month), 2 (once a week), 3 (multiple days in a week), and 4 (daily).

Student Library Resource Use

Students' use of library resources was measured by 11 items through the following question: "Last semester, how often did you use each of the library resources? (1) journal articles, (2) subject specific databases, (3) print books from the stacks, (4) textbooks on reserve, (5) electronic books, (6) library subject and course guides, (7) special collections and university archives, (8) digital images, (9) streaming media, (10) DVDs on reserve, and (11) patient care tools." The answers were coded as: 0 (never), 1 (once a month), 2 (once a week), 3 (multiple days in a week), and 4 (daily).

Student Library Space Satisfaction

To measure the extent that students are satisfied with library spaces, the four items were included in the following question: "How satisfied are you with the library spaces below at your library? (1) quiet study spaces, (2) collaborative study spaces, (3) group study rooms, and (4) computer areas." The answer was coded as: 0 (I don't use this space in the library), 1 (very dissatisfied), 2 (dissatisfied), 3 (satisfied), and 4 (very satisfied).

Student Grade Point Average (GPA)

Students' cumulative GPAs were taken from fall 2017 institutional records. The cumulative GPA refers to overall GPA, including all of the grades students earned from the beginning of the program to the end of the term. The range of GPAs was from 0.00 to 4.00.

Qualitative Data

Students' perceptions of the library's impact on their learning was assessed with the following open-ended question: "Thinking about your overall library experience at the university, please tell us about your experiences with the library that positively impacted your coursework or research."

Participants

Quantitative Data

In Spring 2018, a total of 28,725 undergraduate and graduate students were invited to participate in an online survey. A total of 2,277 students completed the multiple-choice survey for an overall response rate of 8%. While students across five library locations participated in the survey, for this study we did not closely examine responses by location. The majority of the respondents (about 92%) were enrolled in a program located in a large urban location, where there are two libraries. Because students were not asked which library they used, it is not possible to definitively determine which location the students visited. While assumptions could be made that students enrolled in the health sciences programs used the Library of Health Sciences, some of these programs are located geographically closer to the other library. Students might choose a library based on reasons outside of their program, such as proximity to their home. It was also clear based on the open-ended questions that some students were familiar with both urban library locations. All of those students would have used the same University Library website and had access to the same virtual resources.

As shown in Table 1, it appears that the ratio of respondents from the student survey was similar to the ratio of the university population

Table 1
Students' Demographic Information: Sample from Quantitative and Qualitative Data and University Population

	Sample		**Population (*n* = 28,725)**
	Quantitative Data (*n* = 2,277)	**Qualitative Data (*n* = 992)**	
Gender			
Female	1, 450 (63.7%)	646 (65.2%)	15,201 (52.9%)
Male	823 (36.2%)	346 (34.8%)	13,408 (46.7%)
Unknown	4 (0.1)	-	116 (0.4)
Age Group			
16-25	1,581 (69.4%)	695 (70%)	20,598 (71.7%)
26-35	509 (22.4%)	198 (20%)	6,206 (21.6%)
Above 35	187 (8.2%)	99 (10%)	1,921 (6.7%)
Class			
Undergraduate	1,297 (57%)	570 (57.5%)	18,886 (65.7%)
Graduate	980 (43%)	422 (42.5%)	9,839 (34.3%)
First generation	301 (13.2%)	127 (12.8%)	4,801 (16.7%)
Transfer	463 (20.3%)	202 (20.4%)	6,890 (24%)
Residency			
Commuters	1,951 (85.7%)	849 (85.6%)	24,584 (85.6%)
Resident	276 (12.1%)	125 (12.6%)	3,114 (10.8%)
Online	50 (2.2%)	18 (1.8%)	1,027 (3.6%)
Race/Ethnicity			
White	830 (36.4%)	378 (38.1%)	9,770 (34%)
Hispanic	486 (21.3%)	215 (21.7%)	6,906 (24%)
Asian American	423 (18.6%)	170 (17.1%)	5,406 (18.8%)
African American	163 (7.2%)	75 (7.6%)	2,226 (7.8%)
International	296 (13%)	113 (11.4%)	3,383 (11.8%)
Others	79 (3.5%)	41 (4.1%)	1,034 (3.6%)

Note: In this institution, "International status" was included in the race/ethnicity category. "International" refers to all international students, regardless of their race or ethnicity, who were not born in the U.S. and are not permanent residents or U.S. citizens.

(a difference of less than 5%) in all of the demographic variables, except for two categories: female respondents (approximately 11%) and graduate students (about 9%) were overrepresented in the survey. We can claim that the survey respondents were representative of the university's population. Undergraduate students made up 57% of the total, and 86% were commuters. With respect to the range of students' ages, 69.4% of respondents were between 16 and 25, followed by respondents between 26 and 35 (22.4%), and over 35 years old (8.2%). With respect to students' ethnicity, 36.4% of the respondents were White, followed by Hispanic (21.3%), Asian American (18.6%), International (13%), and African American (7.2%).

Qualitative Data

While 2,277 students completed the multiple-choice survey, a total of 992 students completed

the open-ended question at the very end. As with the quantitative data, the qualitative data sample for the student survey is representative of the university population, except for gender and class: female students (more than 12%) and graduate students (8%) were overrepresented in the qualitative data sample (see Table 1). With respect to students' ethnicity, 38% of the respondents were White, followed by Hispanic (21.7%), Asian American (17.1%), International (11.4%), and African American (7.6%). Students' demographic information is displayed in detail in Table 1.

Procedures

This study was approved by the Institutional Review Board at the institution. The list of potential students, including students' demographic information and their cumulative GPAs, was obtained from the Office of Institutional Research (OIR). The demographic information requested from the OIR for this study includes gender, race/ethnicity, class standing, academic program, campus location, commuter/resident/online, age, and first-generation (Table 1). All of the university students' email addresses and the data listed above, including GPAs, were uploaded as a "panel" in Qualtrics (2018 version). The email address and the data including GPA of each student were linked in Qualtrics to a unique URL created by Qualtrics. After distributing the survey, Qualtrics was able to track who responded to the survey and provided de-identified survey responses as well as the demographic data and GPAs for only those students who completed the survey. The survey was administered during the spring semester of 2018 and the survey reminder email, which included a drawing to win an iPad, was sent to students four times in order to increase the number of responses.

Data Analysis

Quantitative Data Analysis

Quantitative data was analyzed using quantitative data analysis software SPSS 25. Prior to analyzing correlations, descriptive statistics using frequencies were used to demonstrate how responses were distributed. The median was also used for the variables (library visit, library resource use, and library space satisfaction) and organized by class level in order to demonstrate where the center of the data is located. The median is appropriate for data that has the character of an ordinal scale, and is generally used for skewed number distribution—that is, the majority of scores tend to accumulate either at the high or low end of the distribution (King & Minium, 2007). To examine whether the library visits (in-person or online), library resource use, and library space satisfaction were associated with students' GPAs, a two-tailed Spearman's rank correlation was used. Given that most of the variables, except for students' GPAs, are ordinal scale (e.g., from 0 [never] to 4 [daily]), the Spearman's rank correlation coefficient, also called Spearman Rho (coefficient) is appropriate. This type of correlation is used when testing non-linear correlations and measuring the strength of the relationship between variables on a scale that is at least ordinal (Gust & D'journo, 2015; King & Minium, 2007; Pallant, 2011). Spearman rank correlation is commonly used in the field of psychology research and medical literature (Pallant, 2011).

Qualitative Data Analysis

Prior to analyzing the data, students' responses were screened to verify that their answers were complete. During this process, 14 responses were excluded because their responses were recorded as "N/A." A total of 992 responses were reviewed several times. Qualitative thematic analysis was employed using qualitative data analysis software (NVivo 12) in order to have an in-depth understanding of the impact of the academic library on students' learning. Thematic analysis is a method for identifying, analyzing, describing, organizing, and reporting themes that emerge from a data

set, and is widely used for a qualitative research method in epistemology and psychology (Braun & Clarke, 2006). Codes were developed mainly from guided research questions (provisional coding) and, at the same time, they emerged from respondents' quotations (inductive coding). After initial coding, codes were reviewed and revised by the first author. Afterwards, the pattern coding technique was utilized in order to condense the existing codes into a small number of themes (Creswell, 2009; Miles, Huberman, & Saldaña, 2014). Themes for coding were organized by the main question, "Tell us about your experiences with the library that positively impacted your coursework or research." The final codes and themes were reviewed by the second author, who designed the student survey. At this stage, no codes and themes were changed.

Results

Quantitative Findings

This study aims to examine whether students' library visits, library resource use, and library space satisfaction are related to their academic achievements. Table 2 shows descriptive statistics for each measure of student library visits and student library resource usage. As shown in Table 2, about half of the students responded that they visited the library "multiple days in a week" or "daily," whereas 33% of the students replied that they visited the library "once a month" or "never." On the other hand, only 24% of the students responded that they used the online library "multiple days in a week" or "daily," whereas about 45% of the students replied that they used the online library "once a month" or "never."

The frequency of students' library resource use is also displayed in Table 2. The most common response for students' use of any type of library resource fell into "never." The top five resources that were marked as "never": DVDs on reserve were ranked first for "never" (91.1%), patient care tools were ranked second (88%), followed by digital images (83%), special collections and university archives (82.7%), and streaming media (81.7%). The patterns of library resource use for students who replied "once a month" to "daily" were consistent. The top three resources that were used "once a month" or more include journal articles, subject specific databases, and electronic books.

With respect to student library space satisfaction (quiet and collaborative study spaces, group study rooms, and computer areas), quiet study room satisfaction (satisfied and very satisfied) was the highest (69.6%), whereas group study room satisfaction was the lowest (44.6%) (see Figure 1). Among library spaces, group study rooms were ranked the least used (31.8%).

Taken together, students' library usage (students' library visits, library resource use, and space satisfaction) are further shown in Table 3 using median values organized by class level. As shown in Table 3, the median values of undergraduate students' library visits in person and their online library use were 3 (multiple days in a week) and 1 (once a month). However, the pattern of library visits for doctoral students was the opposite: the median values of doctoral students' library visits in person and their online library use were 1 (once a month) and 3 (multiple days in a week). In terms of student library resource use, the results showed that the median values of undergraduate students using both journal articles and databases were 1 (once a month). However, the median values of doctoral students using journal articles and databases were 3 (multiple days in a week) and 2 (once a week). Regarding student library space satisfaction, the median values were the same across class level, except for doctoral students. Specifically, the median values of doctoral students' satisfaction with collaborative spaces and group study rooms were 0 (I don't use this space in the library).

Table 2
Quantitative Data: Descriptive Statistics on Students' Library Visits and Library Resource Use

	Response Scale				
Variables	0 Never	1 Once a month	2 Once a week	3 Multiple days in a week	4 Daily
Student Library Visits					
In Person (*n* = 2,237)	265 (11.6%)	493 (21.7%)	358 (15.7%)	724 (31.8%)	397 (17.4%)
Online (*n* = 1,924)	447 (19.6%)	572 (25.1%)	364 (16%)	429 (18.8%)	112 (4.9%)
Student Library Resource Use					
Journal Articles (*n* = 2,251)	662 (29.1%)	591 (26%)	357 (15.7%)	495 (21.7%)	146 (6.4%)
Subject Specific Databases (*n* = 2,224)	724 (31.8%)	676 (29.7%)	351 (15.4%)	382 (16.8%)	91 (4.0%)
Print Books from the Stacks (*n* = 2,213)	1,568 (68.9%)	418 (18.4%)	110 (4.8%)	87 (3.8%)	30 (1.3%)
Textbooks on Reserve (*n* = 2,214)	1,640 (72%)	366 (16.1%)	102 (4.5%)	85 (3.7%)	21 (0.9%)
Electronic Books (*n* = 2,214)	1,196 (52.5%)	558 (24.5%)	208 (9.1%)	191 (8.4%)	61 (2.7%)
Subject & Course Guides (*n* = 2,205)	1,598 (70.2%)	338 (14.8%)	138 (6.1%)	104 (4.6%)	27 (1.2%)
Special Collections & University Archives (*n* = 2,211)	1,883 (82.7%)	219 (9.6%)	55 (2.4%)	45 (2.0%)	9 (0.4%)
Digital Images (*n* = 2,209)	1,889 (83%)	185 (8.1%)	71 (3.1%)	54 (2.4%)	10 (0.4%)
Streaming Media (*n* = 2,204)	1,860 (81.7%)	155 (6.8%)	87 (3.8%)	75 (3.3%)	27 (1.2%)
DVDs on Reserve (*n* = 2,205)	2,075 (91.1%)	85 (3.7%)	26 (1.1%)	18 (0.8%)	1 (0.0%)
Patient Care Tools (*n* = 2,205)	2,003 (88%)	88 (3.9%)	49 (2.2%)	52 (2.3%)	18 (0.8%)

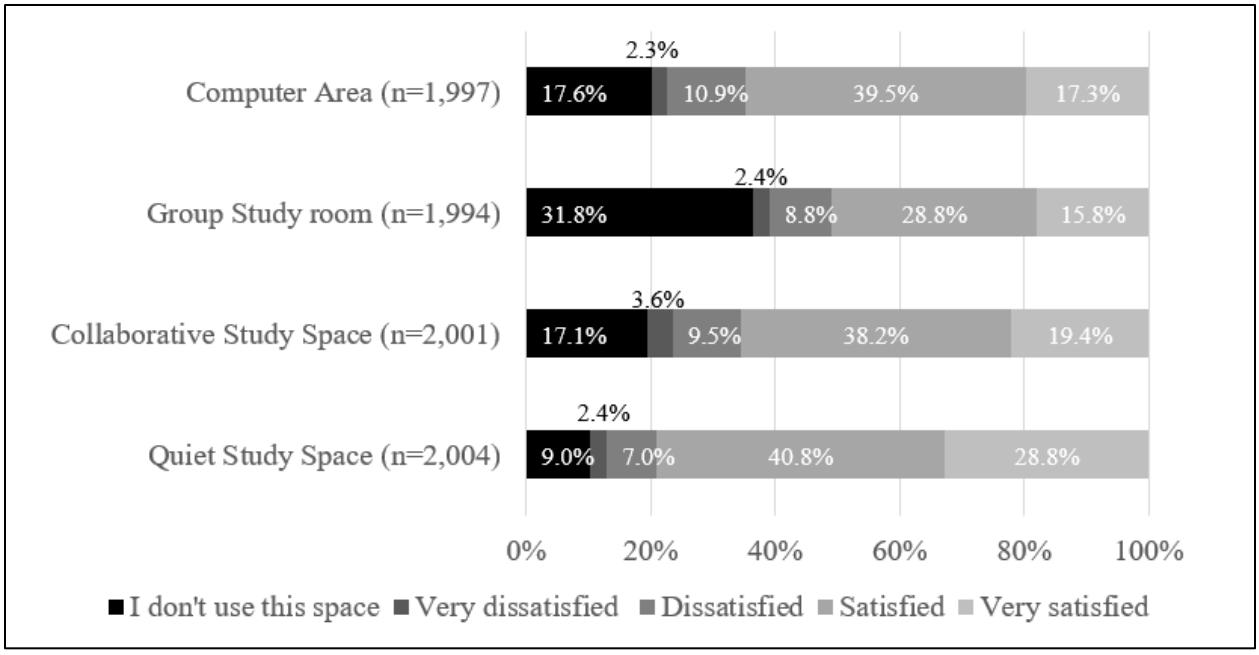

Figure 1
Students' library space satisfaction.

We further examined the relationships between students' library visits, library resource use, library space satisfaction, and their GPAs. A Spearman's rank correlation was employed, and the correlation matrix is shown in Table 4. The results indicate that student library visits in person (r_s[2,086] = -.24, p < .01) and online (r_s[1,794] = .27, p < .01) were associated with their GPA. However, when looking closely at the directions of the relationships, the results show that students' in-person library visits were negatively associated with their GPAs, whereas a positive relationship was observed between students' GPAs and their online library use. In other words, the higher the number of student library visits in person, the lower the student's GPA. On the other hand, the higher the student's online use, the higher their GPA.

The results of the relationship between library resources and GPA revealed that all of the library resources, except for DVDs on reserve (r_s [2,062] = -.03, p =.126), were correlated with students' GPAs (see Table 4). Most of the library resources (e.g., journal articles, databases, print books, electronic books, subject course guides, and special collections) are positively associated with student GPAs, suggesting that as a student's GPA increases, their use of resources such as journal articles and databases also increases. On the other hand, some resources (e.g., textbooks on reserve, digital images, streaming media, and patient care tools) were negatively associated with student GPAs, indicating that as a student's GPA increases, their use of some resources such as digital images and streaming media decreases.

In terms of the relationship between students' library space satisfaction and their GPAs, as shown in Table 4, the results revealed that students' satisfaction with all library spaces (quiet study spaces, r_s [1,896] = -.11; collaborative study spaces, r_s[1,893] = -.11; group study rooms, r_s[1,889] = -.11; and computer areas, r_s[1,889] = -.09; all p's < .01), were negatively correlated with students' GPAs. This finding suggests that as a student's GPA increases, their library space satisfaction decreases.

Table 3
Quantitative Data: Median Values for Students' Library Visits, Library Resource Use, and Library Space Satisfaction, by Class Level

Class	Library Visits		Library Resource Use											Library Space Satisfaction		
	In person	Online	Journal Articles	Subject Specific Databases	Print books from Stacks	Textbooks on Reserve	Electronic Books	Subject & Course Guides	Special Collections	Digital Images	Streaming Media	DVDs	Patient Care Tools	Collaborative Study Spaces	Group Study Room	Computer Area
Freshman	3	1	1	1	0	0	0	0	0	0	0	0	0	3	2	3
Sophomore	3	1	1	1	0	0	0	0	0	0	0	0	0	3	3	3
Junior	3	1	1	1	0	0	0	0	0	0	0	0	0	3	2	3
Senior	3	1	1	1	0	0	0	0	0	0	0	0	0	3	2	3
Masters	2	2	2	1	0	0	1	0	0	0	0	0	0	3	3	3
Doctoral	1	3	3	2	1	0	1	0	0	0	0	0	0	0	0	2
Professional/ Doctoral	2	2	2	2	0	0	1	0	0	0	0	0	0	3	3	3
Others	3	2	1	1	0	0	0	0	0	0	0	0	0	3	3	3

Note: Variables for library visit and library resource use are ordinal scale: 0 (never), 1 (once a month), 2 (once a week), 3 (multiple days in a week), and 4 (daily). The library space satisfaction variable is ordinal scale: 0 (I don't use this space in the library), 1 (very dissatisfied), 2 (dissatisfied), 3 (satisfied), and 4 (very satisfied).

Table 4
Quantitative Data: Correlations among Student Library Visits, Library Resource Use, Library Space Satisfaction, and GPA

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1.In person visit	1																	
2. Online visit	-.06**	1																
3. Journal articles	-.20**	.68**	1															
4. Databases	-.10**	.58**	.72**	1														
5. Print books	.10**	.29**	.29**	.27**	1													
6. Textbooks	.16**	.14**	.16**	.16**	.40**	1												
7. Electronic books	.00	.43**	.41**	.39**	.39**	.38**	1											
8. Subject/ Course guides	.04	.28**	.27**	.35**	.26**	.25**	.35	1										
9. Special Collections	.07**	.16**	.20**	.25**	.34**	.30**	.30**	.46**	1									
10. Digital images	.12**	.13**	.15**	.19**	.29**	.30**	.30**	.38**	.55**	1								
11. Streaming media	.15**	.14**	.12**	.16**	.24**	.28**	.26**	.33**	.39**	.55**	1							
12. DVDs	.11**	.07**	.09**	.14**	.28**	.27**	.21**	.29**	.41**	.44**	.44**	1						
13. Patient care tools	.01	.13**	.19**	.20**	.16**	.23**	.28**	.29**	.30**	.34**	.36**	.44**	1					
14. Quite study spaces	.17**	-.03	-.09••	-.04	-.01	.07**	.01	.03	.01	.06	.05	.04	.04	1				
15. Collaborative study spaces	.15**	-.05**	-.08**	-.03	.02	.12**	.02	.10**	.08**	.11**	.10**	.09**	.09**	.42**	1			
16. Group study room	.14**	.02	-.00	.04	.01	.13**	.07*	.13*	.09**	.12**	.10*	.09**	.14**	.30**	.56**	1		
17. Computer area	.12**	.02	-.01	.02	.02	.11**	.04	.08**	.07**	.10**	.11**	.07**	.06**	.35**	.42**	.39**	1	
18. GPA	-.24**	.27**	.29**	.19**	.10**	-.07**	.10**	.05*	.05*	-.06**	-.08**	-.03	-.07**	-.11**	-.11**	-.11**	-.09**	1

* indicates $p < .05$.; ** indicates $p < .01$

While most of the variables (students' library visits, resources use, and library space satisfaction) were found to be statistically correlated with students' GPAs at either $p < .05$ or $p < .01$, the strengths of relationships across variables were weak (all r_ss < |.30|), as indicated by Dancey and Reidy (2011). The highest r_s value is .29 for journal articles (see Table 4).

Qualitative Findings

The second goal of the current study is to better understand how libraries have an impact on students' learning from the students' perspective. By utilizing an open-ended question, four overarching themes relating to students' perceptions of the library's impact on their learning emerged from the thematic analysis (Table 5). Those four themes include: (1) primary activities in the library; (2) choosing an appropriate space for academic and learning needs; (3) types of resources used for course work and research; and (4) library staff and librarians assisting students.

Primary Activities in the Library

Primary activities in the library represent the reasons why students visited the library. The majority of students responded that they went to the library for studying (n = 190), utilizing library resources for research (n = 111), or working on their coursework/homework (n = 77). The balance of the students used the library to prepare for an exam (n = 30), or work with their peers on group projects (n = 18).

Choosing an Appropriate Space for Academic and Learning Needs

A great number of students reported that they considered the library as a place where they can stay focused without distractions and get work done (n = 104). Specifically, students commented that when they needed to concentrate, or had to finish coursework or a project, they utilized a quiet space." One representative comment included the following:

> I spend time in the library to focus on homework and to study efficiently on the quiet floors. The quiet environment influences me to focus and get all of my work done (Criminal Law & Justice, Freshman, Female).

Of those students who perceived quiet spaces as an essential place for their learning, some responded that the use of the quiet space enabled them to increase their academic grades (n = 10). By way of example, one student commented:

> My scores get lot more improved after studying in quiet library space (Biological Sciences, Sophomore, Male).

While many students reported that they were able to focus on their academic work and finish their work in the library quiet space, other students stated that they appreciated the library providing both a quiet space and a collaborative space (n = 26). In other words, students are likely to choose the appropriate library space depending on their academic needs, studying independently, or working with their peers. For example, a graduate student responded:

> I love that both of the libraries have options for people who need all different kinds of environments to study (i.e. quiet, shared space, etc.). Some days I need absolute silence, other days I like to energy of being around people talking. I recently learned about the study corrals, and I wish that was something I knew about in undergrad, though. As a graduate student, that would have been especially helpful to know (Public Health, Graduate Student, Female).

In addition to the themes mentioned above, a few students reported that the library environment motivated them to work on their studies (n = 7).

Table 5
Qualitative Data: Themes and Codes for Students' Perceptions of the Library's Impact on Their Learning

Theme	Indicators	Description
Primary activities in the library	Studying, utilizing library resources for research, working on their coursework/homework, preparing for exams, and working with their peers on group projects	Students identified their primary reasons for using the library
Choosing an appropriate space for academic and learning needs	Quiet space to stay focused, quiet study space to increase academic grades, quiet space and collaborative space, and library environment	Students considered library space as a valuable space to inspire their concentration and productivity and to accomplish their academic goals
Types of resources used for course work and research	Journal articles, books, databases, computers, interlibrary loan and reciprocal borrowing	Library resources and services contribute to students' completing their coursework and research
Library staff and librarians assisting students	One-on-one consultations, online chats, asking questions in person, and library instructions	Students considered library staff and librarians' assistance a critical asset

Types of Resources Used for Course Work and Research

Students expressed that it is critical for them to access library resources in order to successfully complete their coursework and research. The resources students used for their coursework and research include journal articles (n = 140), books (n = 89), databases (n = 76), computers (n = 50), interlibrary loan, and reciprocal borrowing (n = 35). In many classes, students were asked to write papers using citations. Students perceived accessing library resources as the key to completing their coursework or research. One student stated:

> The online library databases and journals helped me find scholarly articles to aid in my research papers for my English and Art History courses (Graphic Design, Sophomore, Female).

Library Staff and Librarians Assisting Students

Some students admitted that they have difficulty navigating resources in the library and online. When they encountered this challenge, they sought help from a librarian through a one-on-one consultation, online chat, and asking questions in person (n = 135). Overall, students who received assistance from librarians and staff stated that they appreciated receiving immediate help from librarians and staff. In additional, students found it helpful when the librarians provided instructions on how to search for resources on the library website to use in their coursework and research. A master's student acknowledged:

> The ability to meet with a librarian for individualized help was extremely helpful and we wouldn't have been able to successfully complete our projects without it (Public Health, Masters Student, Female).

Because the open-ended question was asking about the library's "positive impact" on students' learning from the students' perspective, the themes from students' responses mainly focused on the positive impact. While the majority of students responded with their positive perceptions of the library's impact on their learning, some students expressed negative feedback on the library's facilities. For example, some students wanted a microwave to reheat food, while others wanted more food vending machine options, and others wanted more quiet study spaces.

Discussion

The first goal from the quantitative data was to learn how students' library experiences (library visits, library resource use, and library space satisfaction) were associated with students' GPAs. The results revealed several important patterns. Of interesting, the direction of the relationships between students' library in-person visits and students' GPAs showed a negative correlation. That is, the frequency of a student's library visits in person is negatively associated with student's GPA. This finding is contrary to the earlier studies indicating that students' library visits were positively associated with students' academic success (Brown & Malenfant, 2018a; Massengale et al., 2016). It is possible that students' previous academic success may influence their intention to visit the library. In other words, students with a lower GPA may need a place where they can concentrate on studying, which results in an increase in their visits to the library. On the other hand, students with a higher GPA may not think it is necessary to go to the library because of their self-discipline. Another possible explanation is that, due to the advantages of technology (e.g., easy access to Internet), students may shift their library use from a physical place of study to a place for accessing resources online. However, it is not easy to clearly explain this negative relationship. Given that this is merely a correlation, the results should not be interpreted that one necessarily causes the other. As such, further research is needed to investigate how this negative relationship occurs.

Most of the students' library resource use was shown to be positively associated with their GPAs. This finding is consistent with previous studies indicating that library resource use (e.g., databases) was positively correlated with students' GPAs (Brown & Malenfant, 2018a; Soria et al., 2013, 2017). It is important to note that some resources (textbooks on reserve, digital images, and streaming media) are negatively associated with students' GPAs. In the case of streaming media, it is possible that students with a low GPA need access to online tutorials in order to catch up on their studies, or the content of the streaming media may not be related to their course work or research, which results in the negative relationship. It will be useful to further investigate how specific resources are negatively associated with students' GPAs.

The results also revealed that there are correlations between all types of library space satisfaction and students' GPAs. However, it is important to note that the directions of relationships were negative. That is, the lower a student's GPA, the higher their library space satisfaction. Given that there was a negative relationship between students' library in-person visits and their GPAs in the current study, this finding can be accounted for by the same explanation. Students with lower GPAs are likely to use the library spaces and are satisfied with the library spaces. Again, this correlation does not indicate causation; further research is required to examine the relationship between students' library space satisfaction and their GPAs.

While the strengths of the correlations across all variables were weak, the interpretation of the strengths of correlations should be made with caution. For example, the r_s value for journal articles is .29. While this may appear weak, the R square value for journal articles is .08, meaning that journal use accounted for 8% of variability in GPA. Given all the potential variables that could impact GPA, it is not insignificant to see the potential impact of journal article use on GPA. Use of databases accounted for 4% variability with GPA. Again, with many factors likely impacting GPA, there is a potential for a lower grade without use of the library and its resources. On the other hand, some r_s values were less than |.10| (e.g., special collections, digital images, steaming media, and patient care tools), meaning that the variability related to the use of these and GPA is very small. This is not surprising for some library resources like special collections. It is likely that only students in specific programs would use some of these resources, such as special collections or patient care tools. For these, it might be more meaningful to look at their use and relationship with students' GPAs within specific programs. In spite of the findings of the weak relationships in the current study, it is important to note that the findings of the correlations (e.g., resource use) were supported by the literature discussed above (Allison, 2015; Soria et al., 2013, 2017). Weak correlations between undergraduate students' library use (e.g., checkouts and databases) and GPAs also were found in Allison's study.

Through quantitative data, the results provided evidence that the library has an impact on students' academic achievements. However, it is not clear whether the library's measurement of the relationship between students' library experiences and their academic achievements are aligned with students' perceptions of the library's impact on their learning. Utilizing qualitative data provided a deeper understanding of how students perceived the impact of library use on their learning and, furthermore, the association between students' library use and their learning outcomes.

Findings from the qualitative data uncovered how the library spaces and library resources impact students' learning. The key findings related to library spaces showed that students were able to increase their concentration and productivity in a quiet space, and they selectively chose the library space depending on their learning needs, studying independently or working with their peers. This finding provides evidence that at least some of the students from the study institution found that library spaces promote students' learning behaviours within that space. Additionally, providing both quiet and collaborative spaces in the library allows students to select the space they need to achieve their academic goals. In particular, students choosing and utilizing both kinds of spaces (quiet and collaborative spaces) provides important evidence that the university library promotes students' choice of learning venue. This finding is supported by the previous articles which argue how library space plays a role, which impacts students' learning. That is, the library is regarded as a place that nurtures both "self-directed learning and the creation of new knowledge" (Nitecki, 2011, p. 31), as well as "social learning" by providing an environment where students talk and collaborate (Montgomery, 2014, p. 72). These findings help library staff make decisions on how best to use library spaces to meet students' needs.

The qualitative findings further revealed which library resources have a positive impact on students' learning from their perspective. Students reported that they valued library resources (journal articles, books, and databases) and believed that those library resources have a positive impact on their coursework and research. Students commented that interlibrary loan and reciprocal borrowing are critical for them to complete their coursework and research. Moreover, students mentioned that library instruction and research consultations (learning how to search references and navigate the

library website), as well as library staff's support when looking for assistance either in person or online, were valuable resources in order to successfully complete their course work and research. This finding is also supported by the results of the quantitative data indicating that students' library resource use was positively associated with their GPAs. Other students have also reported similar findings related to the positive impact that library resources and services (e.g., database use, interlibrary loan, library instruction, research consultations) may have to promote students' learning (Allison, 2015; Brown & Malenfant, 2018a, 2018b; Gaha, Hinnefeld & Pellegrino, 2018; Soria et al., 2013, 2017).

Taken together, while the results from the quantitative and qualitative data may look different, in fact, the findings from the qualitative data complement the findings of the quantitative data. The quantitative data results showed that students' library visits in person and library space satisfaction were negatively correlated with their GPAs. However, the findings from the qualitative data revealed that students used the library for studying and preparing for exams. In addition, findings from the qualitative data indicated that respondents considered library space as a valuable space to accomplish their academic goals. Therefore, we speculate that students with a lower GPA tend to use the library to study and prepare for exams in order to improve their GPA, and those with a lower GPA are likely to be satisfied with the library spaces. Admittedly, the main focus of the current study weighs toward the findings from the quantitative data, and the open-ended question from the qualitative data are also largely presented from a quantitative perspective. Nevertheless, when looking at these findings together, the findings from the qualitative data may provide a better understanding of the results of the quantitative data. While we cannot confirm the causation without knowing students' previous GPAs, it is worth noting that through the qualitative data at least we are able to better understand why and how students used the physical library, and their perceptions of library use for their learning.

Limitations and Future Directions

A significant contribution to this study is the use of the survey developed by the university library staff in an effort to measure the impact of the library on university students' academic success. In spite of this contribution, there are some limitations to be addressed in this study. The open-ended question, "…please tell us about your experiences with the library that positively impacted your coursework or research," asked only about the positive impact on students' coursework or research. How a question is written might produce biased results. However, while it was written to produce positive comments, based on the comments it would appear that those who wanted to share negative feedback did so. While we do intend to use this question again in a future survey because we are interested specifically in understanding how students view the library in contributing to their success, we may add another open-ended question asking them to let us know whether there is anything additional they wish to share to provide the opportunity to give other feedback or comments, including negative ones. Another limitation of the current study is that it only focused on analyzing the relationship between students' overall library experience and their GPAs, rather than examining other factors such as degree sought, because the correlation of students' library use and GPAs may be influenced by those factors. Future research is needed to further examine whether there are correlations with other factors (e.g., class level or degree sought). Nevertheless, the finding of the negative relationship between in-person library visits, library space satisfaction, and students' GPAs needs further investigation. The university library has already begun designing a follow up study to further explore this finding by using the qualitative approach.

Conclusion

The purpose of the current study was to examine whether students' library experiences (student library visits, library resource use, and library space satisfaction) were associated with students' GPAs, and explore how students perceived the library's impact on their learning. The current study provided evidence that, overall, the student library experience was associated with their academic achievement even though the strength of correlations was weak. When looking closely at the directions of the associations between students' library experiences and their GPAs, there were mixed findings: students' library in-person visits and library space satisfaction were negatively associated with their GPAs, whereas most students' library resource usage was positively associated with their GPAs. The qualitative analysis demonstrated students' perspectives about how they benefited from using the university library. The findings indicate that students' primary activity in the library was studying. Furthermore, students utilized both quiet and collective study spaces, depending on their learning purpose, and valued library resources (e.g., journal articles and interlibrary loan) for their coursework and research. Last, students appreciated the assistance provided by the librarians and library staff with explaining how best to utilize library resources.

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Appendix
Student Experience Survey

I have read the "Agreement to Participate" document and agree to participate in this research.

- ☐ Yes
- ☐ No

Last semester, how often did you visit the university library?

	Daily	Multiple days in a week	Once a week	Once a month	Never
In person	☐	☐	☐	☐	☐
Online	☐	☐	☐	☐	☐

How satisfied are you with the library spaces below at your library?

	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	I don't use this space in the library
Quiet study spaces	☐	☐	☐	☐	☐
Collaborative study spaces	☐	☐	☐	☐	☐
Group study rooms	☐	☐	☐	☐	☐
Computer areas	☐	☐	☐	☐	☐

If you study in places other than the university library, what do you like about those spaces?
[Check all that apply]

- ☐ More study space
- ☐ Quieter study space
- ☐ Food/drink availability
- ☐ Software availability
- ☐ Equipment (e.g., computer, printer, scanner, etc.) availability
- ☐ Longer hours
- ☐ More comfortable furniture
- ☐ I can find a seat
- ☐ I prefer to study at home
- ☐ Other (Please specify) [ ]

Last semester, how often did you use each of the library resources below?

	Daily	Multiple days in a week	Once a week	Once a month	Never
Journal articles	☐	☐	☐	☐	☐
Subject specific databases	☐	☐	☐	☐	☐
Print books from the stacks	☐	☐	☐	☐	☐
Textbooks on reserve	☐	☐	☐	☐	☐
Electronic books	☐	☐	☐	☐	☐
Library Subject & Course Guides	☐	☐	☐	☐	☐
Special collections & University Archives	☐	☐	☐	☐	☐
Digital Images	☐	☐	☐	☐	☐
Streaming media	☐	☐	☐	☐	☐
DVDs on reserve	☐	☐	☐	☐	☐
Patient care tools	☐	☐	☐	☐	☐

Please indicate the relative **IMPORTANCE** of each of the library resources/services for your research or coursework.

	Very important	Important	Somewhat important	Not at all important	I don't use this tool/service
Journal articles	☐	☐	☐	☐	☐
Subject specific databases	☐	☐	☐	☐	☐
Print books from the stacks	☐	☐	☐	☐	☐
Textbooks on reserve	☐	☐	☐	☐	☐
Electronic books	☐	☐	☐	☐	☐
Library Subject & Course Guides	☐	☐	☐	☐	☐
Special collections & University Archives	☐	☐	☐	☐	☐
Digital Images	☐	☐	☐	☐	☐
Streaming media	☐	☐	☐	☐	☐
DVDs on reserve	☐	☐	☐	☐	☐
Patient care tools	☐	☐	☐	☐	☐
Library instruction arranged by your professor	☐	☐	☐	☐	☐
Library workshops that you self-selected to attend	☐	☐	☐	☐	☐
Other (Please specify)	☐	☐	☐	☐	☐

How **Easy** is to use the university library website for the services below?

	Very easy	Easy	Difficult	Very difficult	I don't use this service
Finding journal articles using the search box on the library home page	☐	☐	☐	☐	☐
Finding an e-book using the search box on the library home page	☐	☐	☐	☐	☐
Finding a print book using the search box on the library home page	☐	☐	☐	☐	☐
Accessing a database to search for articles and other scholarly materials	☐	☐	☐	☐	☐
Requesting a print book from another library	☐	☐	☐	☐	☐
Requesting an article from another library	☐	☐	☐	☐	☐
Logging into my library account to renew a book	☐	☐	☐	☐	☐
Asking for help from a librarian by IM/chat	☐	☐	☐	☐	☐
Using library Subject & Course Guides to access materials by subject	☐	☐	☐	☐	☐
Finding media (e.g., films, videos, online images, etc.)	☐	☐	☐	☐	☐
Booking a group study room online	☐	☐	☐	☐	☐
Other (Please specify)	☐	☐	☐	☐	☐

How **LIKELY** are you to recommend the following library services to another student?

	Very likely	Likely	Unlikely	Very unlikely	I don't use this service
One on one research consultation with a librarian	☐	☐	☐	☐	☐
Library workshops about library research (e.g., finding resources, requesting materials, etc.)	☐	☐	☐	☐	☐
IM/Online chat research help	☐	☐	☐	☐	☐
E-mail research help	☐	☐	☐	☐	☐

Suppose you had funding to improve the university library. Please select up to THREE of your most important priorities from the list below.

- ☐ Access to more online journals
- ☐ Access to more books (e-books, print books, textbooks)
- ☐ More computers
- ☐ More quiet study space
- ☐ More group study space
- ☐ More electronical outlets
- ☐ More white boards
- ☐ More drink/food options
- ☐ Additional comfortable furniture
- ☐ Other (Please list) [ ]

Think about your overall library experience at the institution, please tell us about your experiences with the library that positively impacted your coursework or research.