Library Correlational Assessment and Campus Partnership for Student Success

Holly Yu and Adele Dobry

Data-driven assessments in academic libraries, which demonstrate their relevance to student success, have become increasingly crucial. This correlational study aimed to assess whether using online resources and borrowing print materials from the university library contributed to higher grade point averages (GPA) and better retention rates among undergraduate students at California State University, Los Angeles (Cal State LA), a campus where students of color comprise 85% of the overall student population with 75% coming from underserved communities. The analysis explored library resource usage patterns based on gender, ethnic background, first-generation status, and Pell Grant eligibility. The findings have strengthened the library's efforts to partner with the campus student success team to integrate library resource access and services into the learning workflows, which enabled more effective use of library resources and services within the applications or systems commonly employed by students and faculty. Additionally, this study has highlighted some challenges associated with collecting library data and integrating it with campus data systems for sustained assessments.

Introduction

This study aimed to utilize evidence-based assessment, specifically correlation analysis, to highlight the library's role and value in fostering student academic attainment at Cal State LA. The identified evidence was used to persuade campus partners about the significance of integrating library use data with student demographic and academic performance data for continued assessments. It was also used to initiate a partnership between the library and the campus student success team to integrate library resource access and services into campus student learning analytics and learning management system. Both outcomes helped establish the library as a true contributing partner in student success.

The importance of data-driven assessments in academic libraries, which demonstrate contributions and relevance to student success, has been increasingly recognized. Recent scholarship has highlighted the growing trend of identifying correlations or associations between the utilization of library services and resources and improved student academic performance. In

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this correlational analysis, the aim was to assess whether the use of library online resources and material borrowing contributed to higher GPAs and better retention rates among undergraduate students at Cal State LA over a period of five semesters, from fall 2017 to fall 2019. The analysis involved mapping electronic resource remote access through EZProxy logins and library print circulation counts with campus student demographic and academic performance data.

To examine potential statistically significant differences in cumulative GPA between undergraduate students who utilized at least one of the mentioned library services and those who did not use any of these services, the chi-square test and Pearson's correlation coefficient test were employed. The findings revealed a positive correlation between library resource utilization and better GPAs among undergraduate students. The analysis also explored library resource usage patterns across various categories, including gender, ethnic background, first-generation status, and Pell Grant eligibility.

The study results have further propelled the library's efforts to: integrate library resource access and services into campus learning workflows; facilitate the timely and effective use of library resources and services within the applications or systems commonly utilized by students and faculty; and enhance sustained collaboration among campus partners to foster student success. Examples include embedding the library discovery function in the learning management system and integrating the library research consultation service into student learning analytics. The initial success has set the library on a path to further develop campus partnerships for student success, to address the challenges associated with library data collection, and to integrate library usage data with campus data systems for ongoing and systematic assessments.

Literature Review

Academic library assessment has evolved. It started by heavily relying on qualitative measures to assess the quality of library services and resource use. At the beginning of the 2000s, return-on-investment (ROI) evaluation gained popularity. In the last decade, library impact and value assessment utilizing correlational analysis started emerging, which represented a transformational shift in library value assessment. Assessment results have propelled libraries to seek integration with campus systems both to demonstrate value and to shift the library to being a true partner in student success.

Academic library assessment using qualitative measures became the dominant methodology when the American Library Association published the Library Survey Questionnaire in 1924 (Craver et al.). Qualitative studies, such as focus group interviews, user feedback, or comments, were also frequently used. The library assessment interview conducted by the Digital Library Federation (DLF), which had 24 member institutions in 2001 (Covey, 2002), as well as a similar survey the Association of Research Libraries (ARL) conducted of its 24 large academic libraries in the United States (Hiller et al., 2008) found that the following assessment methods were being employed: surveys/questionnaires, focus group interviews, library web usability studies, usage/transaction log analysis or return-on-investment evaluation, and space and facility use. These assessments are effective in gauging and understanding user needs, satisfaction, and expectations, but they are qualitative and anecdotal (Wong & Webb, 2011).

Assessment preferences began to shift from user satisfaction surveys on the outcomes of library services and resource use, to return on investment (ROI). Library ROI research was

particularly common during the 2008 and 2009 economic downturn when academic libraries needed to demonstrate their value to their parent institutions and to secure funding for library resources (Aabø 2009; Matthews, 2011; Mezick, 2007). More recently, a shift to focusing on student success in higher education required academic libraries to reconsider how to demonstrate their contribution and impact on student success. This also led to an increasing realization of how insufficient previous assessment methods were in understanding the relationship between library uses and student success. The Association of College and Research Libraries (ACRL) created the Value of Academic Libraries (VAL) initiative and published *The Value of Academic Libraries: A Comprehensive Research Review and Report* in 2010, seeking answers to the following two critical questions:

- What differences do academic libraries and librarians make in the lives of students, faculty, their overarching institutions, and other stakeholders about things that matter to them?
- How can librarians capture the difference made—the impact of the library—and how can they assess it, share it, and increase it?

The report summarized existing academic library value research, set the course for future work in the field, and articulated an initial academic library value research agenda. Since the publication of the ACRL 2010 report, library assessment transformed from fragmentally measuring service qualities and user satisfaction to systematically measuring library impact on student success; it also became a goal in ACRL's Plan for Excellence in 2011 (Becker & Goek, 2020).

ACRL published *Academic Library Contributions to Student Success: Documented Practices from the Field* in 2015, which documents the *Assessment in Action: Academic Libraries and Student Success* (AiA) Project and supports a multi-approach assessment. ACRL's *Academic Library Impact: Improving Practice and Essential Areas to Research*, published in 2017, recommended six priority research areas to highlight the library's impact on student learning and success: communicating the library's contributions; matching library assessment to the institution's mission; including library data in institutional data collection; quantifying the library's impact on student success; enhancing teaching and learning, and collaborating with educational stakeholders. In *Action-Oriented Research Agenda on Library Contributions to Student Learning and Success*, published in 2017, ACRL narrowed its scope to focusing on the library's impact on institutional priorities for improved student learning and success.

The literature on academic library correlation assessment has documented research and practices using the quantitative method to collect data on resource and service use, to analyze how student library use impacts their learning, and to explore the relationship between students' library use and learning outcomes or academic achievement. These studies have found a relationship between library use and better or improved academic performance (Allison, 2015; Beile et al., 2020; Cox & Jantti, 2012; Goss, 2022; Haddow, 2013; Heady et al., 2018; Hsieh et al., 2021, LeMaistre et al., 2018; Marcum & Schonfeld, 2014; Nackerud et al., 2013; OCLC 2018; Scoulas et al., 2019; Soria et al., 2013; Stone & Ramsden, 2013; Thorpe et al., 2016; Wong & Webb, 2011). In their correlation study, LeMaistre et al. (2018) noted a significant difference in semester GPA between library users and nonusers. Cox and Jantti (2012) discussed how the Library Cube database, developed at the University of Wollongong Library in Australia, joined the library usage data with the Performance Indicators Unit (PIU), to become a campus one-stop data source for student demographic and academic performance data. Using the unique identifier, the student number in both library borrowing records, and electronic resource EZProxy log data as the match point in PIU, their data analysis revealed a strong correlation

between the use of electronic resources and student grades. The Joint Information Systems Committee (JISC), a non-profit organization in the United Kingdom, developed the Learner Analytics environment in partnership with several pilot institutions. In 2017, partnering with OCLC, JISC started access to both circulation data and EZproxy logs to the institutions using OCLC WorldShare Management Services (WMS) (OCLC, 2018). Involving data from OCLC systems has helped JISC develop a standard process and create data structures that can be used to process WMS data.

The literature documents how libraries have used a range of service points, combined with student demographics and academic performance data, in correlation assessments. Quantitative use reports, such as borrowing, access to electronic resources via EZProxy, attendance at information literacy sessions, and research consultations can be integrated with student performance data to indicate possible associations between library use and student success, as well as to demonstrate libraries' value and contribution to student success and the mission of the institution (Haddow, 2013). Soria et al., in a study done at the University of Minnesota Library, connected library information—including interlibrary loan transactions, library computer workstation uses, library instructional classes and workshop attendance, and research consultations, as well as in-person reference transactions—with non-library data—including student demographics, GPA, academic background, and ACT and SAT scores. The study found s statistically significant differences in "cumulative GPA between first-year students who used at least one library service (GPA 3.18) compared to the student who did not use any library services (GPA 2.98)" (2013, p. 151). Library data alone are not sufficient in providing an overall picture of who uses library services and whether using library services improves GPAs. To outline the scope and level of library assessments illustrating how library services impact student academic performance, and to provide a frame of reference for libraries planning to embark on similar assessments, this study conducted an examination of the literature of library correlation studies on both the library service data points used and student demographic and academic performance data.

An analysis of Allison, 2015; Beile, et al. 2020, Cox & Jantti 2012, Haddow 2013, LeMaistre et al. 2018, Nackerud et al. 2013, Soria et al. 2013, Stone & Ramsden 2013, Thorpe et al. 2016 found that, among other data points, loan transactions and proxy logins are two data points consistently used in library correlational assessment, as shown in Table 1. Both data points contain student unique identifiers as reliable match points in institutional student performance

TABLE 1
Library Data Points

Data Point	Allison	Beile et al.	Cox & Jantti	Haddow	LeMaistre	Nackerud et al.	Soria et al.	Stone et al.	Thorpe et al.
Ask Librarian						x	x		x
Computer Workstation						x	x		
Course-Integrated Instruction		x				x			
Interlibrary Loan Request						x	x		x

TABLE 1
Library Data Points

Data Point	Allison	Beile et al.	Cox & Jantti	Haddow	LeMaistre	Nackerud et al.	Soria et al.	Stone et al.	Thorpe et al.
Intro to Library Research		x				x	x		x
Loan Transaction	x		x	x	x	x	x	x	x
Library Visits								x	
Research Consultation		x				x	x		
Proxy Login	x		x	x	x	x	x	x	x
Reference Service Desk		x							x
Phone/Chat Reference									x
Website						x	x		
Workshop						x	x		

and demographic systems.

Similarly, an analysis of Allison, 2015; Cox & Jantti 2012, Haddow 2013, LeMaistre et al. 2018, Nackerud et al. 2013, Soria et al. 2013, Stone & Ramsden 2013, Thorpe et al. 2016 indicates that GPA is one of the data points researchers measure the most. As shown in Table 2, some libraries use more data points to try to obtain a multidimensional picture of overall library services by both undergraduate and graduate students; they also divide it into colleges or departments so that targeted intervention and outreach can be executed. All these studies have demonstrated that connecting student library use to student demographic and academic performance data is a critical aspect of library assessment. It is important that libraries measure the relationship between student library use and their academic performance and retention

TABLE 2
Data Points Outside Library

Data Point	Allison	Cox & Jantti	Haddow	LeMaistre et al	Nackerud et al	Soria et al	Stone & Ramsden	Thorpe et al
Academic Level					x		x	x
Academic Performance		x						
Academic Program								x
Academic Registry								
Academic Standing	x			x				x
Age			x		x			x
AP Credit						x		
Course							x	
Demographics		x						
DFWI*				x				

TABLE 2
Data Points Outside Library

Data Point	Allison	Cox & Jantti	Haddow	LeMaistre et al	Nackerud et al	Soria et al	Stone & Ramsden	Thorpe et al
Enrollment Status			x					
Ethnicity				x	x	x		
First-Generation				x		x		
Gender				x	x	x		
GPA	x	x	x	x	x	x	x	
International Status						x		
Major					x			
Part-Time Status					x			
Pell Grant				x		x		
Pre-College ACT Score						x		
Retention				x				
School/Dept					x		x	
Socioeconomic Status			x					
Student of Color					x			
Veteran Status						x		
*DFWI stands for D grade, fail, withdrawal, or incomplete								

using quantitative data from reliable library and institution systems.

Together, Table 1 and Table 2 show that the scope of measurable data points, both in library service data and in student demographic and academic performance data, varies in the literature of library correlation studies.

Recent literature has also documented research about libraries' attempts to advance the six priorities initiated in the 2017 ACRL *Academic Library Impact* report. As detailed by Croxton and Moore (2020) the University of North Carolina at Charlotte has been working on three of the six priorities, including library data integration with campus data collection, quantifying the library's impact on student success, and forming campus partnerships. However, intentional plans to advance all six priorities remains, as yet, unreported. The literature has indicated that correlation research aided by available data and technology is accelerating. The readily available data on student GPA, retention, and graduation rate provided by campus institutional research allows for tracking student performances in real-time for timely intervention. Without exception, all the research has documented both a statistically significant relationship between student library resource and service use and better GPAs, and that these two factors are positively correlated (Cox & Jantti, 2012; Haddow, 2013; LeMaistre, 2018; Soria et al. 2013; Nackerud et al., 2013; Stone & Ramsden, 2013; Wong & Webb, 2011). Despite the positive evidence, Cox and Jantti (2012), and Thorpe et al. (2016) caution that correlation may not prove cause and point out that many other factors may contribute to student academic success, such as teaching skills, students' motivation levels, and financial situation.

In examining the library correlation study literature, the authors found that integrating library data with institutional analytics is often a one-time collaboration. Consistent integration

with campus analytic systems is rare and should be a goal of future studies. The University of Minnesota Libraries provides an early example of an ongoing integration of library and institutional data. In 2011, the libraries started gathering usage data in an attempt to connect library resources and service use to student success measures, such as higher GPA, retention, and four-year graduation rates. Every semester the library collects usage data for approximately 15 different library engagement points, including digital/electronic material usage, online reference transactions, instruction sessions, circulation data, and library workstation usage. In partnership with the campus Institutional Research, and with Institutional Review Board approval, multiple studies have been conducted and published using these data (Oakleaf, 2018). A second example is DePaul University Library: in 2016, the Library Research Service was added as a referral option to learner support services available to DePaul faculty and academic advisors. The system was designed to improve communication among student support offices and to provide integrated information about academic resources both to students and to their advisors. This is a very successful example of integrating library data with a campus learning analytics system. Croxton and Moore (2020) illustrate how the library, Academic Affairs, and Student Affairs, along with other student success units, established a repository with contributed student data in which the campus can identify engagement factors that significantly contribute to student success. Beile et al. (2020) discuss both the dissemination of their correlation study results and their ongoing work to build an interactive learning analytics library dashboard that complements existing institutional dashboards.

One of the primary objectives of this correlational study at Cal State LA was to advance partnership and data integration by leveraging early study results to enhance library services for student success. The aim was to provide timely assistance to support student academic performance intervention and improvement. The initial success was achieved through a collaborative effort with the campus student success team, which integrated library research consultation with student learning analytics through Navigate LA. Moving forward, using the positive results of correlational studies to foster sustained collaboration among campus partners for student success remains a key goal.

Correlation Assessment at Cal State LA

Research Justification

Cal State LA, founded in 1947, serves a diverse and predominantly underserved student population, preparing them for the state's workforce. With approximately 23,000 FTEs, it stands as the premier comprehensive public university in the heart of Los Angeles. At Cal State LA, students who face equity gaps are identified as "Historically Underserved Students" (HUS). This includes first-generation students, economically disadvantaged students eligible for Pell Grants, and students from underserved communities. As of 2019, nearly 57% of our students are first-generation, 63.7% are Pell-eligible, and 70.5% come from underserved communities. Their four-year graduation rate and two-year retention rate consistently lag behind those of non-HUS students (Institutional Effectiveness, 2022). To address these disparities and promote student success, data-driven interventions have become a crucial strategic decision within the California State University system and Cal State LA, aimed at closing equity gaps.

Since the 2017 launch of Cal State's Graduation Initiative 2025, the campus has embraced the use of data as a powerful tool for analyzing student learning and for identifying interventions to improve graduation rates. Student success dashboards have fostered a data-informed

decision-making culture across the campus, empowering faculty, administrators, and staff to identify, diagnose, and predict challenges in student learning and success. Cal State LA's Student Success Collaborative, provided by the Education Advisory Board (EAB), offers a learning analytics tool that provides predictive analytics associated with student learning and enables targeted interventions. The EAB especially benefits students who may be less familiar with navigating higher education, providing them with insights into their learning and guiding them toward effective interventions.

The University Library at Cal State LA offers a rich array of scholarly and informational resources to support learning, instruction, research, creative activities, community engagement, and career development. It provides access to over 350 subscription databases, 65,000 electronic journals, approximately 1.4 million volumes of print and ebooks, as well as streaming video and music. OneSearch (PrimoVE), the library's discovery tool, facilitates searches across all material types and 23 California State University campuses, offering access to over one billion items, including 29 million books. The library offers one-on-one research consultations, conducts approximately 800 library instruction sessions annually for lower-division courses, and course-integrated instruction sessions for upper-division and graduate-level courses. Additionally, a credit-bearing information literacy course is available as an elective. While the library has conducted surveys to gauge student opinions about library services and resources, the output has primarily been qualitative, lacking longitudinal and quantitative research. Moreover, previous findings have been limited to library-specific information, without a holistic view of the student learning experience connected to their academic performance. This study aims to address these gaps by initiating quantitative assessments and correlational investigations to uncover the association between library use and student academic attainment.

Currently, the impact of the library on student success at Cal State LA is largely overlooked in the campus-wide assessment process. Furthermore, the role of the library is not mentioned in the five targeted intervention areas outlined in the Graduation Initiative 2025 Plan aimed at improving graduation rates. None of the library service elements, including information literacy instruction and resource use, are part of the existing intervention programs (CSU, 2021). Therefore, one of the primary goals of conducting this quantitative assessment and correlational investigation is to use the positive correlational study results to convince the campus partners the importance of integrating library services into the overall student success initiative of the parent institution. By articulating the value of the library through both qualitative and quantitative assessments, we have taken the first step toward integration.

An anecdote shared by a history faculty member underscores the significant role the library can play in preventing or reducing student withdrawals. The faculty member observed that students were more likely to withdraw from classes when assigned reports without a library information literacy session. Many students struggled to come up with their own research topics, so library instructional sessions and individual research consultations were designed to assist them in developing critical thinking skills, defining research topics, and finding necessary research resources. Referring students to librarians at this stage could potentially aid in withdrawal prevention. By harnessing the positive correlation between library use and improved student academic performance, we can effectively advocate for the integration of library services, particularly information literacy instruction, individual research consultation, and abundant research resources, into the institution's student inter-

vention program.

This study is particularly timely as the campus is focusing on interventions aimed at closing equity gaps. The study is also particularly valuable for Cal State LA, where most students are historically underserved and often face challenges in navigating the collegiate environment. The study, and this article, align with the three priorities outlined by ACRL: quantifying the library's impact; communicating its contributions; and fostering collaborations and partnerships with entities such as the Academic Success Center and Institutional Effectiveness (IE).

Existing literature has not specifically documented how the library contributes to large urban public universities, particularly where students of color comprise over 85% of the student population. To address these gaps, this article includes data and analysis of gender, ethnicity, and first-generation differences in library use. It also examines whether students receiving Pell Grants utilize the library differently. The findings of this study not only demonstrate the value of the library in promoting student success but also establish a positive correlation that informs the library's collaboration with campus entities directly involved in student performance and retention, enabling timely intervention in student learning. Furthermore, these study results can influence library decision-making in resource development, instruction and research consultation, targeted marketing, and outreach. They also highlight the need for the library to re-evaluate services that do not contribute to student success.

Research Objectives

Mapping out the library use data with student demographics and academic performance data reveals the association between our students and the role of the library in student academic performance. This approach enables the library to compare the demographic profile of library users to non-library users among all students and HUS, and to identify the strength of the association between student library use and academic attainment. In collaboration with the Office of Institutional Effectiveness, Center for Academic Success, and other campus partners, this study aimed to achieve the following objectives:

- Map the library use data with campus student demographic and academic performance data to determine whether undergraduate students and HUS utilize library resources, and to identify correlations or associations between library resource use and better GPA and retention.
- Communicate the library's contributions, match library assessment to the institution's mission, including library data in institutional data collection for sustained assessment, and quantify the library's impact on student success.
- Foster ongoing collaborations and partnerships with the campus student success team, faculty, academic advisors, Institutional Effectiveness, and Information Technology Services to leverage student data in support of student learning and success.

Methodology and Design

The student population investigated in this study comprised undergraduate students who entered as first-year or community college transfers from the fall of 2017 to the fall of 2019. The study used two measurable library data points to map with campus student demographic and academic performance data:

- Circulation counts: This included check-outs, renewals, and course reserve material borrowing. The library's unified library management system, Alma Analytics, provided

comprehensive transaction records with student ID numbers and the number of transactions. These circulation reports were exported as an Excel file and matched with student demographic and academic performance data from PeopleSoft.

- EZProxy log: Students accessed library electronic resources remotely through the campus network, primarily using EZProxy. The EZProxy log file contained student campus network user names, which were matched with student demographic data and academic performance in PeopleSoft to identify users and non-users of library electronic resources.

During the period under this research, the total number of reserve borrowings was 23,047 (2.7% of total transactions), and the total number of circulation transactions was 31,524 (3.7% of overall transactions). Due to the small sample size for physical circulation and reserves, it was combined with EZProxy login data (843,347) for meaningful statistical analysis, as recommended by the campus IE.

Data collection for both EZProxy and circulation data was completed by the end of the fall semester of 2019. To address privacy concerns and obtain an Institutional Review Board (IRB) exemption, aggregated analysis results were provided by the Institutional Effectiveness office without student IDs and network login IDs.

To analyze the data, the IE analyst performed a matching process aligning library data points with institutional data on students, including variables such as gender, ethnicity, first-generation status, Pell eligibility status, semester GPA, and one-semester retention. To answer the following questions, chi-square tests were conducted to determine statistically significant disparities in library use across categories such as gender, ethnicity, first-generation status, and Pell eligibility. Pearson's correlation coefficient (r) test was used to assess the strength of the relationship between GPA and library use.

1. Among all undergraduate students during the period under study, are there any significant differences in remote access to library resources and general resource use by ethnicity, gender, first-generation status, and Pell Grant status?
2. Among all undergraduate students during the period under study, are there any significant differences in remote access to library resources and general resource use by ethnicity, gender, first-generation status, and Pell Grant status?
3. Is there a positive relationship between library resource use and better semester GPA and retention among undergraduate students during this period?
4. How might the analysis results highlight the impact of library services and resources on student learning?

Although library information literacy instruction data were collected for the research, they were not included in the analysis due to the absence of a unique identifier required to match the library instruction records with campus courses and course sections. A graduate student assistant was hired to clean up the data and fill in missing information fields. The library instructional class data cleanup was funded by the Diversity Research Grant awarded by the American Library Association (ALA, 2020). Analysis plans for the library instruction data are yet to be determined, including whether to separate sessions by general education courses for lower-division students and course-integrated instruction for upper-division students with research assignments.

Data Analysis

The results from the data analysis include library resource use by gender, ethnicity, first-generation status, and Pell Grant eligibility status among undergraduate students, and whether

TABLE 3
Library Resource Use by Gender, Ethnicity, First-Generation, and Pell Grant Eligibility Status

		Non-User (3-Year)		User (3-Year)		Subtotal	χ^2	*P*
		Num	%	Num	%			
	Gender						1,436	<.001
	Female	14166	40	21248	60	35414		
Gender	Male	14143	56	11324	44	25737		
	Grand Total	28309	46	32572	54	61151		
	Ethnicity						126	>.005
	American Indian	19	34	37	66	56		
	Asian	4526	49	4711	51	9238		
	Black/African American	1208	51	1161	49	2369		
	Hispanic/Latino/a/x	21670	49	26486	55	48156		
	International	2466	50	2467	50	4933		
	Pacific Islander	34	49	35	51	69		
	Two Races	562	51	540	49	1102		
	Unknown	769	47	867	53	1636		
Ethnicity	White	1757	48	1903	52	3660		
	First Generation						17	>.005
	First Generation	5630	46	6609	54	12239		
First Generation	Non First Generation	3768	49	3921	51	7689		
	Pell Grant						4,173	<.001
	Received	6305	44	8025	56	14330		
Pell Grant	Never Received	2753	49	2865	51	5618		

the use of library resources has any statistical significance on student GPAs and retention.

Table 3 provides an overview of library resource use and non-use among undergraduate students based on their demographics to answer the first question: "Among all undergraduate students during the period under study, are there any significant differences in remote access to library resources and general resource use by ethnicity, gender, first-generation, and Pell Grant status?"

There was a total of 61,141 undergraduate FTEs enrolled in the five semesters of fall 2017, spring 2018, fall 2018, spring 2019, and fall 2019. Among them, 32,572 students used library resources at least once, representing 54% of the overall student population. Among the overall undergraduate student population at Cal State LA during this period, there were an average of 57.5% female students, 42.4% male students, and 0.1% unidentified (Institutional Effectiveness, 2022). As observed, the use of library resources by gender is significantly different. Among female students, 21,248, or 60% used library resources at least once. During the same period, among the male students, 11,342, or 44% used library resources at least once. The difference between male and female students' library use is over 16%. To further clarify whether there were statistically substantial differences between male and female student library resource use, a chi-square test was performed with the chi-square value $X^2 = 1{,}436$, degree of freedom (*df*) = 1, and *p-value* < .001. The smaller the p-value, the stronger the evidence is to indicate the significant difference in library resource use between female and male students, with more female students using library resources. Research has been planned to investigate the reasons why fewer male students used library resources. Uncovering the underlining explanations can assist the library with our effort to reach out to male students.

Our research hypothesis inquires whether there are any statistical differences in library use between the HUS and non-HUS undergraduate students during this period. First-generation and Pell Grant status were used as controlling factors for this analysis. During the five

semesters of this study, among the overall undergraduate student population, 61.3% were first-generation and 63.7% of the student population was Pell Grant eligible. Table 3 clearly indicates that Pell Grant recipients were using more library resources. On average for the five semesters evaluated, 56% of Pell Grant recipients used library resources, while 51% of non-Pell Grant students used library resources. The chi-square test was also performed with a result of $X^2 = 4{,}173$, $df = 1$, and $p\text{-value} < .001$, which indicates a difference in library resource use between Pell and non-Pell students.

The chi-square tests do not conclude significant differences between our first-generation and non-first-generation students in using library resources. On average for the five semesters evaluated, 54% of first-generation students were using library resources, while 51% of non-first-generation students were using library resources. The critical value of the chi-square test of $X^2 = 36$, $df = 1$, and $p\text{-value} > .005$ ($p\text{-value} = 1.84$) indicates no significant difference exists, which mirrors the analysis by the percentage of use.

Resource use by ethnicity also yields a result of no significant differences among the students with different ethnicities. Aside from American Indians (0.1/22 student population), the library resource use by ethnic group is within a 6% points difference with Black and biracial students at the low end, with 49%, and Hispanic students at the high end, with 55%. The chi-square value $X^2 = 126$, $df = 8$, and $p\text{-value} > .005$ ($p\text{-value} = 2.11$) reveals no significant differences in library resource remote access and print material borrowing among different ethnic groups of students. Even though the differences are not significant, further research should be done to uncover the reasons why the percentage of library resource use is low among Black and biracial students, and how we can increase the use among them through effective research consultation and outreach efforts.

Table 4 illustrates the relationships between library resource use and student GPA and it answers the second research question: "Is there a positive relationship between library resource use and better semester GPA and retention among undergraduate students during this period?"

Table 4 shows the accumulative GPA distributions among the students for the five semesters by the number of students under review. There are 30,574 students who used the library at least once, while 30,407 students did not use the library at all. Among the GPA distribution,

TABLE 4
Library Resource Use and Student GPA

GPA	% of Student Use	Num of Student Use	% of Student Not Use	Num of Student Not Use
3.75	0.180267548	5,512	0.08827931	2,684
3.5	0.158206319	4,837	0.088854902	2,702
3.25	0.154935566	4,737	0.098212377	2,986
3	0.148197815	4,531	0.115430789	3,510
2.75	0.102374567	3,130	0.091354614	2,778
2.5	0.087885131	2,687	0.091716414	2,789
2.25	0.057058285	1,745	0.069087441	2,101
2	0.043599137	1,333	0.06007532	1,827
1.99	0.067475633	2,063	0.296988834	9,030
		30,574		30,407

18% of the students who used the library had an accumulative GPA of 3.75 and above, and only 6.7% of students who used the library had a GPA of 1.99 and below. Of the students who did not use the library resources at least once, 30% have GPAs of 1.99 and below, and only 8% have GPAs 3.75 and above. To accurately claim that more library resource use correlates with higher GPAs, a Pearson's Correlation and Coefficient test was performed.

A Pearson's correlation coefficient (r) test in Table 5 examines the relationship between GPAs and the percentage of library use. To avoid significant deviations from the overall pattern of library use and the GPA correlation, the percentage of library use by students for GPAs 2.0 and below was excluded. These outliers can have a strong influence on the calculation of correlation coefficients by creating misleading conclusions, suggesting a stronger or weaker relationship than what exists. Removing outliers can help provide a more accurate representation of the relationship between the two variables, and to allow for more valid interpretations of the results with the analysis focusing on the majority of the data points, providing a clearer picture of the relationship between the two variables. In this case, the analysis included GPAs ranging from 3.75 to 2.25. The test statistics showed a *T* statistic of 8.441846, a degree of freedom (*df*) of 5, and a *p-value* of 0.00034. The test revealed a strong positive correlation (r = 0.97) between the percentage of library use and GPA, indicating that students who used the library more tended to have higher GPAs. These values indicate a significant relationship

TABLE 5
Pearson's Correlation & Coefficient Test

GPA	**% Library Use**	**PEARSON's R Test**	
3.75	0.202803635	Coefficient (r):	0.968208761
3.5	0.177968284	N:	7
3.25	0.174288973	T statistic:	8.441846
3	0.166709592	DF:	5
2.75	0.115162442	p-value:	0.00034
2.5	0.098863093		
2.25	0.064203981		

between library use and GPA, with a high level of confidence.

Table 6 presents the relationship between retention status and the use of library resources among undergraduate students. The data includes separate figures for freshmen and transfer students. On average, among the students who were retained in the fall semesters of 2017 and 2018, 57.2% used library resources, while only 39% of the students who were not retained used library resources. This suggests a positive association between library resource use and

TABLE 6
Retention and Library Resource Use

Retention Status	**Use of Library Resources**		**Not Use of Library Resources**	
	Num of Use	**% Use**	**Num of Not Use**	**% No Use**
Fall 17 Freshmen Retained	1461	51.20%	1393	48.80%
Fall 17 Transfer Retained	1701	57.60%	1252	42.00%
Fall 18 Freshmen Retained	1769	57.00%	1318	43.00%

TABLE 6
Retention and Library Resource Use

Retention Status	Use of Library Resources		Not Use of Library Resources	
	Num of Use	% Use	Num of Not Use	% No Use
Fall 18 Transfers Retained	1728	63.00%	996	37.00%
Average		57.20%		42.70%
Fall 17 Freshmen Not Retained	212	30.00%	490	70.00%
Fall 17 Transfer Not Retained	145	40.00%	222	60.00%
Fall 18 Freshmen Not Retained	270	35.00%	505	65.00%
Fall 18 Transfers Not Retained	135	51.00%	132	49.00%
Average		39.00%		61.00%
Retained/Not Retained Students				
Fall 17 Freshmen	1673	40.60%	1883	59.40%
Fall 17 Transfer	1846	48.80%	1474	51.20%
Fall 18 Freshmen	2039	46.00%	1823	54.00%
Fall 18 Transfers	1863	57.00%	1128	43.00%
Freshmen	3712	43.30%	3706	56.70%
Transfer	3709	52.90%	2602	47.10%

student retention.

Comparing the retention status between freshmen and transfer students reveals that transfer students generally used library resources at a higher rate. Among transfer students, 52.9% used library resources, while only 43.3% of entering freshmen used library resources. This difference may be attributed to transfer students taking more upper-division courses that have research assignments requiring more in-depth library resource use, in comparison with first-year students who take more general education courses with fewer research assignments.

Discussion

This study revealed several noteworthy findings and limitations. Some of the key findings include that students who utilized the library tend to have higher GPAs, that student retention rate is also associated with library use, and that Pell Grant recipients are more likely to use library resources compared to non-Pell Grant recipients. Among Pell Grant recipients, 56% used library resources, while 51% of non-Pell Grant recipients used them. There is also a gender difference in library resource use, with female students being 16% more likely to use library resources compared to male students.

The study had some limitations. Correlation does not imply causation, and other factors, both internal and external to the students, could influence GPA and retention rates, such as instruction, student attitudes and aptitude, attendance, financial situation, and family dynamics. Thus, the study alone cannot determine causation. The study only examined undergraduate students' remote access to library electronic resources via EZProxy and print material borrowing. It did not include on-campus users or users accessing resources through

a virtual private network (VPN). This limited scope may have impacted the sample size of this analysis. The data used in the study were not specifically collected for this research but rather were previously collected by the library.

Despite these limitations, the study has several benefits and implications. The study demonstrates the role of library use in student academic attainment. The positive correlation results led the library to propose the establishment of partnerships between the library and various campus entities, such as Institutional Effectiveness, the Center for Academic Success, and information technology management. These partnerships aim to foster student success through initiatives like comprehensive academic support services, tutoring, workshops, and peer-to-peer services. The positive association between library use and better academic performance allowed the library to collaborate with faculty, academic advisors, and students. This study emphasizes the importance of collaboration with the campus community in data integration and sharing. It highlights the need for standardized data collection methods, data interoperability standards, and collaboration in data processing. This collaboration can lead to improved library impact evaluation, sustained value demonstration, and evidence-based decision-making.

The library's active participation in campus efforts to foster student success is evident through its involvement in the planning and development of the Center for Academic Success (CAS). The CAS, located within the library, offers a range of academic success services to students. The partnership between the CAS and the library has resulted in the implementation of the library's peer-to-peer service within the Navigate LA platform, a cloud-based student success management system. This service allows students to access research and citation assistance from student research consultants (SRCs) and in-depth research consultations from librarians. Students can also schedule research consultation appointments with subject librarians directly through Navigate LA. Additionally, the library joined the CAS "Plan to Soar" webinar series. In the fall of 2021, the library also launched its own "Library Live" series to introduce the role of the library, its services, and basic information literacy skills to students.

The positive association between library use and academic performance has positioned the library to engage with faculty, academic advisors, and students. For instance, the library collaborates with the College of Health and Human Services to require first-year students in the Introduction to Higher Education courses to complete the Library Research Tutorial Canvas Course and attend Library Information Literacy webinars. The library has been encouraging faculty to integrate library resources into research and writing requirements and to refer students to librarians for research consultations. Academic advisors are also made aware of library services to enable timely referrals and interventions for at-risk students. The library can use evidence to demonstrate to students how library resources and use of the library services can improve their academic standing, thereby driving further library resource utilization and forming a positive cycle of student performance and library return on investment.

Furthermore, the analysis results highlight the importance of collaboration with the campus community in data integration and sharing for successful assessment in the future. However, challenges related to data collection methods, data ambiguity, interoperability standards for integration, and collaboration in data sharing and processing with the campus community need to be addressed. Purposeful, proactive, and systematic data collection aligning with the parent institution's standards is critical in allowing the library to demonstrate its value and contributions to student success. To conduct sustainable data collection, libraries must stan-

dardize data collection by defining data points and eliminating data-name ambiguity, which is vital for comprehensive library impact evaluation and specific area assessments. Libraries must also establish an infrastructure for data gathering and investigate interoperability standards that facilitate integration with institutional learning analytics, student demographic data, and academic performance systems. Most importantly, ensuring data privacy and defining data-sharing protocols must be considered throughout the process. Additionally, leadership support from both the library and campus units is critical in establishing an infrastructure for library-related performance measurement. Clear communication, documented goal alignment, and collaboration with campus units contribute to the process.

Conclusion

The findings of the study highlight several important next steps in standardized data collection, assessment, and collaboration with campus entities involved in student success. The study underscores the importance of continued analysis of the relationships between student resource use and GPA, as well as retention, particularly within the historically underserved student (HUS) population. By examining whether library resource use contributes to improved academic performance among HUS students, further insights can be gained to support their success. The study highlights the urgent need for a purposeful and systematic library data collection process. This includes developing procedures to collect library data that can be interoperable with campus institutional and learning analytics systems. By adding relevant metrics, a multidimensional picture of the overall impact of library services on student academic attainment can be obtained.

The study emphasizes the need to go beyond demonstrating the value of the library in student success. It calls for utilizing the assessment results to further establish partnerships with the campus student success team and integrate library services and resource access within the campus systems. This integration is crucial to create a comprehensive campus intervention program for student success. Furthermore, the study recognizes that existing library systems, such as Alma and Primo VE, are primarily focused on library operations, collection management, and resource discovery. To truly integrate library services, resources, and access into the daily workflows of students and faculty, it is necessary to embed them within systems commonly used on campuses for teaching, learning, and research. This finding aligns with the argument made by Evans and Schonfeld (2020) that the library system should be viewed as an integral part of the higher education system. The services and resources offered by academic libraries should be tightly integrated with course management systems, student learning analytics, and textbook assignment/provision systems. This integrated approach allows for a comprehensive analysis of student use of library resources and their impact on academic performance, ultimately enhancing student learning outcomes.

In summary, the study calls for continued analysis of library resource use and student academic attainment, systematic data collection, and the integration of library systems and services with commonly used platforms in higher education. These steps will contribute to the overall goal of improving student success, a task for all of us to undertake.

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