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Measuring the Academic Impact of Libraries

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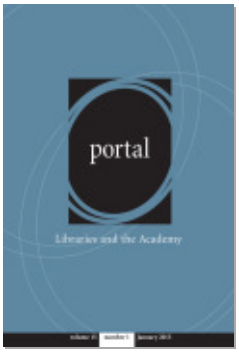
Measuring the Academic Impact of Libraries

DeeAnn Allison



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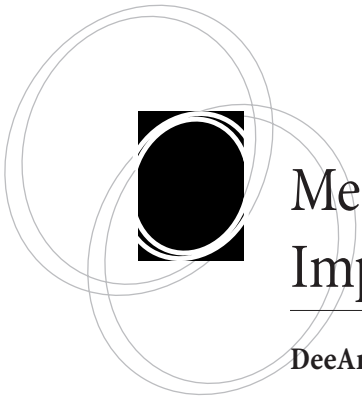

Measuring the Academic Impact of Libraries

DeeAnn Allison

abstract: University and college libraries often seek ways to demonstrate their impact for the academic community. This article reports the results from a two-year study that analyzed library use as demonstrated through checkouts and off-campus access to full-text resources against grade point averages (GPAs) of undergraduates and graduates at a large Midwestern library. The study found that undergraduates with a GPA above the mean university GPA used the library more than those with a GPA below the mean. There was a correlation between greater use of the library and increases in GPA between the two years—that is, as one grew, so did the other. The study also showed that students who checked out materials in one year returned for additional checkouts.

Introduction

How are libraries judged in a world where more people are turning to the Web for information? Will academic libraries continue to be cherished as the "heart of the university" while building usage and print circulation diminish? Usage statistics alone do not demonstrate value, so libraries must look to other means to prove the impact they have on a community. The challenge for academic librarians, as Megan Oakleaf reports in *The Value of Academic Libraries,* is to "assess and link academic library outcomes to institutional outcomes related to the following areas: student enrollment, student retention and graduation rates, student success, student achievement, student learning, student engagement, faculty research productivity, faculty teaching, service, and overarching institutional quality."[1]

One measure of library value, circulation, has been dropping for years. Rick Anderson reported on trends in research libraries by comparing full-time student enrollment with library circulation data, adjusted for changes in student numbers, to gain a better picture of library use. He determined that adjusting for enrollment actually made the decline in circulation greater for several libraries. "If the average user in 2008 checked out 80% fewer books than the average student in 1995, then there is an important message in that fact for libraries," Anderson said.[2]

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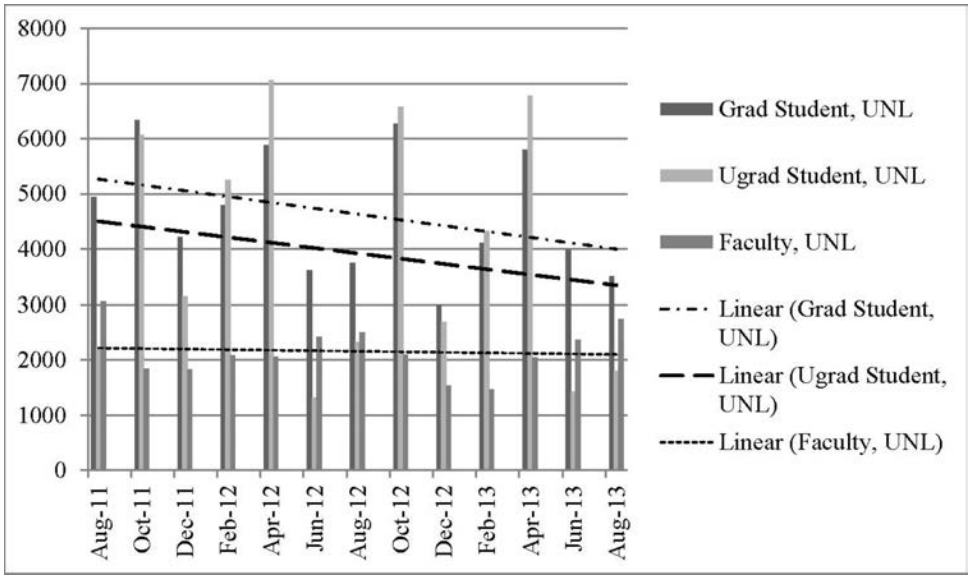

Figure 1. Print checkouts are declining

The decline in checkouts at the University of Nebraska–Lincoln (UNL) is not so dramatic. Print circulation has declined over the past three years, as demonstrated in figure 1. All three patron types—faculty, graduate students, and undergraduates—show a decrease in checkouts, with faculty checkouts falling at the slowest rate. Undergraduate and graduate checkouts continue to follow the cyclical academic schedule, albeit at a lower rate.

…the declining trend in checkouts is alarming to library managers, who fear reduced support for library buildings and print collections.

Increases in the use of full-text materials have offset this reduction in print checkouts to some extent; however, the declining trend in checkouts is alarming to library managers, who fear reduced support for library buildings and print collections. For these reasons, librarians are seeking studies that connect library use to beneficial changes in patron behavior.

The Association of College and Research Libraries (ACRL); the Association for Institutional Research, a professional organization for researchers in higher education; the Association of Public and Land-Grant Universities, which represents state university systems and public research universities; and the Council of Independent Colleges, a group of independent liberal arts colleges, have sponsored summits on the value of libraries (http://www.cni.org/topics/assessment/building-capacity-for-demonstrating-the-value/). These gatherings, part of a project funded by the Institute of Museum and Library Services (IMLS) called "Building Capacity for Demonstrating the Value of Academic Libraries," were designed to increase librarian skills for measuring and publicizing the value of libraries. This IMLS project is an example of the increasing attention to connecting library activities with institutional missions and an indication of the growing importance of impact studies.

Literature Review

Gauging outcome and impact have been described as two different measures in the library literature. Outcome has been described as a change in patron activity as a result of library intervention, and impact as analyses that demonstrate an alignment of library activity with the mission of the institution.[3] Both measurements have challenges for demonstrating a direct cause-and-effect connection between the library activity and patron behavior. Measures that have been used include surveys, focus groups, observation, citation analysis, pretesting and posttesting, and comparisons of library usage with evaluations of student success.

Survey methods can be useful to gather information on learning outcomes. Bowling Green State Library in Ohio used a combination of mini-quizzes and instruction session assessments that involved student posttests, faculty input, and peer observation to measure skill development and identify areas where the library needed to improve.[4]

Comparisons of library usage with estimates of success require comparing institutional data against library statistics. The University of Huddersfield in the United Kingdom is working with seven other universities to compare library usage—as measured with statistics for electronic access, checkouts, and library visits—against success in obtaining a degree. The study will also include a process to collect student opinions through focus groups.[5] Final results are not available at this time, but preliminary reports from Huddersfield that focus on student use of resources and impact point to a link between library usage and better grades. Additional data collection among the institutions may confirm a correlation across a number of universities between library activity and student attainment.

The University of Wollongong Library in Australia also conducted a research project that resulted in the development of a "Library Cube," a graphical interface that allows researchers to drag and drop specific criteria for analysis.[6] The Cube provides a mechanism that links library usage data with student performance data, allowing researchers to better understand the student experience and the impact library resources have on academic success.

Some institutions are collaborating on impact studies. In the United Kingdom, the Library and Information Research Group (LIRG) and the Society of College, National and University Libraries (SCONUL) are working together on a project, begun in 2004, to develop methodologies for academic libraries to evaluate the effect of their services and innovations.[7] In the first phase of the project, participating institutions agreed to take on specific impact questions that include online instruction, resource usage, information literacy, technology skills, and faculty support in selecting publications. In the following phase, they tackled questions including scholarly communications, equity of access, postgraduate skills, specialized resources, and budget issues for digital content. This initiative demonstrates how collaboration can advance efforts to develop and implement impact measures.

A study undertaken at the University of Minnesota by Krista Soria, Jan Fransen, and Shane Nackerud gathered usage statistics and grade point data from the fall semester 2011 for first-year students.[8] Their evaluation involved a variety of activities that included database use, full-text access and other online resources, as well as instruction and other

service point interaction. Interactions included patron attendance at workshops, course-integrated instruction, research consultations, and reference services. The investigators uncovered a positive correlation between these services and students' grade point averages—that is, as one grew, so did the other—which demonstrates the impact library services have on achievement and on students staying in school.

Elizabeth Mezick researched the correlation between library expenditures, staffing, and retention of students using data collection from the ACRL, the Association of Research Libraries (ARL), and the Integrated Postsecondary Education Data System (IPEDS).[9] The strongest correlation she found was between total library expenditure and retention of students. The correlation between the size of professional staff and student retention was also strong for doctorial-granting institutions. Another study, by Mark Emmons and Frances Wilkinson, compared the staff, collections, circulation, reference, and instruction of academic libraries with rates of retention and graduation at their parent institutions.[10] Emmons and Wilkinson's findings also point to a correlation between staffing and rates of retention and graduation. Gaby Haddow and Jayanthi Joseph built on this study with data from the ARL, IPEDS, and the National Center for Education Statistics (NCES) to analyze the relationship between student retention for one semester with checkouts, workstation use, and logins to library resources.[11] They determined that a higher proportion of the students who were not retained had no or limited library use. Although this study focused on a single semester, the authors suggested that a student's library use in the early weeks of the semester is associated with staying in school.

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This article will report on a study that compares grade point averages (GPAs) with library use measured by two variables: circulation checkouts and off-campus access to databases. It differs from previous studies because it compares data collected over two academic years. Analyzing GPA scores with library activity was selected because of evidence that undergraduate GPAs influence postgraduate earnings.[12] This evidence that GPAs influence earnings for the first five years of employment is significant, so measuring any relationship between library use and grades would be an important measure of the value of library services during the early careers of graduates.

Methods

Data were collected from the University of Nebraska–Lincoln (UNL) student information system, including an identification number, grade point average, and class standing for graduate and undergraduate students registered for the academic years of 2011–2012 (N = 20,040) and 2012–2013 (N = 21,564). These data were matched against data from off-campus authentication records from proxy logs and circulation checkout records for the same two time periods. The proxy logs were used to gather off-campus access to electronic materials that included articles and e-books. Four groups of student records were analyzed in the study: 2011–2012 (2011), 2012–2013 (2012), those present in both academic years (N = 14,722), and those present in 2011–2012 but not in 2012–2013 (N

= 7,078) because they had left the university. The data were then made anonymous by removing the ID number that could be linked back to individual student records. Students identified as professional, or who were not considered part of a degree program, were removed.

Table 1 shows the numbers for the students in each class that were collected for the two-year study. Students who were present in both 2011 and 2012 and those in the 2011

Table 1.
Class size totals in the study

Class	2011–2012	2012–2013	Both 2011–2012 and 2012–2013	2011–2012 but not 2012–2013
Graduate	3,124	4,427	3,004	1,746
Senior	5,985	6,139	5,669	3,534
Junior	4,464	4,699	3,949	507
Sophomore	3,343	3,266	2,008	529
Freshman	3,124	3,033	92	762
Total	20,040	21,564	14,722	7,078

group but not in the 2012 group are the focus of this study. The purpose of this analysis is to evaluate any relationships over time between library use and grades or between library use and retention. Library use was defined as students who checked out at least one item, or who accessed a full-text resource from off-campus, at least once during the year.

Of the 7,078 who were in the 2011 group but not in the 2012 group, 1,798 were freshmen, sophomores, or juniors. The remaining 5,280 were seniors and graduate students, who may have finished their program of study and were therefore removed from the retention analysis. The overall mean GPA for the remaining group was 2.39. The class means for GPA averages range from a low of 2.04 for the freshmen who had left the university in 2012 to a high of 3.67 for graduate students, as shown in table 2. The mean GPA for students who had left the university shows a trend of lower GPA scores based on class standing, with graduates having the highest mean, descending to freshmen, who had the lowest GPA mean.

In the 2011 group, there were 5,644 students who had never checked out a book nor used a database from off-campus. In 2012, the total was 4,966 in this category. This

Table 2.

Average GPAs for those who left the university after 2011

Class	Mean	N	Standard deviation
Graduates	3.6706	1,746	0.53704
Seniors	3.2226	3,534	0.49699
Juniors	2.7545	507	0.76465
Sophomores	2.5680	529	0.78336
Freshmen	2.0407	762	1.02671
Total	3.1234	7,078	0.79572

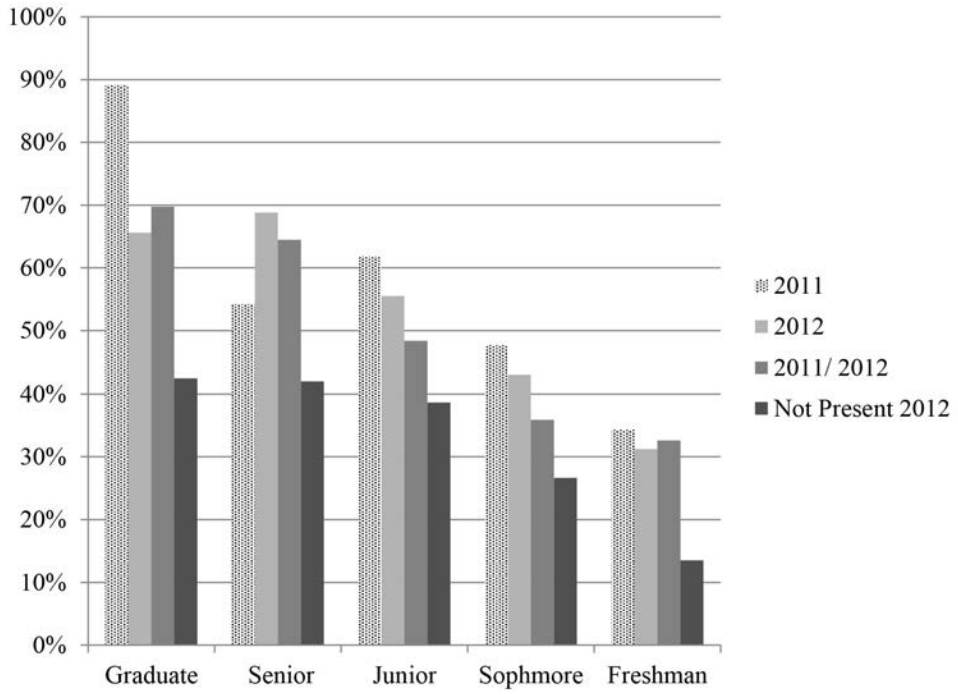

Figure 2. Percentage of students who used the library either by checking out an item, or through off-campus access to a full-text resource

study could not gather information on building visits or on-campus use of databases, so the research gathered data from off-campus access to databases and library checkouts only. Figure 2 shows the percentage of students who used the library as indicated through our data during the specified year. The percentage of students using library resources shows a consistent pattern of use that increases as students advance through class standings. The lowest usage appears for those who left the university and demonstrates a trend for the lowest usage among underclassmen.

The percentage of students using library resources shows a consistent pattern of use that increases as students advance through class standings.

Of the 8,079 students with grade increases, there were 2,628 with upticks in both GPA and library use between the two academic years. Library use was measured as growth in checkouts, database use, or both over the previous year. Table 3 shows the breakdown between classes and percentages for this group. The largest increase in library use and GPA was demonstrated by graduate students at 34 percent, with sophomores, juniors, and seniors at 32 percent.

Table 3.

Students with increases in GPA and library use compared with GPA increases only

Class	Increase in both GPA and library use	Increase in GPA	%
Graduates	497	1,466	34%
Seniors	1,098	3,393	32%
Juniors	679	2,107	32%
Sophomores	341	1,068	32%
Freshman	13	45	29%
Total	2,628	8,079	33%

GPA, Library Use, and Disciplines

Data were also examined based on degree emphasis for the humanities, social sciences, and science, technology, engineering, and mathematics (STEM) disciplines for graduates and undergraduates combined. Multidisciplinary fields and disciplines of study that did not obviously fit into the three categories were not included. Data were limited to students whose grades had improved between the years. A regression analysis, a technique that

examines the nature and strength of relationships between variables while controlling for one or more covariates, was conducted to examine predictors of humanities fields (n = 457) based on the 2012 checkout and database activity. The predictors accounted for 10 percent of the variance in humanities subject areas. Checkouts (β = 0.279) and database connections (β = 0.134) were positively associated with majors. Conducting the same analysis for graduate and undergraduates (n = 1,206) in social science areas accounted for 5 percent of the variance in social sciences. Checkouts (β = 0.122) and database connections (β = 0.179) were positively associated with social science students. When data were limited to STEM areas (n = 895), the predictors accounted for 3 percent of the variance. Checkouts (β = 0.167) and database connections (β = 0.056) were also positively associated with science students. Students in the humanities fields demonstrated the strongest relationship between improved grades and library use. There was a weaker, but positive, relationship for STEM and social science fields.

Students in the humanities fields demonstrated the strongest relationship between improved grades and library use.

Undergraduate Results

Among the 14,722 graduate and undergraduate students present for both academic years, 43 percent (n = 6,316) had used the library either by checking out print materials or by accessing a database from off campus. The mean GPA for undergraduates in this group (n = 11,718) in the academic year 2012–2013 was 3.11. Looking at this group's library activity, there were a mean 6.81 print checkouts in the 2012–2013 academic year, and 13.63 database sessions during the same period. These numbers contrast with 3.41 checkouts and 5.65 database sessions for those with a GPA lower than 3.11, so undergraduates with a 3.11 GPA or higher had 50 percent more checkouts and 41 percent higher usage rates of databases than those with a lower GPA.

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Was there an overall correlation between the different levels of undergraduate library use and changes in GPA between the years? To answer this question, an analysis was made on undergraduate data present for both academic years, but limited to those students who used the library more in 2012–2013 than in the previous year. The average percent change in GPA from 2011 to 2012 was computed for all records. A second calculation was added for the difference in database use and checkouts between the years. The correlation between GPA changes and variations in library activity for those who used the library was positive and statistically significant ($r = 0.14$, $p < 0.001$), where p is an estimate of the probability that the result has occurred by statistical accident. (A low level of p indicates a high level of statistical significance.) However, the coefficient of determination (r^2), a value used to analyze how much the difference in one variable

can be explained by a difference in a second variable, was 0.02, revealing that only 2 percent of the variance was explained by the change in library use.

A two-tailed Pearson correlation, which indicates the closeness of the relationship between two variables, was conducted with 2011 and 2012 data using database sessions and checkouts. The results found the strongest correlations ($r = 0.96$, $p < 0.001$) between checkout activities for the two years, with a coefficient of determination ($r^2 = 0.92$) for a 92 percent variance due to checkout activity. The only positive correlation between database activity and checkouts occurred in the 2012 academic year ($r = 0.057$, $p < 0.001$), with a coefficient of determination ($r^2 = 0.003$). There was also no significant correlation for database use between the years.

Library Use and Undergraduate Retention

To examine whether library use as measured by checkouts and database use from off-campus were related to the GPA for freshmen, sophomores, and juniors who were not retained at the university, a two-tailed Pearson correlation was performed with the variables of GPA, and total checkouts and database use. The correlation between GPA, checkouts, and database use was positive for checkouts ($r = 0.128$, $p < 0.001$) and databases ($r = 0.155$, $p < 0.001$). The coefficients of determination for checkouts ($r = 0.016$) and databases ($r = 0.02$) reveal that only 2 percent or less of the variance is explained by library use.

Graduate Students

A two-tailed Pearson correlation of the 2011 and 2012 data was conducted for library use and GPA for graduate students. The results revealed a significant correlation in checkout activity in 2011 ($r = 0.059$, $p = 0.002$) and ($r = 0.065$, $p = 0.001$) for 2012. Database activity showed a similar significance ($r = 0.045$, $p = 0.017$) for 2012. The graduates demonstrated a similar pattern to the undergraduates for repeat library visits, with a strong correlation between checkouts in both years ($r = 0.70$, $p < 0.000$). The coefficient of determination for checkouts and database revealed no variance explained by library use: it was ($r^2 = 0.00$) for both checkouts and database use.

Limitations

This study looked only at possible relationships between grade point averages and library use as defined through print checkouts and off-campus access to full-text resources. It did not look at possible relationships with service points, such as reference, individual consultations, or instruction activities, which other studies point to as additional factors. Because of this limitation, it is difficult to say whether library use makes good students, or library use is a characteristic of a good student. Other studies that include more demographic and classroom information could be combined with library use and other library service points to gather more information to answer this question.

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The study also found that students who check out materials in one year will return to check out materials in the next year, but there was less evidence that database use correlated with return sessions. This finding implies that students who physically go to the library to use resources are more likely to return to the library, whereas off-campus access to resources is less associated with repeated use of full-text materials. Since this study only examined off-campus access to full-text resources, adding on-campus access by students to a future study could validate this finding.

This study also found evidence of a relationship between improved grades and library use based on the field of study. It was stronger for the humanities fields. Additional research could provide more detail on the exact nature of this relationship to identify the best time for library instruction and other interventions that could help students improve their GPAs and retention at universities.

Conclusions

This study shows a correlation but not necessarily a cause-and-effect relationship between library use and grade point averages for both graduate and undergraduate students. Undergraduates with a GPA above the mean of 3.11 use the library more than those with a GPA below the mean. For undergraduates, there is a weak but positive correlation between greater use of the library and better grades between the two years of the study. A stronger relationship is shown when the data are analyzed by field of study and include graduates and undergraduates who have improved their grades. This provides evidence that libraries play a role in student performance and that increased use of the library is linked with grade improvements.

The study also found that students who check out materials in one year will return to check out materials in the next year, but there was less evidence that database use correlated with return sessions. This finding may point to the need for better advertising of digital resources. Perhaps, better branding and marketing of full-text resources will produce higher usage of electronic resources. The good news comes from evidence of the loyalty of students who check out materials and return for more. It seems clear that libraries with programs that attract students into their facilities will have an opportunity to so engage users that they become regular patrons.

Because library use is correlated with student retention, libraries should participate in university programs that target at-risk students to help them improve their grades, which can aid efforts for retention at the university.

This study also shows that library use is lower among the students who leave the university in their freshman through junior years. Because library use is correlated with student retention, libraries should participate in university programs that target at-risk students to help them improve their grades, which can aid efforts for retention at the university. Follow-up studies with such activities will provide valuable evidence for the impact of library services on how many students remain in school.

Overall, this study points to a positive relationship between student use of library resources and academic success as measured through GPAs. The challenges of determining the impact are many, and additional studies are necessary to understand the connections and level of influence between academic libraries and student success. Factors outside of library activities may play a significant role in academic performance, so understanding these outside factors and their relationship to library services will provide a direction for librarians seeking ways to improve the student experience at their institutions. It may well be that the services librarians perform have a greater impact on student success than collection use. This research clearly implies there is a vital connection between student success and use of library resources, which should hearten librarians struggling with the changing landscape of library and information science.

DeeAnn Allison is a professor and director of computer operations and research services at the University of Nebraska–Lincoln Libraries; she may be reached by e-mail at: dallison1@unl.edu.

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