Academic Libraries' Impact on Community College Student Success

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Abstract
While library impact studies at individual institutions have proliferated in recent years, it is also important to grow the literature on libraries' impact on a national level. This is particularly true in the community college realm where research on the impact of the community college library on student success has been limited. Using national datasets, this study examines the impact of various institutional expenditures and library use variables on full-time retention rates, part-time retention rates, and graduation rates of community college students. As in similar studies of four-year institutions, this study finds mixed results. Though several variables are statistically significant, no variable singularly has a large impact on student success.

Introduction
With the increasing trend to demonstrate the value of academic library efforts on institutional student success measures, studies to examine library impact have proliferated. However, the findings of many studies have been mixed or inconclusive. Additionally, the study of library impact on community college student success is largely absent from the literature. This study seeks to fill the gap of community college library impact studies. Using institutional expense data and library use data, the study explores the impact of institutional expenditures and library use on three student success outcomes: full-time retention rate, part-time retention rate, and graduation rate. While uncommon in studies at four-year institutions, part-time retention rate is included due to the frequency of part-time student enrollment at community colleges.

Literature Review
Since Oakleaf's[1] call to demonstrate the impact of academic library efforts on student success and institutional goals, many studies have explored library impact using quantitative methods, including multiple regression analysis. The studies have included institutional analysis using institutional datasets and national studies using publicly-available national datasets.

Some researchers looked at comparisons of library user and non-user student populations to gain an understanding of the impact of library use on student success outcomes at an institutional level. Jantti and Cox[2] compared student outcomes among library user and non-user populations. They found that students who use library resources have higher grades than students who do not use library resources. Primarily using log-in information and circulation data, Haddow and Jyanthi[3] and Haddow[4] used descriptive statistical analysis to analyze institution-level data to find that retained undergraduate students have higher levels of library use than students who are not retained. Several other studies used statistical analysis to examine the relationship between student GPA and library variables including circulation data, electronic resource usage, workshop attendance, and computer log-ins, among others. In two such studies, positive relationships between student GPA and various library use variables were found by Soria, Fransen, and Nackerud[5] and Wong and Webb.[6]

Expanding upon the institutional approach, researchers began to apply statistical analysis to large national datasets. Researchers also began to apply inferential methods to gain a better understanding of library use on student success. The results of these studies, however, showed mixed results. Mezick[7] used national datasets to examine 586 baccalaureate institutions. Primarily using expenditure data as a proxy, Mezick found positive correlations between

student retention and the independent variables of total library expenditures, materials costs, and serials costs. Emmons and Wilkinson[8] used Integrated Postsecondary Education Data System (IPEDS) retention and graduation rate data and library data from the Academic Library Survey (ALS), including circulation, reference transactions, volumes, materials expenditures, students receiving library instruction, and the like. They found a significant positive relationship between library staffing and retention and graduation rates.

Crawford[9] sought to examine institutional expenditures and library use data using IPEDS and ALS. Studying four-year colleges in Pennsylvania, Crawford used institutional expenditure data along with library use variables including circulation, interlibrary loan, gate count, reference transactions, and attendance at instructional sessions. Rather than list each library use variable separately, Crawford constructed a library use index that was made up of the library variables mentioned. Through regression analysis, Crawford did not find a significant relationship between the library use index and the dependent variables of retention and graduation rate. Crawford did, however, find significant relationships between the dependent variables and instruction, public service, academic support, student services, and institutional support.

Though the studies mentioned above took important steps in exploring the impact of academic libraries on student success, the results are mixed and often do not show significant relationships with library variables. Further, these studies only focus on four-year institutions. The limited amount of community college research highlights a gap that could be valuable to pursue. Community college students often face increased challenges compared to their four-year college counterparts. In fact, community college students constitute more than half of single parent students, students with disabilities, first-generation students, Hispanic students, and black students. Further, community college students are more likely to be of nontraditional age and attend part-time.[10] Due to these challenges, community college students are often retained at lower rates than the four-year counterparts at 59.9% and 79.9%, respectively. For these reasons, it is important to increase the literature focused on the impact of community college libraries on student success.

Methodology

The study uses data from the 2012 reporting cycle of the Integrated Postsecondary Education Data System (IPEDS) and the Academic Library Survey (ALS) provided by the National Center for Education Statistics (NCES). The dataset included all public two-year community colleges that completed the ALS, who participate in Title IV, and award associate's degrees. Institutions who reported a zero value for any variable were excluded to address the uncertainty of true reported zero values versus non-reporting of data. There were 762 institutions included in the analysis after accounting for zero or unreported values.

The dependent variables were full-time retention rate, part-time retention rate, and graduation rate. The full-time retention rate is the percentage of full-time students who enroll in a particular fall semester who are retained to the following fall semester as full-time or part-time students. The part-time retention rate is the percentage of part-time students who enroll in a particular fall semester and are retained as full-time or part-time students the following semester. The graduation rate is the percentage of students who begin in a particular fall semester and finish in 150% of the normal time-to-degree.[11]

The independent variables include the major institutional expenses including instruction, academic support, student services, institutional support, and other core expenses. Though reported by IPEDS, research expenses and public service expenses were not included due to the low instance or nonexistence of such activity in the community college environment. Library expenditures are included in academic support expenditures, so no separate library expenditure variable was included. Given the vast array of variables in higher education that may contribute to student success, the institutional expenditure variables were used as a proxy to simplify the model and allow for a more focused examination of library use variables. Additionally, all expenditure variables are presented per full-time equivalent (FTE) to account for varying sizes of institutions. Library use variables included general circulation, reserve circulation, presentation attendees, and number of reference transactions in the reported year. Since library use variables are not reported per FTE, we transformed these variables by dividing each library use variable by the institution's reported FTE. This approach ensured all variables were presented per FTE.

Table 1 Descriptive Statistics by Variable

	N	Minimum	Maximum	Mean	Standard Deviation
Full-time retention rate	762	14%	89%	57.09%	9.38%
Part-time retention rate	762	4%	87%	39.88%	10.31%
Graduation rate	762	3%	75%	21.56%	9.97%
Instruction expenses	762	$1,639	$14,393	$4,992.17	$1,560.36
Academic support expenses	762	$51	$5,176	$986.29	$549.62
Student service expenses	762	$287	$5,885	$1,319.37	$800.90
Institutional support expenses	762	$135	$6,921	$1,820.39	$855.37
All other core expenses	762	$3	$16,241	$2,018.29	$1,364.36
General circulation	762	.0357	74.1663	4.2653	6.1578
Reserve circulation	762	.0008	37.5183	1.5499	2.6488
Presentation attendees	762	.0101	10.2863	0.7227	0.6933
Reference transactions	762	.0001	53.8378	2.3023	3.8068
Gate count	762	.0269	10.4046	1.2863	1.0384

Statistical Methods

This study employs multiple regression analysis to examine the impact of the independent variables on full-time retention rate, part-time retention rate, and graduation rate. The regression models are demonstrated below where Y_1 is full-time retention rate, Y_2 is part-time retention rate, and Y_3 is graduation rate.

$Y1 = ß_0 + ß_1$Instruction expenses $+ ß_2$Academic support expenses $+ ß_3$Student services expenses $+ ß_4$Institutional support expenses $+ ß_5$All other core expenses $+ ß_6$General circulation $+ ß_7$Reserve circulation $+ ß_8$Attendance at presentations $+ ß_9$Reference transactions $+ ß_{10}$Gate count $+ ε$

$Y2 = ß_0 + ß_1$Instruction expenses $+ ß_2$Academic support expenses $+ ß_3$Student services expenses $+ ß_4$Institutional support expenses $+ ß_5$All other core expenses $+ ß_6$General circulation $+ ß_7$Reserve circulation $+ ß_8$Attendance at presentations $+ ß_9$Reference transactions $+ ß_{10}$Gate count $+ ε$

$Y3 = ß_0 + ß_1$Instruction expenses $+ ß_2$Academic support expenses $+ ß_3$Student services expenses $+ ß_4$Institutional support expenses $+ ß_5$All other core expenses $+ ß_6$General circulation $+ ß_7$Reserve circulation $+ ß_8$Attendance at presentations $+ ß_9$Reference transactions $+ ß_{10}$Gate count $+ ε$

Limitations

This study focuses on public two-year community colleges. Thus, this study is not generalizable to four-year institutions, independent community colleges, for-profit two-year colleges, or tribal community colleges. Further, the data included in this study is only representative of one reporting year, thus time series inferences are not possible. Finally, this study uses broad institutional expenditure categories and very basic library use statistics. The study does not

include more contemporary measures of library use such as electronic resource usage, space use, or technology usage as these measures are often not yet reported comprehensively.

Data Analysis

The regression analysis for graduation rate yielded an R-squared of .099. This means that our model explained only 9.9% of the variance. Results of the analysis can be seen in Table 2. Of the independent variables, instruction expenses, academic support expenses, institutional support expenses, reserve circulation, and presentation attendance resulted in statistical significance. Instruction expenses and institutional support expenses showed both a significant and positive relationship with graduation rates. However, all variables had extremely small coefficients with academic support expenses, reserve circulation, and presentation attendance, showing a negative relationship. Negative relationships are typically not what one would expect when considering variables that are logically associated with supporting students and their academic habits. Though unexpected, negative results have been found in previous studies.[12]

Table 2: Regression for Graduation Rate—150% of Normal Time

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Standard Error	Beta		
Constant	15.719	1.423		11.048	.000
Instruction expenses	.001	.000	.210	5.187	.000
Academic support expenses	-.002	.001	-.103	-2.782	.006
Student services expenses	.000	.000	-.012	-.297	.767
Institutional support expenses	.002	.000	.130	3.260	.001
All other core expenses	.000	.000	-.024	-.680	.497
General circulation	.053	.058	.033	.905	.366
Reserve circulation	-.369	.134	-.098	-2.748	.006
Presentation attendees	-1.738	.543	-.121	-3.203	.001
Reference transactions	.014	.096	.005	.141	.888
Gate count	.273	.369	.028	.738	.461

The regression analysis for full-time retention rate yielded an R-squared of .066. This indicates that our model explains 6.6% of the variance. The regression results can be seen in Table 3. Of the independent variables, instruction expenses, reserve circulation, and reference transactions were statistically significant. Again, however, the coefficients were extremely small. Only instruction expenses and reserve circulation showed a significant and positive relationship with full-time retention rate.

Table 3: Regression for Full-Time Retention Rate

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Standard Error	Beta		
Constant	56.621	1.363		41.555	.000
Instruction expenses	.001	.000	.092	2.222	.027
Academic support expenses	-.001	.001	-.041	-1.090	.276
Student services expenses	-.001	.000	-.062	-1.559	.119
Institutional support expenses	-.001	.000	-.049	-1.198	.231
All other core expenses	.000	.000	-.025	-.696	.486
General circulation	-.051	.056	-.034	-.917	.360
Reserve circulation	.756	.129	.213	5.873	.000
Presentation attendees	-.523	.520	-.039	-1.007	.314
Reference transactions	-.231	.092	-.094	-2.517	.012
Gate count	.453	.354	.050	1.280	.201

The regression analysis for the part-time retention rate yielded an R-squared of .067, indicating that our model explains only 6.7% of the variance. Regression results can be seen in Table 4. Of the independent variables, instruction expenses, student service expenses, and general circulation were statistically significant. Again, the coefficients were extremely small with student services expenses and institutional support expenses being negative while instruction expenses were significant and positive.

Table 4: Regression for Part-Time Retention Rate

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Standard Error	Beta		
Constant	36.599	1.497		24.451	.000
Instruction expenses	.001	.000	.216	5.231	.000
Academic support expenses	.001	.001	.027	.713	.476
Student services expenses	-.002	.001	-.178	-4.477	.000
Institutional support expenses	-.001	.000	-.073	-1.794	.073
All other core expenses	.000	.000	-.052	-1.452	.147

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Standard Error	Beta		
General circulation	.135	.062	.081	2.193	.029
Reserve circulation	.170	.141	.044	1.202	.230
Presentation attendees	.254	.571	.017	.445	.656
Reference transactions	.001	.101	.000	.010	.992
Gate count	.041	.388	.004	.106	.916

Discussion

Though this study found significant positive relationships between some independent variables and graduation rates, full-time retention rates, and part-time retention rates, the effect of those variables was extremely small. The study also found several independent variables to have a negative relationship with the dependent variables. This leaves us unable to draw any broad statements about the impact of the academic library on community college student success.

This study sought to increase the body of work focused on community college libraries. Several studies have focused on four-year college and university libraries with mixed results. To date, no study has shown extensively that independent library variables have sizeable significant impacts on student success outcome, such as graduation rate or retention rate. That was also the case in this study. Though some variables showed to be significant, their impact was extremely small. Size of the impact, however, may not entirely matter. Incremental impact may at times be small. It is worthwhile to consider what a "good" size of a coefficient might be instead of assuming the higher the coefficient the better.

Additionally, the R-squared values in each model are lower than we would like. Ideally, the larger the R-squared, the more appropriately the model explains the relationships between the independent and dependent variables. The complexity of the higher education environment, however, may make it challenging to build a model that considers every variable that may impact student success.

Conclusion

As explained above, community college students often face unique challenges compared to their four-year counterparts. It is important to grow the literature on what contributes to community college student success. Libraries, in particular, can lead the charge to examine their role in supporting community college students.

It may also be time to acknowledge the usefulness of qualitative studies to gauge the impact of libraries on student success. Though accountability and funding pressures prevalent in higher education today have put a spotlight on quantitative analysis, it may not be the best approach in all cases. Given the complexity of the higher education environment, it may simply not be possible to include every variable that may impact student success measures. It may be useful, then, to examine the insight qualitative studies can provide. A qualitative or mixed methods approach may be the appropriate perspective to help community colleges and their libraries assess the impact of library engagement on community college student success in a complex higher education environment.

Endnotes

1. Association of College and Research Libraries, *Value of Academic Libraries: A Comprehensive Research Review and Report*, researched by Megan Oakleaf (Chicago: Association of Research Libraries, 2010), http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/val_report.pdf.

2. M.H. Jantti and B. Cox, "Measuring the Value of Library Resources and Student Academic Performance through Relational Datasets," in Proceedings of the 2010 Library Assessment Conference: Building Effective, Sustainable, Practical Assessment, October 24–27, Baltimore, Maryland (Washington, DC: Association of Research Libraries, 2011): 525–532, http://libraryassessment.org/bm-doc/proceedings-lac-2010.pdf.

3. G. Haddow and J. Jayanthi, "Loans, Logins, and Lasting the Course: Academic Library Use and Student Retention," *Australian Academic & Research Libraries* 41, no. 4 (2010): 233–244.

4. G. Haddow, "Academic Library Use and Student Retention: A Quantitative Analysis," *Library & Information Research* 35, no. 2 (2013): 127–136.

5. K.M. Soria, J. Fransen, and S. Nackerud, "Stacks, Serials, Search Engines and Students' Success: First-year Undergraduate Students' Library Use, Academic Achievement, and Retention," *The Journal of Academic Librarianship* 40, no. 1 (2014): 84–91; K.M. Soria, J. Fransen, and S. Nackerud, "Library Use and Undergraduate Student Outcomes: New Evidence for Students' Retention and Academic Success," *Libraries and the Academy* 13, no.2 (2013): 147–164.

6. S.H.R. Wong and T.D.Webb, "Uncovering Meaningful Correlation between Student Academic Performance and Library Material Usage," *College & Research Libraries* 72, no. 4 (2011): 361–370.

7. E.M. Mezick, "Return on Investment: Libraries and Student Retention," *The Journal of Academic Librarianship* 33, no. 5 (2007): 561–566.

8. M. Emmons and F.C. Wilkinson, "The Academic Library Impact on Student Persistence," *College & Research Libraries* 72, no. 2 (2011): 128–149.

9. G.A. Crawford, "The Academic Library and Student Retention and Graduation: An Exploratory Study," *Portal: Libraries and the Academy* 15, no. 1 (2015): 41–57; G.A.Crawford, "Pennsylvania Academic Libraries and Student Retention and Graduation: A Preliminary Investigation with Confusing Results," *Pennsylvania Libraries: Research & Practice* 2, no. 2 (2014): 129–141; G.A. Crawford and G.S. McGuigan, "An Exploratory Quantitative Analysis of Academic Library Services: An Examination of Performance Based Metrics," *Library Leadership & Management* 25, no. 3 (2011): 1–19.

10. "2016 Fact Sheet," American Association of Community Colleges, http://www.aacc.nche.edu/AboutCC/Documents/AACCFactSheetsR2.pdf; "Data Points: Who Attends Community College?" American Association of Community Colleges, http://www.aacc.nche.edu/Publications/datapoints/Documents/WhoAttendsCC_1_MD.pd f.

11. National Center for Education Statistics, https://nces.ed.gov/.

12. Crawford, "Pennsylvania Academic Libraries."