

Pennsylvania Academic Libraries and Student Retention and Graduation

A Preliminary Investigation with Confusing Results

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This study examined the relationships between specific institutional financial variables and two library-related variables on graduation and retention rates for colleges and universities through correlations and multiple regression analysis. The analyses used data for Pennsylvania colleges and universities that were extracted from the Integrated Postsecondary Educational Data System (IPEDS) and the Academic Libraries Survey (ALS). All analyses were run using IBM SPSS software. The correlations showed that both library expenses per student and library use per student were significantly correlated with both graduation and retention rates. In contrast, the multiple regression results showed that neither library budgets nor library use had significant effects on either graduation rates or retention rates. As would be expected, instructional expenses per student had the highest correlation with both graduation and retention and also yielded the strongest coefficient in the resulting regression equations.

Introduction

Over the last few years, accountability has become a major driving force within higher education. This is true also of academic libraries. In 2010, Dr. Megan Oakleaf of Syracuse University published a report commissioned by the Association of College & Research Libraries (ACRL) that examined the state of the literature on the value of academic libraries within their institutional context. To help libraries demonstrate their value, Oakleaf suggested the development of a research agenda that included determining how academic libraries could improve student retention and graduation rates. As a beginning step in understanding the relationship between the library and the rates of retention and graduation, this study examined the correlations between these variables and used multiple regression analyses to determine a formula for predicting both retention and graduation within four-year colleges

and universities in Pennsylvania. The study further extended research that looked at correlations between institutional and library variables with retention and graduation rates for colleges and universities across the United States (Crawford, 2015).

Literature Review

Other research looked at the effects of specific library services on retention and graduation. For example, Haddow and Joseph (2010) and Haddow (2013) determined a possible positive relationship between student retention and library use. They defined library use as the total of the number of items borrowed; the number of logins to a library workstation; and the number of logins to the catalog, databases, metasearch tool, and e-reserves. Using data from the Integrated Postsecondary Education Data Survey (IPEDS), Teske, DiCarlo, and Cahoy (2013) examined the correlation between different library measures (library expenditure per FTE student, library staffing, professional salaries, book expenditure, book acquisitions, book collection size, circulation, information services, and library instruction) and retention and graduation rates. The authors reported that expenditures for books, the size of the collection, and the number of circulations were positively related to retention and graduation rates.

In a study that examined only one public research university, Soria, Fransen, and Nackerud (2013) found that those first-year students who used the library had higher grade point averages (GPAs) for their first semester and a higher retention rate from the fall to the spring semester than did non-library users. In a British study, Stone and Ramsden (2013) reported that there was a positive relationship between both book borrowing and use of electronic resources and the receipt of a degree, although simply coming to the library, as indicated by gate counts, did not have a significant effect on obtaining a degree. Using data from Association of Research Libraries (ARL) members, Emmons and Wilkinson (2011) employed linear regression to explore the relationship between retention rates and sixth-year graduation rates and measures of library staff, collections, use, and services. The results indicated that only the ratio of library professional staff to students predicted a statistically significant positive relationship with retention rate and graduation rate.

The factors related to student retention and graduation may be myriad and include a wide variety of institutional variables. For example, in their study of 218 doctoral and research universities, Gansemer-Topf and Schuh (2003) found that instruction and academic support expenditures were significantly correlated with graduation rates. As a result, they argued that universities should allocate additional resources to both instruction and academic support in order to increase graduation rates. Ziskin, Hossler, and Kim (2009) tested a model for student retention rates that yielded three significant factors: advising, “residentialness” (the percentage of first-year undergraduate students who lived in campus residence halls), and instructional expenditures per student. Studies such as these, however, have not included library factors.

Methodology

This study sought to integrate both library and institutional factors to examine their relationship with graduation and retention rates at colleges and universities. Two major surveys of academic institutions within the United States provided the data for this study. The first is the Integrated Postsecondary Education Data System and the second is the Academic Libraries Survey (ALS), both of which are produced by the National Center for Education Statistics (NCES). Located in the U.S. Department of Education and the Institute of Education Sciences, the NCES is the primary agency of the federal government that collects and analyzes data related to higher education in the United States and other nations.

For the IPEDS, NCES conducts annual surveys to gather information on every college, university, and technical and vocational institution of higher education that participates in federal student financial aid programs. Participation in such data gathering efforts is mandated by the Higher Education Act of 1965 (as amended). The IPEDS survey requests data on enrollments, admissions requirements, program completions, graduation rates, faculty and staff, finances, institutional prices, and student financial aid. Over 7,500 institutions complete the survey each year, and the data itself, as well as a variety of analyses, are made available on the NCES website.

The biennial Academic Libraries Survey is also administered by the NCES and covers approximately 3,700 degree-granting postsecondary institutions. Data requested by the survey include variables such as size of collections (print and electronic), use of services (reference questions, interlibrary loans, and circulation), size of staff, library expenditures, and instructional sessions. The files for the surveys as well as several analyses are also available at the NCES website.

The study reported in this article focused specifically on four-year colleges and universities in Pennsylvania as classified by the Carnegie Foundation. Thus, data from community colleges, baccalaureate colleges that primarily give sub-baccalaureate degrees (associate's degrees and certificates), for-profit institutions, technical or vocational schools, and specialty institutions (such as law schools, medical schools, or theological seminaries) were not included in the study. Data from a total of 89 Pennsylvania institutions that had responded to both the IPEDS and the ALS were included in the final analyses. All data used in the analyses were drawn from the 2010 fiscal year reports.

Table 1 provides a breakdown of those institutions by the Carnegie Classification Code as reported in the 2010 ALS. The ALS uses two levels of classification for each institutional type of doctoral and research universities, master's level colleges and universities, and baccalaureate colleges. The ALS defines Doctoral/Research Universities-Extensive as institutions that typically offer a wide range of baccalaureate programs but are committed to graduate education through the doctorate, awarding 50 or more doctoral degrees per year across at least 15 disciplines. The Doctoral/Research Universities-Intensive classification includes institutions that offer a wide range of baccalaureate programs, are committed to graduate education through the doctorate, and award at least ten doctoral degrees per year across three or more disciplines or at least 20 doctoral degrees per year overall. The classification Master's Colleges and Universities I represents institutions that offer a wide range of baccalaureate programs and are committed to graduate education through the master's degree. They award 40 or more master's degrees per year across three or more disciplines. The Master's (Comprehensive) Colleges and Universities II offer a wide range of baccalaureate programs, provide graduate education through the master's degree, and award 20 or more master's degrees per year. Baccalaureate Colleges-Liberal Arts are primarily undergraduate colleges with a major emphasis on baccalaureate programs, awarding at least half of their baccalaureate degrees in liberal arts fields. Finally, the Baccalaureate Colleges-General classification is used for those institutions that are primarily undergraduate colleges with a major emphasis on baccalaureate programs but award less than half of their baccalaureate degrees in liberal arts fields. Table 2 reports on whether the college or university is private nonprofit or public, i.e., state or state-related.

Table 1
Institutions by Carnegie Classification

| | Frequency | Percent |
|--|------------------|----------------|
| Doctoral/Research Universities—Extensive | 6 | 6.7 |
| Doctoral/Research Universities—Intensive | 4 | 4.5 |
| Master's Colleges and Universities I | 34 | 38.2 |
| Master's (Comprehensive) Colleges and Universities II | 11 | 12.4 |
| Baccalaureate Colleges—Liberal Arts | 24 | 27.0 |
| Baccalaureate Colleges—General | 10 | 11.2 |
| Total | 89 | 100.0 |

Note: Adapted from National Center for Education Statistics (2010). Academic Libraries Survey.

Table 2
Institutions by Financial Control

| | Frequency | Percent |
|-------------------------------|------------------|----------------|
| Private not-for-profit | 65 | 73.0 |
| Public | 24 | 27.0 |
| Total | 89 | 100.0 |

Note: Adapted from National Center for Education Statistics (2010). Academic Libraries Survey.

The descriptive statistics for the major variables included in the study are given in Table 3. The variables include

- total library service index per FTE (computed from ALS and IPEDS);
- library expenses per FTE (computed from ALS and IPEDS);
- instruction expenses per FTE (IPEDS);
- research expenses per FTE (IPEDS);
- public service expenses per FTE (IPEDS);
- academic support expenses per FTE (IPEDS);
- student service expenses per FTE (IPEDS);
- institutional support expenses per FTE (IPEDS);
- graduation rate—bachelor degree within 6 years total (IPEDS); and
- retention rate (IPEDS).

Table 3
Descriptive Statistics of Variables

| | N | Minimum | Maximum | Mean | Standard Deviation |
|---|----------|----------------|----------------|-------------|---------------------------|
| Total library service index per FTE | 83 | 5.50 | 715.65 | 93.52 | 97.03 |
| Library expenses per FTE | 83 | \$217.11 | \$3059.21 | \$634.22 | \$524.66 |
| Instruction expenses per FTE | 86 | \$4445.00 | \$38074.00 | \$10156.16 | \$6114.42 |
| Research expenses per FTE | 86 | \$0 | \$28605.00 | \$1469.91 | \$4998.79 |
| Public service expenses per FTE | 86 | \$0 | \$3328.00 | \$349.94 | \$533.04 |
| Academic support expenses per FTE | 86 | \$673.00 | \$38697.00 | \$2968.45 | \$3413.27 |
| Student service expenses per FTE | 86 | \$883.00 | \$9443.00 | \$3464.17 | \$1710.96 |
| Institutional support expenses per FTE | 86 | \$575.00 | \$14508.00 | \$4563.42 | \$2294.70 |
| Graduation rate—Bachelor degree within 6 years total | 87 | 24% | 96% | 65.49% | 14.70% |
| Retention rate | 87 | 49% | 98% | 80% | 9.26% |

Note: Adapted from National Center for Education Statistics (2010). Academic Libraries Survey.

The researcher computed the total library service per FTE variable from data provided in the ALS and IPEDS. The first step was to compute a total service index for each institution. Based on work by Crawford and McGuigan (2011), the total service index served as a surrogate for library use and was calculated by adding the total number of circulations, interlibrary loans, gate counts, attendance at instructional sessions, and reference transactions. This figure was then divided by the total FTE of the institution to provide an inference on the average use of the library by each student for the year. The mean (average) use of the library for all the schools was 93.52, meaning that each student used the library in some manner over 93 times in the school year. Liberal arts colleges had the highest use (173) while the smaller doctoral universities had the least (47). Of special concern is the exclusion of the use of online resources from the total library service variable. Data for the use of online resources was not reported in the ALS so could not be included in the total library service variable. If such information were available, the results of the analyses may have changed. Hopefully, future iterations of the ALS will include the use of online resources.

Using the total library expenses reported on the ALS, the library expenses per FTE variable was calculated by the researcher simply by dividing the total library expenses by the student FTE reported on IPEDS. The mean library expenses per student was \$634.22, although there was great variation in total amount spent per student. The larger research universities spent almost \$1,180 per student, and liberal arts colleges spent \$1,040, while those master’s institutions that awarded fewer master’s degrees spent less than \$370 per student.

Calculated by the NCES as part of the IPEDS process, instruction expenses per FTE includes expenses of the colleges, schools, and departments for both credit and noncredit activities and are based on Financial Accounting Standards Board (FASB) or Government Accounting Standards Board (GASB) standards, depending on the control of

the institution. FASB standards are used for private institutions and GASB for public. The amount spent per student varied widely. The extensive research universities spent \$22,919 per student compared to the \$12,481 spent by liberal arts colleges and \$7,254 for the smaller master's-level institutions.

The research expenses per FTE variable includes funds spent on activities designed to produce research outcomes that are commissioned by an organization or agency external to the institution or that are budgeted separately by the institution. As would be expected, the extensive doctoral universities spent overwhelmingly more per student on research than the other colleges and universities, averaging almost \$17,000 per student. The next highest expenditure was slightly over \$1,700 per student at the smaller, intensive doctoral universities.

Public service expenses per FTE refers to those expenditures which primarily provide non-instructional services that benefit individuals and groups who are external to the institution, including such activities as conferences, cooperative extension, and public broadcasting. As with the research expenses, the extensive doctoral universities spent much more on public services than the other colleges and universities with an average of \$1,361 per student.

Academic support expenses per FTE includes those activities and services that support the instruction, research, and public service of the institution. This may include audiovisual services, demonstration schools, clinics that support the educational function, museums, and libraries. As with many of the other expenses, the larger research-focused doctoral universities spent more on average than the other schools, averaging \$9,815, which is more than twice the amount that the other doctoral universities spent.

Student service expenses per FTE includes services such as admissions, the office of the registrar, and efforts related directly to the emotional and physical well-being of students. This may include cultural events, student activities programs, student newspapers, intramural athletics, and student organizations. The baccalaureate colleges spent the most on student services when compared to the other schools. The liberal arts colleges spent \$5,083 per student, and the general baccalaureate colleges spent \$3,776. The mean for all the institutional types was \$3,464.

The institutional support expenses per FTE variable reports on the amounts colleges and universities spend for the day-to-day operations of the institution. These expenses include general administrative services, executive activities, legal and fiscal operations, services such as purchasing and printing, and public relations and development. The overall mean for these expenses was \$4,563, but expenses varied widely from \$575 to \$14,508. The doctoral extensive universities and the liberal arts colleges spent the most on average (\$6,160 and \$6,019 respectively). All the other institutions spent less than \$4,500 per student.

IPEDS reports several different graduation rates. For this research, the six-year graduation rate was used since it is the variable used in most studies of graduation rates. The six-year graduate rate reports the rate at which first-time, full-time degree or certificate-seeking students graduate within six years of the "normal time to completion" (defined as four years). Research universities and liberal arts colleges reported the highest graduation rates, 83% and 75% respectively, with the average for all institutions being 65.5%. The Masters II institutions had the lowest graduation rate with 59% of their students graduating within six years.

As defined by NCES, the retention rate variable represents the percentage of those full-time students who reenrolled at the institution as either a full- or part-time student in the current year. For baccalaureate institutions, this is the percentage of first-time bachelor's students from the previous fall who are enrolled in the current fall. For universities, this is the percentage of first-time degree/certificate-seeking students from the previous fall who either reenrolled or successfully completed their program by the current fall. The overall average for the retention rate was 80% with the larger research universities retaining over 93% of their students and the general baccalaureate colleges retaining just 73%.

The analyses used in the research were bivariate Pearson's product moment (*r*) correlations and multiple linear regressions. Pearson's product moment correlations were used to determine relationships between the

variables under study. It must be remembered that while correlations may show significant relationships, they do not imply causation. Due to the smaller size of the population, tests for differences in means (t-test and ANOVA) for the colleges and universities grouped by Carnegie Classification or control were not used. Crawford (2015) provides fuller analyses by fiscal control (private or public) and by Carnegie Classification for colleges and universities across the United States. Multiple linear regression attempts to create a formula that will permit predictions of how the dependent variable will change as a result of changes in the independent variables. For this research, the dependent variables were graduation rate and retention rate, and the other institutional and library variables were independent variables. Theoretically, the formula that results from the regression analysis could show how much the graduation rate or the retention rate would change if a college or university were to change how much they spent on a specific variable, such as student support, library support, or instructional support.

Results

The correlation analysis yielded some very interesting relationships, as shown in Table 4. All the institutional expense variables and the two library variables show highly significant correlations ($p < .01$) to the two primary variables of interest (graduation rate and retention rate). The highest correlation to both graduation rate and retention rate is instruction expenses per FTE. Since education is the primary function of a college or university, this relationship is logical. When the correlation is squared to obtain the coefficient of determination, instruction expenses per FTE explains almost 50% of the variance in graduation rate and retention rate. Library expenses per FTE had the second highest correlation with the graduation rate and the retention rate. The coefficient of determination was 46% for the graduation rate and 37% for the retention rate.

The use of the library by students, as expressed in the total service index per FTE, gives a different story. Although the correlation is significant, the coefficient of determination explains 22% of the variance in the graduation rate and 15% of the retention rate. Of the eight variables used in the analysis, the total service index per FTE had only the fifth highest correlation with the graduation rate and the sixth highest with the retention rate.

For exploratory purposes, a separate correlation analysis was run just between the library expenses per FTE and the total service index per FTE. The resulting correlation (0.500) was highly significant ($p < .01$), but the coefficient of determination shows that only 25% of the variance of the use of the library could be explained by the amount spent per student.

The multiple regression analyses gave a different picture of the relationship between the independent variables (the expenditure and use variables) and the graduation rate and retention rate, which served as dependent variables. The purpose of regression analysis is to derive an equation from existing data that can then be used to predict the criterion or dependent variables, in this case graduation rate and retention rate, when the independent variables are known. The analysis itself attempts to derive the best equation for generating this prediction. The analysis also yields an R^2 value that provides a measure of how much of the variation is explained by the model. For both analyses, all the variables of interest were entered simultaneously into the model.

Table 4
Correlations between Expense and Library Variables and Graduation and Retention Rates

| | | Graduation rate— Bachelor degree within 6 years total | Retention Rate |
|---|---------------------|--|-----------------------|
| Total service index per FTE | Pearson Correlation | .465** | .390** |
| | N | 82 | 82 |
| Library expenses per FTE | Pearson Correlation | .681** | .608** |
| | N | 82 | 82 |
| Instruction expenses per FTE | Pearson Correlation | .694** | .686** |
| | N | 85 | 85 |
| Research expenses per FTE | Pearson Correlation | .378** | .424** |
| | N | 85 | 85 |
| Public service expenses per FTE | Pearson Correlation | .319** | .329** |
| | N | 85 | 85 |
| Academic support expenses per FTE | Pearson Correlation | .508** | .451** |
| | N | 85 | 85 |
| Student service expenses per FTE | Pearson Correlation | .535** | .392** |
| | N | 85 | 85 |
| Institutional support expenses per FTE | Pearson Correlation | .463** | .350** |
| | N | 85 | 85 |

Note. ** Correlation is significant at the 0.01 level (2-tailed).

For the retention analysis, the resulting model yielded a regression coefficient (R) of 0.803 and an R squared (R²) of 0.644, meaning that 64% of the variance can be explained by the resulting formula. Table 5 provides a listing of the coefficients. According to the resulting model, the following variables had significant coefficients: instructional expenses per FTE, public service expenses per FTE, academic support expenses per FTE, student service expenses per FTE, and institutional support expenses per FTE. Surprisingly, neither the library expenses per FTE nor the total service index per FTE had significant coefficients and therefore could be left out of the model. In other words, the institutional variables by themselves could be used to predict the retention rate. As can be seen by the standardized coefficients, the instruction expenses per FTE variable has the highest impact on retention, much greater than the

other variables. In fact, two of the variables had significant negative coefficients. A negative coefficient means that, while the other variables are held constant, the dependent variable will actually decline if the variable with the negative coefficient is increased. In this case, this means that increasing expenditures on institutional support and, more surprisingly, on academic support would have a negative impact on the retention of students. Interpreting the meaning of this relationship is more difficult, but the coefficients indicate that as academic support expenses and institutional support expenses increase, the rate of retention decreases.

Table 5
Regression for Retention Rate

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| (Constant) | 66.566 | 2.337 | | 28.482 | .000 |
| Instruction expenses per FTE | .002 | .000 | 1.315 | 5.497 | .000 |
| Research expenses per FTE | .000 | .000 | -.202 | -1.378 | .172 |
| Public service expenses per FTE | .004 | .002 | .237 | 2.676 | .009 |
| Academic support expenses per FTE | -.001 | .000 | -.382 | -2.867 | .005 |
| Student service expenses per FTE | .001 | .001 | .252 | 2.381 | .020 |
| Institutional support expenses per FTE | -.002 | .000 | -.511 | -4.393 | .000 |
| Library expenses per FTE | -.001 | .003 | -.032 | -.182 | .856 |
| Total service index per FTE | .004 | .009 | .037 | .416 | .679 |

As shown in Table 6, a similar result was obtained for the sixth-year graduation rate. The entire model produced a regression coefficient of .805 and an R² of .649 indicating that almost 65% of the total variation in the graduation rate could be explained by the model. Upon examining the coefficients, the following variables were significant: instructional expenses per FTE, public service expenses per FTE, student service expenses per FTE, and institutional support expenses per FTE. Again, neither library-related variable produced any significant results. As with retention, the variable with the highest standardized coefficient was instruction expenses per FTE. In this analysis, only one variable had a significant negative coefficient, which indicates that as institutional support expenses increase, the rate of graduation decreases.

Table 6
Regression for Graduation Rate

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|-----------------------------|------------|---------------------------|--------|------|
| | B | Std. Error | Beta | | |
| (Constant) | 42.135 | 3.662 | | 11.507 | .000 |
| Instruction expenses per FTE | .002 | .001 | .903 | 3.797 | .000 |
| Research expenses per FTE | -.001 | .000 | -.214 | -1.473 | .145 |
| Public service expenses per FTE | .006 | .002 | .229 | 2.599 | .011 |
| Academic support expenses per FTE | .000 | .001 | -.102 | -.773 | .442 |
| Student service expenses per FTE | .003 | .001 | .372 | 3.536 | .001 |
| Institutional support expenses per FTE | -.003 | .001 | -.386 | -3.336 | .001 |
| Library expenses per FTE | .001 | .005 | .034 | .194 | .847 |
| Total service index per FTE | .011 | .013 | .070 | .800 | .426 |

In summary, for both the retention of students and their ultimate graduation, the variable with the greatest effect is the instructional expenses per student. Other variables, such as public service expenses, student support expenses, and institutional support expenses, are significant but have a smaller or even negative impact on both graduation and retention. In regression analysis, the resulting formula based on the coefficients for each significant variable indicates that if more money would be spent on instruction and student services, the retention of students and their graduation rates would increase. If more money is spent on institutional support, then both rates would decline.

Discussion

The results of this study reinforce those of others, yet the results should also give pause, especially to librarians, library directors, and academic administrators. Although this study did not set out to replicate the work of other authors, some interesting comparisons can be made. For example, Haddow and Joseph (2010) found that library use is positively associated with retention. Overall, the correlations in this study confirmed this finding. For both the graduation rate and for the retention rate, the variable measuring the total services index per FTE (a surrogate for use of the library) had positive and significant correlations. However, although significant, the relationships as shown by squaring the correlation were fairly small, explaining 22% of the variation in the graduation rate and 15% of the retention rate. Confirming the research by Gansemer-Topf and Schuh (2003), this research supported their findings that expenditures on instruction and academic support were significantly correlated with graduation rates. This research shows that instruction expenses per FTE and academic support

expenses per FTE were significantly correlated with both retention and graduation rates. In fact, as would be expected, the instruction expenses per FTE had the highest correlation with both rates.

The relationships, as shown by the correlations between library expenses per FTE and graduation and retention rates, are heartening. In general, the more a college spends on the library, the higher the graduation rate and the higher the retention rate. In contrast, the relationship between library use and graduation and retention rates is less than might be expected. Higher library use is associated with slightly higher graduation and retention rates, but the relationship is not nearly as high as that of library expenses and graduation and retention rates. Importantly, in interpreting these results, it must be remembered that correlations do not imply causality.

The multiple regression analyses give a very different picture. For both graduation rate and retention rate, the most important factor is the amount of expenses for direct instruction, as would be expected since the most money spent by a college or university is for student instruction. In addition, student support expenses contribute strongly to the overall graduation and retention rates. Library use and library expenses, in contrast, do not affect the model in any significant way. Thus, neither the amount of use of the library nor the overall funding of the library has any direct statistical effect on either graduation rate or retention rate in the regression formulas, although the correlations did show significant relationships. This is a surprising result and one that deserves additional study since regression analyses can imply causation. Thus, the results show that increasing the amount of library funding would not necessarily change either the graduation or the retention rate of students. However, increasing spending on instruction or student support could yield higher rates.

Limitations

This research is primarily limited by the fact that it was performed at only one point in time, namely using 2010 data. To obtain a better view of how these variables interact, time trends should be attempted, although this will require significant data manipulation. Although limited to Pennsylvania colleges and universities, this study was broad in scope. Additional analyses could be undertaken to understand the relationships between the variables. Of special concern is the lack of data for electronic use of libraries. Such use, since it may represent a large proportion of overall library use, may change the dynamics of the interactions of the variables, especially in the regression analysis. In addition, this study focused on the college or university as the unit of analysis; it tells us nothing about why the individual student stayed at a specific school or why the student graduated. To understand such behavior, other studies employing both quantitative and qualitative research must be undertaken.

Conclusions and Implications

The data provided in this research uses two different methods of examining the effect of college and university expenditures and use data on student graduation and retention rates. Although it focused specifically on Pennsylvania, this study can provide interesting data for academic administrators at institutions of higher education in other states. The results show that library expenditures and library use are positively correlated with graduate rates and retention rates. Correlation studies, however, do not imply causation. Thus, this research only shows that library expenditures and use, as well as other institutional variables such as educational expenditures, have a positive relationship with both graduation and retention rates. Library expenditures and use cannot predict graduation or retention rates.

Multiple regression analysis, in contrast, does attempt to create a formula through which predictions can be made. When all the independent institutional and library-related variables were entered into the analysis, neither library variable rose to the level of significance and, as a result, could be eliminated from the resulting formula.

Several of the institutional variables, especially expenses for instruction and student services, provided very good predictive value for graduation and retention rates.

The research and the resulting findings raise important questions, such as why was the use of the library not more highly correlated with academic success as defined by retention and graduation? Additionally, why did library expenses and use not help better predict retention and graduation rates? These are very important questions since libraries are judged by their use and that use, in turn, is often used to justify budgets for staff and materials. Would the inclusion of the use of electronic resources change the outcome of the analyses? Are there other library-related variables that would be better to use than expenses and use? This research and its methodology can only raise these questions. More sophisticated research methods may be able to shed light on this conundrum for librarians.

Overall, deans and academic administrators can be heartened by the results since many of the core expenditures of a college or university are significantly correlated with the graduation and retention rates. Additional research is needed before definite statements about the causal relationships between the variables included in the study can be made. However, these results do verify that those institutions that provide better funding for instruction and support services, such as libraries and student services, witness higher graduation and retention rates. Indeed, both the correlations and the regression analyses show the importance of the expense for instruction and student services.

Although librarians may be disappointed by some of the results presented, we need to remember that the library at a college or university is part of an educational ecosystem that must be understood in its entirety. The library does not stand alone, especially when it comes to the success of our students.

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