# Academic Library Services and Undergraduate Academic Success: Trends in Research Literature

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## Abstract

Academic libraries are under increasing pressure from higher education administrators to demonstrate that library services contribute to student academic success. The purpose of this scoping review is to examine the research methods used to investigate academic library contributions to undergraduate academic success. After searching *ERIC*; *Library, Information Science & Technology Abstracts with Full Text*; and selected journals, 38 articles were included in this scoping review. The included articles used quantitative methods to primarily explore five academic success measures: grade point average, information literacy skills, retention, final degree attainment, and graduation rates.

This scoping review provides areas for librarians to consider when designing research studies about library contributions to student success. First, librarians should consider research designs that incorporate advanced statistical methods or qualitative methods. Second, when designing studies, researchers should consider utilizing higher education theoretical frameworks. Finally, research should be conducted to investigate the previously explored academic success measures from alternate angles or to explore unstudied academic success measures, like job placement, post-college performance, and graduate school entrance exams.

In *The Value of Academic Libraries,* Oakleaf conducted an extensive literature review focusing on how academic libraries have demonstrated that their services advance the missions of higher education institutions.[1] This scoping review examines the methods used in empirical research articles to investigate academic library contributions to undergraduate academic success since the publication of *The Value of Academic Libraries*. The findings from this scoping review will assist in the development of future research studies.

"Academic success" is a broad term used to describe outcomes, like graduation, grade point average (GPA), or career placement, that are the result of a student's higher education experience. The academic success measures of interest are identified in York, Gibson, and Rankin's Operationalized Model of Academic Success and described as student learning surrogates in *The Value of Academic Libraries*.[2] York, Gibson, and Rankin's Operationalized Model of Academic Success includes six categories of academic success measures: academic achievement, attainment of learning objectives, acquisition of desired skills and competencies, satisfaction, persistence, and post-college performance.[3] Oakleaf's student learning surrogates include: GPA, persistence, test scores, graduation rates, time to graduation, learning outcome attainment, transfer ready status, job placement, and post-college career advancement.[4] In the current era of higher education accountability, highlighting the outcomes related to the use of library services makes a stronger case.[5] Thus, when applying York, Gibson, and Rankin's Operationalized Model of Academic Success to the academic library context, I removed the satisfaction measure. This scoping review explores two research questions:

1. What academic success measures are explored in relation to academic library services?
2. What research designs have been used to study academic success measures and academic library services?

## Research Methods

This research study used the scoping review method. Scoping reviews systematically explore the literature on a particular topic, but do not assess the quality of the research methods used in the included studies.[6] Arksey and O'Malley's scoping review framework outlines five stages: (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; and (5) collating, summarizing, and reporting the results.[7] In this section, I describe the search strategy used to identify relevant studies, the inclusion and exclusion

criteria used to select the studies, and the data management method used to chart the data.

**Identifying Relevant Studies**
For this scoping review, I searched two databases, *ERIC (EBSCO)* and *Library, Information Science & Technology Abstracts with Full Text (EBSCO)*, to identify scholarly literature. In addition, I searched key journals focusing on higher education and academic libraries. These journals included *The Journal of Higher Education*, *Research in Higher Education*, *portal: Libraries and the Academy*, *The Journal of Academic Librarianship*, *Evidence Based Library and Information Practice*, *College and Research Libraries*, and *College and Undergraduate Libraries*. The search was originally conducted in October 2015 and was updated in September 2016.

Three key concepts were identified from the purpose statement: academic libraries, undergraduate students, and academic success. In order to be comprehensive, I combined the three key concepts and related synonyms into one keyword search. I used two database limiters. I restricted the publication date to 2010 and later to encompass the dates after the publication of *The Value of Academic Libraries*. Due to the focus on research literature, I limited the search to academic journals.

**Study Selection**
I developed inclusion and exclusion criteria to select the studies. All included articles had to be empirical studies published from 2010 to present. Other inclusion criteria were an academic or college library context, an undergraduate student study population, primary focus on academic success measures, and English language. If the study population included graduate students as well as undergraduate students, I included the study as long as the results pertaining only to undergraduates could be identified in the findings. In order to focus on long-term learning outcomes, I included studies related to the attainment of information literacy skills only if the students were studied over multiple years or if comparisons were made between different classifications of students (e.g., freshman, sophomore, junior, senior).

I also applied exclusion criteria to assist the study selection. I excluded literature reviews and review articles because these articles would not report original research studies. Due to the focus on academic success measures, an article was excluded if it

- focused on student satisfaction with library services;
- reported only library service usage statistics;
- described the development of a program, project, or service model;
- tested the effectiveness of a teaching method; or
- reported a single class, a single activity, or grade on a single assignment in a library instruction class or workshop.

The combined search result from both databases was 763 articles. I exported the articles to EndNote bibliographic software for de-duplication and screening. After removing 67 duplicates, I screened the abstracts of 696 articles using the inclusion and exclusion criteria. After the abstract screening, 76 articles remained for full-text review. Following the application of the inclusion and exclusion criteria to the full-text articles, 28 articles from the database searches met the inclusion criteria. I included seven articles after searching the key journals and three articles after consulting the reference lists of the included articles. This scoping review included 38 articles.

**Charting the Data**
Each article selected for inclusion was described in an Excel summary table. The description of each article included the author(s), year of publication, journal, academic success measures, study location, research methods, and participant sample. The appendix includes the summary table of these 38 articles.

## Findings
This scoping review included 38 articles related to academic library services and undergraduate academic success. The fifth stage of Arksey and O'Malley's scoping review framework, summarizing and reporting the results, is described in this section.[8] First, I provide an overview of the publication characteristics of the 38 articles. Then, I answer the study's research questions by reporting the academic success measures explored and the research designs used in the included articles.

**Overview of the Articles**
In the included articles, there are trends in the journals, the authors, and the study locations. Eighteen different journals published the included articles; however, only one journal is outside of

the library science field (see Table 1). Some of the researchers focusing on this topic are prolific in their research output. Three research teams published more than one article. The study locations show that exploring academic libraries and academic success is a topic of international interest (see Table 2). Twenty-five of the study locations were in the United States, and thirteen of the study locations were outside of the United States.

**Table 1. Included articles by journal**

| Journal | Articles |
|---|---|
| *College & Research Libraries* | 11 |
| *Journal of Academic Librarianship* | 7 |
| *portal: Libraries & the Academy* | 3 |
| *Evidence Based Library & Information Practice* | 3 |
| *Library & Information Science Research* | 1 |
| *Journal of the Canadian Health Libraries Association* | 1 |
| *College & Undergraduate Libraries* | 1 |
| *Education Libraries* | 1 |
| *Liber Quarterly: The Journal of European Research Libraries* | 1 |
| *Library Management* | 1 |
| *Communications in Information Literacy* | 1 |
| *Libri: International Journal of Libraries & Information Services* | 1 |
| *Nurse Education in Practice* | 1 |
| *Reference Services Review* | 1 |
| *Australian Academic & Research Libraries* | 1 |
| *Serials* | 1 |
| *Annals of Library & Information Studies* | 1 |

**Table 2. Included articles by study location**

| Study Location | Articles |
|---|---|
| United States | 25 |
| United Kingdom | 4 |
| Hong Kong | 3 |
| Australia | 2 |
| Canada | 1 |
| Ireland | 1 |
| Jordan | 1 |
| Nigeria | 1 |

**Academic Success Measures Explored in Relation to Academic Library Services**

Retention, GPA, degree attainment, information literacy skills, and graduation rates were the most frequent academic success measures explored in the included articles. Academic skill development, academic engagement, and engagement in scholarly activities were explored in one article.[9] Nine articles only examined the library's relationship to student GPA,[10] and 10 articles only explored the development of information literacy skills.[11] Five articles investigated only retention,[12] and

four articles focused on final degree attainment, a cumulative grade placed on the final degree in the United Kingdom.[13] I included final degree attainment as a separate academic success measure because it is related to GPA but distinct in its use to categorize the level of final degrees. The remaining 10 articles included multiple measures examined together,[14] and in these articles, retention was the most frequently occurring measure of academic success.

When examining the number of times individual academic success measures were explored individually or jointly with other measures, GPA and retention were the most frequently occurring measures. GPA was a measure in 16 articles, and retention was a measure in 13 articles. The majority of articles that focused on retention examined the retention of freshmen. Most articles focusing on GPA studied undergraduates of all classifications. However, when focusing on a particular classification, freshman and senior GPAs were the most studied.

**Research Designs Used to Study Academic Success and Academic Library Services**

Every included article used a quantitative method. Thirty-one out of the 38 articles used quantitative methodology exclusively, and the remaining seven articles used mixed methods. Despite the ubiquity of quantitative methods, only four articles articulated and used a theoretical framework. Three articles used Astin's Input-Environment-Outcome model.[15] The other article used Vincent Tinto's model of student integration.[16]

The majority of the quantitative methods do not require extensive knowledge of statistical procedures. Eight articles only analyzed descriptive statistics, like percentages, means, and standard deviations, to draw conclusions.[17] Three articles used only the Pearson correlation to analyze the data for the presence of a relationship.[18] One article used the chi-square test for independence alone,[19] and four articles used the chi-square test with other simple statistical methods.[20] Three articles used t-tests or z-tests with other simple statistical methods to analyze data.[21] The Mann-Whitney U Test, an alternative to the t-test test, was used in three articles.[22] Some studies that utilized more advanced statistical procedures also used simple procedures, like the Pearson correlation, chi-square tests, and t-tests to analyze data. These procedures are not included in the counts above.

In the 14 articles that used more advanced statistical procedures, regression analysis, used in nine articles, was the most popular data analysis method.[23] Two articles used ANOVA to analyze data.[24] Propensity score matching,[25] generalized estimating equation,[26] and predictive model search[27] were other named statistical procedures. Of the articles that used advanced methods, nine had a non-library collaborator explicitly identified.[28]

In the seven mixed methods studies, surveys and focus groups were the qualitative methods used in conjunction with quantitative methods. Three articles described the free text responses on surveys as qualitative data.[29] Stone and Ramsden and Stone, Pattern, and Ramsden used focus groups as part of their data collection to explore the lack of correlation between variables.[30] Bowles-Terry also used focus groups in her mixed methods study.[31] Massengale, Piotrowski, and Savage utilized action research methods by analyzing student GPAs and then reporting the findings back to a student group for feedback.[32]

Another aspect of study design is selection of the participants. Academic success was examined at two levels: the student level and the university level. Thirty-three of the articles explored the relationship between use of library services and academic success by using individual students as the unit of analysis. The other five articles looked at data aggregated at the university level to explore how library services can impact a university's retention and/or graduation rates.[33]

Researchers gathered data from publicly available data sources, university data sources, library usage statistics, and library-developed data collection instruments. The five studies that looked at the university level gathered data from publicly available data sources: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics Academic Library Survey, ACRL*Metrics* database, and ARL statistics. Twenty-two studies combined university data, like demographics, enrollments, and GPA, with library usage data. Library usage measures included checkouts, proxy logins, library instruction attendance, workstation utilization, group study room reservations, research clinic attendance, access to the building, interlibrary loan requests, electronic book usage, website logins, reference, and chats. Ten studies focused on the attainment of information literacy

skills and included data from surveys, tests, and course assignments.

## Discussion

Two main findings answer this scoping review's research questions. First, five academic success measures are primarily explored in the included articles. Second, quantitative methods are ubiquitous in the research designs used in the articles.

### Academic Success Measures

Retention, GPA, degree attainment, information literacy skills, and graduation rates are the five most common academic success measures explored in the included articles. One explanation for the exploration of these five academic success measures is ease of access. Retention and graduation rates for undergraduate students at colleges and universities participating in federal financial aid programs are publicly available. University offices collect data on GPA and final degree attainment. Access to this data requires librarians to collaborate with other campus units, but the prevalence of these measures shows that librarians are succeeding in making these collaborations. The availability of student information literacy skill attainment data can be attributed in part to the increasing importance of learning outcomes assessment within libraries.[34] The inclusion of general academic skill development, academic engagement, and engagement in scholarly activities shows an interest in investigating harder-to-capture measures of student academic success.

Academic success measures that are absent from the included articles include post-college performance, test scores, transfer ready status, job placement, and post-college career advancement. These measures of academic success are more difficult to capture. Students might not take standardized graduate school entrance exams (e.g., MCAT, GMAT) until after graduating from college. Universities often rely on student surveys for reports of job placement and career advancement. Even when reported by colleges, job placement data has been criticized as undependable and inaccurate due to low response rates and broad questions.[35]

### Research Designs

All articles used quantitative research methods. Lack of librarian training in robust research methods contributes to the use of basic statistical methods, but the findings illustrate that librarians are collaborating with researchers outside of the library to use more advanced statistical methods. The frequent use of correlational studies can be attributed in part to the influence of Oakleaf.[36] In *The Value of Academic Libraries,* Oakleaf outlined a research agenda that listed correlations between library services and student success for librarians to investigate. Additionally, Oakleaf advocates for the use of correlational research in demonstrating relationships between academic success and library services despite the causal limitations of correlation methods.[37]

## Implications

For researchers, the findings of this scoping review highlight multiple areas to consider when designing future studies. The studies available exploring the relationship between academic libraries and undergraduate academic success provide multiple examples to use when considering a replication study at a specific institution. However, when looking at the body of research available at the field level, there are four areas that can contribute to the current knowledge base. First, researchers should use research designs beyond simple statistical methods. Additional mixed methods and qualitative studies should also be considered to explore the topic from alternative research perspectives. Second, research should be conducted to investigate the frequently studied academic success measures from alternate angles as well as to explore the ways that academic libraries contribute to job placement, post-college performance, and professional tests. Oakleaf also calls on librarians to expand their outcomes research beyond GPA, retention, and graduation to investigate other measures like professional test scores and career and internship placement.[38] Third, when designing studies, researchers should consider utilizing higher education theoretical frameworks. The theoretical framework grounds the study in work that other educational researchers have conducted and acknowledges that academic libraries are part of the field of higher education. Finally, researchers need to publish outside of library venues. Until librarians widely disseminate their research findings, the role that academic library services play in undergraduate academic success will remain unknown to the larger higher education community.

## Conclusion

This scoping review shows that researchers are utilizing quantitative and mixed methods research approaches to investigate the library's connection to undergraduate academic success. Researchers

can build on the research designs of prior studies when designing new studies to empirically demonstrate how academic library services impact student success. By considering alternative success measures and research methods, the library field can build a robust body of research literature that explores the library's connections to undergraduate academic success.

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## Notes

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19. Wong and Cmor, "Measuring Association."

20. Cook, "Library Credit Course"; Daugherty and Russo, "Assessment of the Lasting Effects"; Samson, "Information Literacy"; Scarletto, Burhanna, and Richardson, "Wide Awake."

21. Cook, "Library Credit Course"; Odeh, "Use of Information Resources"; Scarletto, Burhanna, and Richardson, "Wide Awake."

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25. Chiteng Kot and Jones, "Impact of Library Resource Utilization."

26. Stonebraker and Fundator, "Longitudinal Performance Assessment."

27. Teske, DiCarlo, and Cahoy, "Libraries and Student Persistence."

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## Appendix

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
|---|---|---|---|---|---|---|---|---|
| 1. | Allison, 2015 | *portal: Libraries & the Academy* | United States | GPA | Quantitative | University data (class standing, GPA); Library data (proxy server, checkouts) | Student | Descriptive statistics (mean, percentage); Regression analysis; Pearson correlation |
| 2. | Bowles-Terry, 2012 | *Evidence Based Library & Information Practice* | United States | GPA | Mixed Methods | Focus groups; University data (transcripts); Library data (library instruction) | Student | ANOVA |
| 3. | Chan, 2016 | *Communications in Information Literacy* | Hong Kong | Information Literacy Skills | Quantitative | Pre/post test | Student | Descriptive statistics (percentage) |
| 4. | Cherry, Rollins, & Evans, 2013 | *College & Undergraduate Libraries* | United States | GPA | Quantitative | University data (GPA, school, class); Library data (proxy server) | Student | Pearson correlation |
| 5. | Chiteng Kot & Jones, 2015 | *College & Research Libraries* | United States | GPA | Quantitative | University data (student background, academic records); Library data (workstation use, group student room reservations, research clinic attendance) | Student | Propensity score matching |
| 6. | Cook, 2014 | *College & Research Libraries* | United States | Graduation; GPA | Quantitative | University data (course enrollment, graduation date, GPA) | Student | Chi-square test for independence; Two sample z-tests |
| 7. | Crawford, 2015 | *portal: Libraries & the Academy* | United States | Graduation; Retention | Quantitative | IPEDS; NCES Academic Library Survey | University | Pearson correlation; ANOVA; T-tests |
| 8. | Daugherty & Russo, 2011 | *Journal of Academic Librarianship* | United States | Information Literacy Skills | Mixed Methods | Survey | Student | Descriptive statistics (count, percentage), Chi-square test for independence; Coding |

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
|---|---|---|---|---|---|---|---|---|
| 9. | Emmons & Wilkinson, 2011 | *College & Research Libraries* | United States | Graduation; Retention | Quantitative | ARL Statistics; IPEDS | University | Descriptive statistics (count, mean, median, mode, standard deviation, skewness, kurtosis, range); Regression analysis |
| 10. | Eng & Stadler, 2015 | *Evidence Based Library & Information Practice* | United States | Retention | Quantitative | ACRL Metrics | University | Pearson correlation |
| 11. | Farrell, Goosney, & Hutchens, 2013 | *Journal of the Canadian Health Libraries Association* | Canada | Information Literacy Skills | Quantitative | Survey | Student | Descriptive statistics (count, percentage) |
| 12. | Goodall & Pattern, 2011 | *Library Management* | United Kingdom | Final degree attainment | Quantitative | University data (courses, level, year group, school); Library data (checkouts, electronic resource use, building use) | Student | Charts |
| 13. | Haddow, 2013 | *Library & Information Science Research* | Australia | Retention | Quantitative | University data (enrollment, demographics); Library data (electronic resource logins, checkouts) | Student | Descriptive statistics (mean, median, mode, range, skew) |
| 14. | Haddow & Joseph, 2010 | *Australian Academic & Research Libraries* | Australia | Retention | Quantitative | University data (enrollment, demographics); Library data (checkouts, workstation logins, electronic resource logins) | Student | Mann-Whitney test; Descriptive statistics (frequencies, cross tabulations) |
| 15. | Holliday et al., 2015 | *College & Research Libraries* | United States | Information Literacy Skills | Quantitative | Course assignment | Student | VALUE rubric; Descriptive statistics (mean, standard deviation, percentage) |
| 16. | Issa, Amusan, Olarongbe, Igwe, & Oguntayo, 2015 | *Annals of Library & Information Studies* | Nigeria | Information Literacy Skills | Quantitative | Survey | Student | Descriptive statistics (count, percentage) |
| 17. | Lalor, Clarke, & Sheaf, 2012 | *Nurse Education in Practice* | Ireland | Information Literacy Skills | Quantitative | Pre/post-test; Course assignment | Student | Descriptive statistics (count, percentage) |

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
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| 18. | Massengale, Piotrowski, & Savage, 2016 | *College & Research Libraries* | United States | GPA | Mixed Methods | University data (early warning system); Library data (building use, instruction, research help, laptop checkouts, study room reservations, 3D printer requests, electronic resource usage); Focus group | Student | Descriptive statistics (mean, count, ratio, percentage); Action research |
| 19. | Mezick, 2015 | *Journal of Academic Librarianship* | United States | Retention | Quantitative | Survey of ARL libraries; IPEDS | University | Fisher's exact test |
| 20. | Murray, Ireland, & Hackathorn, 2016 | *College & Research Libraries* | United States | Retention | Quantitative | University data (demographics, enrollment status); Library data (checkouts, proxy server, computer lab use, ILL, instruction sessions, credit bearing IL course, use of writing center, use of oral communication center) | Student | Descriptive statistics (count, percentage); Regression analysis |
| 21. | Odeh, 2012 | *Libri: International Journal of Libraries & Information Services* | Jordan | GPA | Quantitative | University data (GPA); Survey; Interviews | Student | T-tests; Descriptive statistics (count, percentage, mean, standard deviation); Spearman correlation |
| 22. | Pan, Ferrer-Vincent, & Bruehl, 2014 | *Journal of Academic Librarianship* | United States | Information Literacy Skills | Mixed Methods | Survey; Course assignment | Student | Citation analysis; Regression analysis; Descriptive statistics (count, percentage) |
| 23. | Samson, 2010 | *Journal of Academic Librarianship* | United States | Information Literacy Skills | Quantitative | Course assignment | Student | Chi-square test for independence; Rank-sum test |

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
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| 24. | Scarletto, Burhanna, & Richardson, 2013 | *Journal of Academic Librarianship* | United States | GPA; Retention | Mixed Methods | University data (demographic data, GPA, department, major); Library data (building use); Survey | Student | Descriptive statistics (count, percentage, mean); Chi-square test for independence; T-tests |
| 25. | Scott, 2014 | *Journal of Access Services* | United States | GPA | Quantitative | University data (GPA, class standing, department); Library data (ILL) | Student | Descriptive statistics (count, mean, percentage) |
| 26. | Soria, Fransen, & Nackerud, 2016 | *College & Research Libraries* | United States | GPA; Academic skill development; academic engagement; engagement in scholarly activities | Quantitative | University data (GPA, Student Experience in the Research University Survey); Library data (books, web-based services, classes, reference, computer workstation use) | Student | Factor analysis; Regression analysis |
| 27. | Soria, Fransen, & Nackerud, 2014 | *Journal of Academic Librarianship* | United States | Retention; GPA | Quantitative | University data (demographics, college, GPA, enrollment); Library data (database logins, ebooks, checkouts, ejournals, ILL, peer consultations, reference chats, website logins, workshops attended, workstations use) | Student | Regression analysis |

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
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| 28. | Soria, Fransen, & Nackerud, 2013 | *portal: Libraries & the Academy* | United States | Retention; GPA | Quantitative | University data (demographics, GPA, enrollment); Library data (database logins, ebooks, checkouts, ejournals, ILL, peer consultations, reference chats, website logins, workshops attended, workstations use) | Student | Chi-square test for independence; T-tests; Regression analysis |
| 29. | Stemmer & Mahan, 2015 | *Evidence Based Library & Information Practice* | United States | Retention; GPA; Graduation | Quantitative | University data (demographics, GPA, enrollment); Survey | Student | Regression analysis; Chi-square test for independence |
| 30. | Stemmer & Mahan, 2016 | *College & Research Libraries* | United States | Retention; GPA; Graduation | Quantitative | University data (demographics, GPA, enrollment); Survey | Student | Regression analysis; Chi-square test for independence |
| 31. | Stone, Pattern, & Ramsden, 2011 | *Liber Quarterly: The Journal of European Research Libraries* | United Kingdom | Final degree attainment | Mixed Methods | University data (year of graduation, course, grades, academic department); Library data (checkouts, building use, electronic resource logins); Focus groups | Student | Mann-Whitney test; Kruskal-Wallis test |
| 32. | Stone & Ramsden, 2013 | *College & Research Libraries* | United Kingdom | Final degree attainment | Mixed Methods | University data (year of graduation, course, grades, academic department); Library data (checkouts, building use, electronic resource logins); Focus groups | Student | Mann-Whitney test; Kruskal-Wallis test; Grounded theory |

| | Author & Year | Journal | Study Location | Academic Success Measures | Research Methodology | Data Collection | Participant Sample | Data Analysis |
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| 33. | Stonebraker & Fundator, 2016 | *Journal of Academic Librarianship* | United States | Information Literacy Skills | Quantitative | Pre/post Test | Student | Descriptive statistics (mean, standard deviation); Generalized estimating equation; T-tests |
| 34. | Teske, DiCarlo, & Cahoy, 2013 | *Reference Services Review* | United States | Retention; Graduation | Quantitative | IPEDS, NCES Academic Library Survey | University | Pearson correlation; Predictive model search |
| 35. | Travis, 2011 | *Education Libraries* | United States | Information Literacy Skills | Quantitative | Survey | Student | Descriptive statistics (count, percentage) |
| 36. | White & Stone, 2010 | *Serials* | United Kingdom | Final degree attainment | Quantitative | University data (grades); Library data (checkouts, building use, electronic resource logins) | Student | Descriptive statistics (mean, percentage, ratio) |
| 37. | Wong & Webb, 2011 | *College & Research Libraries* | Hong Kong | GPA | Quantitative | University data (GPA, graduation year); Library data (checkouts) | Student | Pearson correlation |
| 38. | Wong & Cmor, 2011 | *College & Research Libraries* | Hong Kong | GPA | Quantitative | University data (GPA); Library data (library workshop attendance) | Student | Chi-square test for independence |