



Research Article

Information Literacy and Retention: A Case Study of the Value of the Library

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Abstract

Objective - The authors investigated the impact of library instruction on information literacy (IL) skills as part of ACRL's AiA initiative. Additionally, the researchers sought to determine whether there was a relationship between IL tests scores and research experiences with student success outcomes such as retention.

Methods - The researchers administered a standardized IL test to 455 graduate and undergraduate students in multiple disciplines. They then collected outcome data on GPA, retention, and graduation three years later.

Results - While there were no significant differences between those students who had instruction and those who did not on the IL test, a regression analysis revealed that experience writing research papers that required library resources and an individual's use of library books

throughout their academic career demonstrated significant, positive relationships with whether a student passed the information literacy test. Additionally, using the longitudinal data on GPA, retention, graduation, and employment, the researchers found that students' IL scores were significantly correlated with their GPAs, and that students who passed the IL test were more likely to be retained or graduate within six years.

Conclusion - The ability to demonstrate IL skills appears to contribute to retention and graduation and, therefore, may be an integral part of one's academic success. Further, experience writing research papers and other meaningful assignments contributes to student success.

Introduction

This article reports the results of a study conducted as part of the first cohort of the Association of College and Research Libraries (ACRL) Assessment in Action (AiA) Initiative, in which librarians from 75 institutions in North America sought to develop and implement research projects that investigated the value of academic libraries. AiA is a three-year program funded by an Institute of Museum and Library Services grant. The program offered an instructional program that took place both online and in person. The purpose of the instruction was to foster Communities of Inquiry between other librarians in the cohort and to develop, implement, and report upon a research plan that would investigate the value of academic libraries. Oakleaf (Association of College & Research Libraries [ACRL], 2010) set forth a multifaceted agenda for exploring and demonstrating the value of academic libraries. Many of the research projects conducted by AiA participants were based on Oakleaf's recommendations. Examples of projects included investigations of the impact of information literacy (IL) programs, library use in a very general sense, and space use, just to name a few (Ackermann, 2016). Outcomes of these projects ranged from determining the impact of various library-related variables on student achievement such as GPA, course grades, and IL test scores, to more broad goals such as impact on retention and graduation. The current study sought to determine information literacy skill levels of students in various disciplines across

different student ranks (freshmen to doctoral). Analyses were conducted to ascertain factors that contributed to a general level of competency in information literacy. Further, three years after the IL tests were administered, retention, graduation, and GPA data were collected from Institutional Research for the students who took the IL assessment.

Hofstra University regularly assesses student learning, engagement, and satisfaction. Further, the university's commitment to developing information literate students is clearly articulated in its mission statement (Hofstra University, 2015). Accordingly, the Hofstra AiA project sought to determine "Which factors contribute to information literacy competencies (e.g., library instruction) as well as other outcomes such as retention and graduation." The team was made up of the first author, who was the librarian team leader, the Provost for Assessment, the Dean of the School of Liberal Arts, and several teaching faculty members in different disciplines, including the second author. This composition allowed us to get input from stakeholders at multiple levels, which facilitated us in constructing and meeting goals important to the university as a whole.

While information literacy assessment is not new, this research adds to the growing body of evidence that describes which factors affect the degree to which both undergraduate and graduate students develop information literacy competencies. We looked at the impact of various types of library instruction (one-shot

and credit-bearing information literacy courses), as well as other factors such as the number of books a student borrowed, majors, and student experiences with writing research papers.

While information literacy has become the language of librarianship, it is not solely the domain or responsibility of librarians to impart (Grafstein, 2002). Therefore, the research team took the approach that all faculty are responsible for imparting information literacy, so we did not primarily seek to evaluate the impact of library instruction on IL skill acquisition. Rather, we investigated the impact of library instruction in concert with other variables that would affect the acquisition of IL skills. Further, in order to meet the AiA program's larger goal of determining the "Value of Academic Libraries" we used IL and book use as two factors (out of many more potential data points) that might contribute to the larger model that affects whether or not a student is retained. Toward that end, the literature review is comprised of studies that discuss what aspects of the post-secondary experience impact student retention, with a focus on the recent studies that have been conducted that connect library use to retention, graduation, and student achievement.

Literature Review

A recent survey of academic library deans reported that over 40% of respondents reported that their libraries support projects specifically addressing student retention. Many of those respondents indicated an interest in further understanding the relationship between their own library and the retention rate at their university (Hubbard & Loos, 2013). While university administrators may look to librarians to support the enrollment and retention of students, and typically institutional priorities and librarians are showing an interest in doing so, there has been little guidance on how librarians can support these initiatives. Therefore, the effective practices librarians employ may often be overlooked by both parties (Lynch et al., 2007; Murray, Ireland, &

Hackathorn, 2016). Accordingly, there is a lack of research to help guide librarians in this effort.

One of the first articles to look at the relationship between retention and college libraries was conducted in 1968. In this article, Kramer and Kramer (1968) looked at the basic relationship between students who checked out books (an effective measure at that time) and the student dropout rate. This study began the conversation about the importance of research on the relationship between libraries and retention when it discovered that 43% of library non-users left the university after their first year, compared with 26% of library users who left after their first year.

In more recent years the research has evolved from looking at the number of books that have been checked out of the library to investigating other measures of library use and impact including GPA, retention, and graduation. While some research on library use and retention has examined various populations including distance education students, graduate students, and students from different ethnic backgrounds, this literature review focuses on undergraduate student retention within on-campus education which, for the purposes of this study, is defined as the majority of the courses within the degree program being taught in an on-campus setting. Retention is defined as ongoing enrollment in the institution (Mezick, 2007). The literature regarding the connection of library use to student retention and graduation rates touches upon a multitude of factors and draws from varied contexts. The range is from detailed and nuanced initiatives to large scale university efforts to retain students and to use the library as a resource to do so.

It has been argued that having librarian-student relationships embedded within a student's education can positively impact retention (Pagowsky & Hammond, 2012). This suggestion has been supported by research that implies that when librarians proactively offer support to students, there is a positive correlation with

retention rates (Hagel, Horn, Owen, & Currie, 2012). This includes offering first year orientation programs and creating strategic partnerships with student support services and faculty (Blackburn, 2010; Grallo, Chalmers, & Baker, 2012; Hagel et al., 2012; Soria, Fransen, & Nackerud, 2013). Further supporting this notion is research suggesting that library expenditures, including the number of library staff, library salaries and staffing, book acquisitions, and library instruction also play a positive role in retention; the higher the expenditure, the higher the retention rate (Emmons & Wilkinson, 2011; Mezick, 2007; Teske, DiCarlo, & Cahoy, 2013).

Research looking at retention and library services from a different angle, library usage, rather than programs designed to be proactive, has also been conducted. The number of items a student borrows and the number of log-ins to workstations, catalogs, databases, and electronic resources have been shown to have a positive correlation with retention. This suggests that students who utilize library resources are more likely to be retained and potentially graduate (Haddow, 2013; Haddow & Joseph, 2010; Soria et al., 2013; Stone & Ramsden, 2013). Along the same lines, research suggests that library usage within the first few weeks of the semester results in a greater chance of retention (Haddow & Joseph, 2010). That being said, the correlation between library expenses per full time equivalent student and both graduation rates and retention is actually stronger in comparison to the correlation between library usage and retention rates (Crawford, 2015). These results indicate that the relationship between expenditures and student success should be explored further.

Interestingly, and expectedly, having a connection to the university and student academic success are suggested to be related to retention rates. The academic and social supports offered by libraries as well as library work-study have been examined and linked with students' connection to the university (Mezick, 2007; Rushing & Poole, 2002; Wilder,

1990). Library use has been positively correlated with academic success in the first semester (Soria et al., 2013). This link was first discovered in 1986 when Hiscock (1986) looked at student use of catalog and reference material and found a link between use of those resources and academic success. Furthermore, library instruction and information literacy skills have been related with student academic success (Bowles-Terry, 2012; Breivik, 1977; Mark & Boruff-Jones, 2003; Mezick, 2007). Instruction on how to use the library for first-time full-time students has become a predictor of academic success in the first two semesters (Gammell, Allen, & Banach, 2012; Mezick, 2007). These findings relate back to the previous statement that much of what the library does that connects to student retention is overlooked as it is only one factor among the myriad factors related to retention, including academic achievement and feelings of connectedness to the university.

Although research on libraries and retention has grown vastly in recent years, few of these studies actually attempt to connect IL with retention. Further, those who do examine library instruction or IL have not assessed IL skills with a large sample using a standardized measure as described in the current study. This research is further strengthened by using longitudinal outcome data, three years after the IL test was administered, in order to obtain a fuller picture of relationships between student success variables, IL skills, and IL instruction.

Methods

During the planning stage of this study, the AiA team investigated various IL tests, both free and fee-based. These tests included Project SAILS (Standardized Assessment of Information Literacy Skills), a validated and commercially available IL test developed at Kent State University (2015), as well as iSkills, a test developed by the Educational Testing Service (ETS) that assesses students on how they evaluate, create, define, synthesize, and use different types of information via scenario-based

problems and tasks (ETS iSkills, n.d.). The costs of these two assessments precluded their use. Therefore, the researchers adapted the Beile Test of Information Literacy for Educators (B-TILED) to be non-subject specific, with Beile O'Neil's permission (Beile O'Neil, 2005). We adapted the test by removing questions that referred to resources that only Education students would use, and replacing those references with more general sources. For example, one question referred to the ERIC database. We changed this question to refer to a multidisciplinary database. Questions on the test that referred to Education topics (e.g., special needs, higher education, Vygotsky) were left unchanged as their presence did not alter the ability of a student in any major to answer the question. The B-TILED is a 22 item test with 13 additional demographic and self-perception items. The test covers four of the five IL standards as articulated by ACRL's Information Literacy Competency Standards for Higher Education (Association of College & Research Libraries [ACRL], 2000), and was originally a part of the Project SAILS initiative. The only standard not assessed is Standard 4, which asks the student to demonstrate that they are able to use information effectively. In Beile O'Neil's own psychometric analysis of the test given to 172 Education students, the instrument demonstrated reasonable validity and reliability. Reliability and validity results on the current sample are reported in the results below.

We utilized several sampling methods in order to receive higher returns on the test. First, all members of the AiA team, who teach in distinctly different disciplines (Geology, Psychology, Education, Physical Education and Sports Sciences, Philosophy, and Health Sciences) administered the test to all the students in all of their classes (two classes per faculty member). Students were offered extra credit for participation, which resulted in a 95% participation rate. While these cluster samples were not random, they did reduce the problematic bias that comes when tests are completed only by students who are inclined to answer surveys, and who are often good

students. The second sampling strategy involved asking the administrators of each school at the University if they would send the survey to their faculty in order to be administered to entire classes (and therefore use cluster sampling strategy). The School of Health Sciences agreed with several faculty participating, resulting in a participation rate of about 90%. These students also received extra credit. The School of Education agreed to send the survey to all Education students directly instead of through faculty/classes. Out of 1,250 Education students (graduate and undergraduate) 123 completed the survey (a 10% response rate). These students were offered a chance to win a \$100 gift card. Data collection took place over the Spring and Fall semesters of 2013. These methods are also reported in Ackermann (2016).

In addition to assessing IL skills, the questionnaire also asked about experiences with research papers, types of library instruction received, and whether the researchers could look up other outcome data and the number of books taken out at a later date. Three hundred and three participants provided us with their student identification numbers and consent. At the end of the Fall 2015 semester the University's Institutional Research Office provided the researchers with one year retention data, four, five, and six year graduation data, as well as the GPA for each participant. Data were collected using Qualtrix survey software. Because the test is somewhat lengthy, there were concerns about whether students were rushing through the test and answering questions randomly just to get extra credit. Since Qualtrix times how long it takes each respondent to complete a survey, we used this information to remove students from the sample who took less than five minutes to complete the test.

Data Analysis

After descriptive statistics were computed, treatment and control groups were created to determine if there were significant differences

between students who received some type of library instruction and those who did not. An ANCOVA was run on the data using SPSS version 21. We also examined the impact of the additional variables listed above using Post hoc analyses. Regression analyses were also run to determine which factors contributed to the IL scores, and which factors contributed to retention, graduation, and student GPA.

Results

Participants

The IL test was completed by 456 students, though 32 of these tests were unusable as they were incomplete or had been completed too quickly to be valid. Participation was evenly distributed among different class ranks except for freshman ($n = 44$). The IL test was taken by 85 sophomores, 100 juniors, 103 seniors, and 124 graduate students, sixteen of whom were doctoral students. English language learners comprised 11% of respondents, and responded "yes" when asked if they communicate better in another language. Most of the participants were female ($n = 326$), while 29 % were male.

Reliability of the Adapted B-TILED

The test demonstrated adequate reliability of a Cronbach's alpha of 0.647. Beile O'Neil's analysis (2005) revealed a similar value using Kuder-Richardson 0.675. Since reliability is a measure of how consistently participants will perform on a test, the reliability coefficient demonstrates how consistently an instrument measures a construct. Reliability, however, is not to be confused with validity, as a test can be valid but not reliable, and vice versa. Generally, the value of a coefficient can be interpreted as follows: .5 or below is considered unacceptable, .65-.8 is the minimum acceptable value, and .9 or above is considered excellent, although some methodologist may employ other parameters to gauge reliability.

Instruction

Of all of the respondents, 65 had taken Library 001, a single credit information literacy course, while 260 students had at least one experience with "one-shot" library instruction. A total of 274 (60%) students had some kind of library instruction, either the credit bearing course or the "one-shot" or both, during their post-secondary education. The cut score (passing score), according to Beile O'Neil (2005) is 55%, which allows for a lot of error. Using this cut score, the results revealed that nearly half of the participants ($n = 229$) passed the test. The mean score was 53.91, the standard deviation was 16.12, and the range of scores was 13.04 to 95.66.

A one-way Analysis of Variance test did not reveal any significant differences between students who had received any type of instruction and those who had none, $F(1, 452) = .124, p = .725$. Students who had no instruction had a mean score of 54.21, while students who had instruction had a mean score of 53.67. However, students who had instruction had higher mean scores if they had been assigned research papers over eight pages long at some point during their post-secondary education. Mean scores for students assigned research papers were 62 for students who had instruction, and 59 for those who had never had library instruction. Additionally, IL scores go up steadily as the page count increases in papers written (e.g., 1-5, 6-8, and 8-15 pages). See Figure 1.

To further analyze the factors that contributed to passing the IL test, a logistic regression was employed in which two groups were created: students who passed the IL test and those who did not. The variables input into the model were number of books borrowed, experiences with research papers, number of papers written, type of library instruction, major, and class rank. Only two of the variables significantly contributed to passing the IL test: books

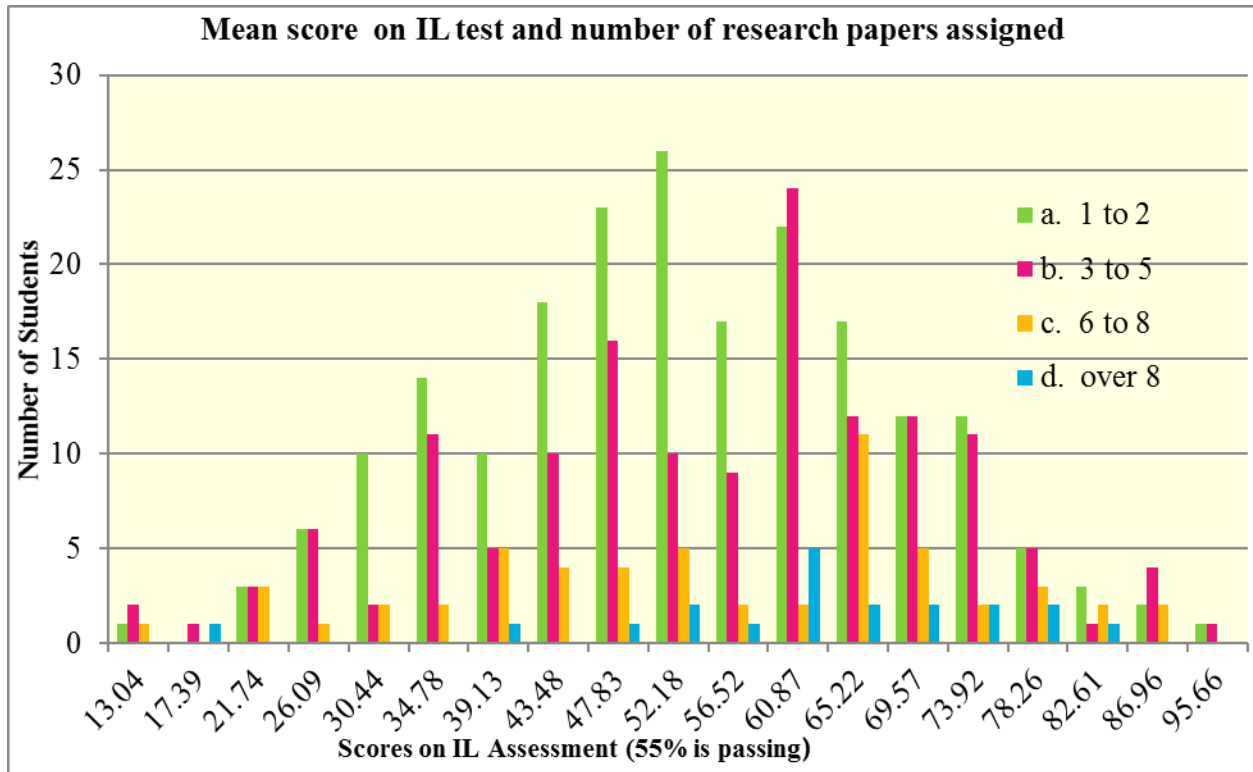


Figure 1
Mean score on IL test and the number of research papers assigned.

borrowed and experiences with research papers (chi square = 15.245, $p < .05$, with $df = 4$). These two variables explained between 3.6% and 4.8% of the variance in the model.

Majors

Participants from 13 majors took the tests, although most were in Education ($n = 149$) or the Health Sciences ($n = 153$). See Figure 2. There were differences in IL scores between majors, however, the sample sizes for each major were too diverse to run an ANOVA. When looking at IL scores as delineated by major, students who had instruction got higher mean scores on the test (except Business, History, Philosophy, and Science, which had smaller samples of students). Psychology students demonstrated a three-point difference between those who had instruction and those who did not, while Sports Science majors demonstrated a six-point difference. The average score for Education majors was 55.9,

and for Health Science majors the average score was 53.9. Although there were not enough participants in each major to make a fair or reliable comparison between disciplines, the highest average scores of 68.8 were achieved by Philosophy majors who had no instruction ($n = 6$). It is difficult to draw conclusions about the relationship between majors and IL scores based on these results as participants were students of a variety of professors in each of the disciplines.

Graduate Scores vs Undergraduate Scores

Graduate students scored significantly higher than undergraduate students on the IL test $p < .0001$ [$F(1,292) = 21.44$], with a mean score of 62 for graduate students as compared to a mean score of 52 for undergraduates. It is important to note, however, that the group sizes were not equivalent as there were 232 undergraduates and only 62 graduates. Graduate students and undergraduate students wrote the same

proportion of papers consisting of six pages in length, while 50% of papers written by both graduate students and undergraduate students were longer than six pages. When breaking down the number of students in each class standing who wrote papers longer than six pages, unexpected results emerge: 68% of freshmen report writing papers longer than 6 pages, followed by 55% of sophomores, 50% of graduate students, and 43% of both juniors and seniors. Although IL scores increased as the number of pages assigned increased, graduate students (who were assigned longer papers less frequently than freshmen) scored significantly higher on the IL test than undergraduates.

Retention, Graduation, and GPA

Out of the 455 students who took the IL test, 328 gave the researchers permission to look up their outcome data (retention, graduation, and GPA) in the future from the Institutional Research office. In this study we excluded graduate students from the examination of retention and graduation. Because graduate students have, by definition, already graduated with a degree, the inclusion of this population muddies the data. Further, because almost all retention studies focus on undergraduate students exclusively, we sought to also focus on this group of students. For those students retained, but not graduated, it was assumed that they were not yet eligible for graduation, and a category of "retained" was created. If a student was not retained, they too, were not eligible for graduation. This resulted in the examination of 294 cases for this part of the analysis. In order to avoid attributing dual statuses to students (not retained and not graduated) and confounding the data, we created one category named "retained or graduated." From this category we were able to define student success broadly. With the exception of the IL scores and GPA, all variables were categorical.

GPA

An ANOVA was employed to determine whether there were differences in GPA between those who had library instruction and those who did not. No significant differences were found. However, an initial correlational analysis revealed that IL score and GPA were moderately significantly correlated ($r = 0.392$, $p < 0.01$).

Retention and Graduation

Since the categories of being "retained or graduated" and "retained" (yes/no) were categorized as binomial variables, a logistic regression was run to determine whether the number of books borrowed, instruction (yes/no), IL score, passing/failing the IL test, whether students wrote research papers that required library resources, or wrote research papers of varying lengths (under 5, 5-8, and 9-15 pages) predicted either of these outcome variables. A separate logistic regression was run for each of the dependent variables. It is important to note that the term "predicted" is associated with the use of regression tests. The use of this term does not indicate that there is a causal relationship between two variables.

For the outcome variable graduated or retained, 294 cases were analyzed. Passing the IL test, and writing research papers predicted whether or not a student was graduated or retained (chi-square = 4.324, $p < .05$ $df = 1$). These two variables contributed to 1.5%-2.1% of the variance, which indicates that they contribute positively, but on a small scale, to the outcome variable graduation and retention.

For the test that analyzed undergraduates who had been retained, but not yet graduated, all variables were again input into the model. One hundred and thirty-eight cases were analyzed. Writing a research paper under five pages long or between five and eight pages significantly predicted retention (chi-square = 18.613, $p < .05$ $df = 7$), explaining 13% to 17% of the variance. These results reveal that writing papers

moderately contributes to student retention. It is possible that other variables not included in these tests interact with the act of writing papers and how it influences retention.

Discussion

The IL test assessed the information literacy skills of 424 students. In addition to information literacy scores, the researchers also collected data on book use, experiences writing research papers, GPA, retention, and graduation (for a portion of the sample). The data analysis revealed that while library instruction did not significantly impact competency at information literacy skills, experiences with research papers requiring library resources and use of the library's book collection contributed significantly to a student's IL test score. Further, information literacy and writing research papers contributes significantly to retention, graduation, and GPA. The results of our project indicate that library instruction (whether one-shot or credit bearing) should be coupled with meaningful assignments requiring sustained engagement with library resources. Additionally, the value of writing research papers with respect to student success is one that should be examined further given the results of this research. In this study information literacy scores went up as the number of pages a student was assigned to write increased. While some disciplines lend themselves to research papers requiring library resources more so than others, written communication skills are essential to career readiness and should be an integral part of a student's college education.

Limitations

Other studies noted in the literature review investigated library use beyond book circulation, to include database use, card swipe data to indicate use of the physical space, and other indicators. Although these data are not available at the authors' institution, they would have added another layer of information to explain our results. We hypothesized that

perhaps it is more use of the library itself rather than book borrowing that predicts IL skills, although book checkouts do provide a small window into library user behaviour. Additionally, as information literacy is often integrated in some way into the curriculum of most disciplines, it is difficult to ascertain whether library instruction really makes a difference in student acquisition of these skills. When designing this study, the AiA team discussed how some disciplines approach information literacy skills more explicitly than others, and therefore the results of this study might be skewed in favour of the social sciences. Although the assessment we used was a standardized instrument, the limited nature of a multiple choice test for measuring IL competency prohibits us from drawing strong inferences about the relationship between a student's IL score and their actual IL competency or the other outcome variables, particularly because the IL test does not assess the ability to use information effectively. Although GPA and IL scores were positively correlated, it is reasonable to conclude that students who do well academically would also do well on an IL test regardless of library or writing experiences. It is very possible that there are other confounding factors that we did not include in these analyses that contribute to student success.

Implications for Future Research

As noted earlier, in planning this study, the researchers investigated the merits of several IL tests. A small grant was obtained by the primary author to purchase 40 licenses of the iSkills test, which is useful for assessing career readiness and work place/real life information literacy skills, however the iSkills assessment will be discontinued as of December 31st 2016. Other means of evaluating information literacy in different disciplines should also be considered. With the incorporation of the ACRL Framework into the way librarians teach and assess information literacy, it is necessary to conduct future studies with the language and concepts

provided in the Framework. Additionally, while post-secondary institutions are increasingly developing models to ascertain the characteristics of both the student and the school environment that contribute to student retention, library researchers must continue to assess the value of library services, space, and instruction with respect to the impact on retention and graduation. In this way, academic libraries can fully articulate one of the many ways that they serve the larger institution. Further, our literature review indicates that institution and library expenditure is related to academic success. This phenomenon should be examined more broadly in order to explain the mechanisms at work as well as the related factors that contribute to student success.

Conclusion

On post-secondary campuses, assessment may often be met with wariness or timidity, however, inquiries that will provide investigators with data with which to make improvements to instruction and policy can only benefit stakeholders, and students in particular. Additionally, these results have implications for the value of assigning research projects and for instructional design when it comes to library instruction. The results make the case for project-based instruction, particularly in “one-shot” library classes, so that students may experience sustained engagement with research resources and have opportunities to integrate these sources into research projects. This research adds to the growing body of literature that highlights academic libraries as contributors to student retention.

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