Evidence Based Library and Information Practice

Research Article

Assessing the Impact of an Information Literacy Course on Students' Academic Achievement: A Mixed-Methods Study

Wilma L. Jones
Professor and Reference/Instruction Librarian
College of Staten Island
City University of New York
Staten Island, New York, United States of America
Email: wilma.jones@csi.cuny.edu

Tara Mastrorilli
Director of Institutional Research
College of Staten Island
City University of New York
Staten Island, New York, United States of America
Email: tara.mastrorilli@csi.cuny.edu

Received: 14 Dec. 2021 **Accepted**: 14 Mar. 2022

DOI: 10.18438/eblip30090

Abstract

Objective – The aim of this study is to demonstrate the impact of a stand-alone, credit-bearing information literacy course on retention and GPA for students at an open access urban college.

Methods – Researchers conducted a mixed-methods study with a two-part focus. The first examined the impact of a credit-bearing course using propensity score matching (PSM) techniques to compare academic outcomes for students who participated in the course versus outcomes for similar students who did not enroll in the course. Multiple regression analyses were conducted to measure impact on GPA and performance in 100-level introductory English general

education courses. Logistic regression analysis was used to determine persistence one year after enrolling in the course. The second part utilized a questionnaire to survey students of this targeted group to determine impact of the course on their information-seeking behaviour in subsequent academic courses and for non-academic purposes.

Results – The quantitative analyses showed: (a) a higher GPA, though slight, for students who have taken the course over the matched comparison group; (b) an increase in persistence for students who have taken the course over the matched comparison group after one year of taking the course; but (c) lower performance in 100-level introductory English courses by students who have taken the course in contrast to the matched comparison group. Qualitative data provided through the questionnaire revealed positive and substantive reflective statements that support learning outcomes of the course.

Conclusion – The findings in this study underscored the importance of a stand-alone, credit-bearing information literacy course for undergraduate students, particularly for first-generation students attending an open access urban institution. The findings also demonstrate the academic library's contribution to institutional retention efforts in support of students' academic success.

Introduction

For the past two decades, academic librarians have had to ensure that students, most of whom are digital natives, acquire information literacy (IL) skills to be able to find and critically sift through the appropriate materials for their research. Moreover, the tenets of IL enable college students to distinguish between scholarly, non-scholarly, or misinformation resources (e.g., fake news, alternate facts). Academic librarians in the U.S. and around the world have continued to revamp and develop innovative methods for delivering IL sessions using current and emerging technologies (Burkhardt, 2016; Diep & Nahl, 2011; Inuwa & Abrizah, 2018; Mackey & Jacobson, 2010; McDevitt, 2011; Polger & Sheidlower, 2017; Swanson & Jagman, 2015). Instruction librarians at the College of Staten Island (CSI), an open access urban public institution, have also experienced similar challenges in teaching students how to access and retrieve the most appropriate information for their assignments and research papers, and assessing how students have applied the knowledge gained from library instruction sessions. The first-year students entering our open access institution are primarily first-generation college students, many of whom need to learn basic library skills to find research resources and how to critically evaluate sources to use in their term papers or assignments. We, librarians, continue to contemplate, grapple with, and develop effective methods of instruction to engage our unique population of students in providing them with the means to conduct academic-level research. These endeavors by academic libraries are rarely counted as contributions towards the collective institutional retention efforts unless quantitative evidence is provided.

Among the new modes of instruction that CSI librarians have explored and implemented are: one-shot sessions tailored to faculty requests, 50-minute workshops for co-curricular credits specifically designed for first-year students, online tutorials with interactive videos and mini quizzes attached, and course-embedded library instruction. However, none of these new modes of instruction have been more satisfying to students than the one-credit IL course, LIB102: Beyond Google: Research for College Success, which was developed in 2014. It became apparent to us that long-term instruction, rather than short-term instruction, provided our students with multiple opportunities to become familiar, in depth, with library resources and IL concepts. These multiple interactions enabled students to see how we, as librarians,

could really be more of a resource to them. Assessment of this course, after one year of instruction, was done using a 5-item, post-evaluation questionnaire in every section taught, and it revealed only positive comments from students. Moreover, feedback from students who self-identified as having 60+ credits had two common comments in the open-ended section: (i) they wished they had taken this course when they were first-year students, and (ii) they suggested that this course be made mandatory for all first-year students. The above feedback and many other insightful comments were found to be a rewarding source that validated the library's worth in terms of contributing positively to students' experiences at CSI.

These preliminary observations were the impetus for this study, and the authors of this study set out to obtain quantitative and qualitative evidence that objectively supported the anecdotal feedback. The authors wanted to find out whether there was a quantifiable association in persistence of students who had enrolled in the stand-alone IL course. A secondary focus sought to examine the information-seeking behaviour of these students to see whether knowledge gained from LIB102: Beyond Google was ever utilized in other classes or for non-academic purposes. While the library offers many opportunities for student success, attempts to measure its impact on student learning, one that ultimately contributes to institutional goals, are lacking in the library literature as noted by Oakleaf (2015), Oliveira (2018), and Pierard and Graves (2007). As such, the result of this study adds to the small but growing literature of the academic library's impact on student academic success and institutional retention efforts.

Background about the LIB102 Course

The creation of a one-credit course, LIB102: Beyond Google: Research for College Success (which from here on will be referred to as LIB102), emerged as an opportunity to develop a course to address critical thinking and IL skills for first-year students. The course aimed to introduce students to the concept of strategic exploration of a research topic, in particular learning how to match information needs to appropriate sources. Course goals were to teach students search techniques to efficiently retrieve reliable sources. The course discussed research-based vs. fake news, citation styles, and how to avoid plagiarism. In its design, LIB102 provided valuable research techniques to enable students to move beyond the incessant use of Google to complete their assignments and to become efficient in utilizing a variety of library research resources as required by their instructors (e.g., peer-reviewed journals, reputable newspapers, as well as some verifiable digital sources). Course topics included distinguishing types of publications within the online discovery tool, basic and advanced searching skills (i.e., Boolean operators, truncation, wildcards), as well as effective Internet search strategies. Embedded in the course design were online interactive tutorials, group work activities, discussion forums, a pre- and post-test, and weekly self-assessment quizzes to evaluate learning throughout the course.

Learning outcomes of the course enabled students to have hands-on experiences in a computer lab while learning about identifying, retrieving, and evaluating the appropriate research materials, as prescribed at the time by the *Information Literacy Competency Standards for Higher Education* (Association of College and Research Libraries [ACRL], 2000). These were fundamental skills that could be applied to any research assignment in other classes. However, the *Framework for Information Literacy for Higher Education* (ACRL, 2016) replaced the *Standards*, which was timely for us as we were revising the final design of the course for adoption into the college catalog. The learning outcomes for LIB102 were slightly modified to embrace the threshold concepts of the new standards, the *Framework*, and included weekly assessment of the continuous process of research. In addition to identifying, retrieving, and evaluating materials, learning outcomes enabled students to develop and refine an academic research topic or question, understand the concept of authority, and be able to think critically about information and communication media. LIB102

was designed as a seven-and-a-half week course, and fittingly, the end of the first seven-and-a-half week course coincided with mid-term assessments, and the second session coincided with final examinations.

This design, we envisioned, would complement the gateway writing courses of ENG111 and ENG151 to enable first-year students who were enrolled in them to prepare for first outlines/drafts of research papers due at midterms or to complete their research papers due at finals. ENG111 and ENG151 are required courses in the general education curriculum and are named Introduction to College Writing and College Writing, respectively. In the undergraduate catalog, ENG151 includes in its description "attention to reading, library skills, and research methods." LIB102 strives to reinforce all three items, including swapping out "attention to reading" for "critical thinking."

Institutional Setting

The CSI Library is situated in an urban comprehensive college, one of 25 colleges that make up the open access City University of New York. At present, CSI has an enrollment of close to 13,000 students primarily consisting of first-time, first-generation college students. Located on Staten Island, the college carries the distinctive honor of being the only public institution among four other institutions of higher learning in the borough. Seventy percent of current students at CSI are residents of Staten Island (CSI, Office of Institutional Research, 2020), which has a population of 474,893 (U.S. Census Bureau, 2019). Since the establishment of a residential hall in 2014, the diversity of the student body has broadened. In Fall 2020, data from the Office of Institutional Research presented the profile of the students as: 0.1% American Indian or Alaskan Native, 11% Asian, 13.5% Black or African American, 25% Hispanic, 45.3% White, and 5% Other. In 2020, first-time, first-generation students were 47% of the student body. Also, in 2019, the college became a Hispanic-Serving Institution (HSI) when self-reported data from Hispanic students reached a minimum of 25%, full-time equivalent.

Consistent with the mission of the college, the CSI Library strives to play its role in assisting students, who are primarily first-generation students, in becoming information competent, critical thinkers, and life-long learners through traditional and virtual IL sessions.

Literature Review

Over the past 20 years, there has been a pointed focus on the academic library's impact on students' academic success and retention as a result of accrediting bodies of higher education institutions seeking such evidence, i.e., evidence demonstrating the academic library's contribution towards institutional priorities of learning outcomes (Britto & Kinsley, 2018; Oakleaf, 2010). IL instruction that is embedded in other courses have garnered much success, yet only few studies in the library literature have captured empirical evidence of its contribution towards student's academic performance and success (Black & Murphy, 2017; Hauck, 2017; Inuwa & Abrizah, 2018; Luetkenhaus et al., 2015; Tumbleson et al., 2019). There are several publications describing the positive relationship between students' use of library resources and services and their impact on higher GPA and retention (Bowles-Terry, 2012; Cook, 2014; Haddow 2013; Pierard & Graves, 2007; Rysavy et al., 2017; Soria et al., 2013; Soria et al., 2014); however, the following are the very few that discuss the impact of a credit-bearing course on students' academic achievement and retention.

Since our study proposed the utilization of propensity score matching (PSM) techniques to compare outcomes of students who had taken an IL course versus those who had not, we searched for studies that had used PSM. We found two studies, one by Soria et al. (2017) and another by Chiteng Kot and Jones

(2015), that had utilized PSM to examine outcomes of library resources and services as it related to student achievement and retention. Soria et al. (2017) explored "the impact of library resources on college students' longitudinal outcomes as related to their graduation or continued enrollment after four years of study" (p. 813). They used quasi-experimental procedures (PSM techniques) to construct control (non-library users) and treatment (library users) groups, they found that "using the library at least one time in the first year of enrollment significantly increased the odds that students would graduate in four years or remain enrolled after four years as opposed to withdrawing from the University'' (p. 819). Chiteng Kot and Jones (2015) also used PSM to conduct a study on three cohorts of first-time, full-time undergraduate students at a large, metropolitan, public research university that provided evidence that the library had an impact on academic performance. Their study revealed that first-term GPA, with regard to students' use of one of three library resources (workstations, study rooms, and research clinics), was associated with a higher first-term GPA, though small.

Only a handful of studies have reported on the contributions of a stand-alone IL course and its impact on students' academic performance that we found relevant to this study. The study conducted by Daugherty and Russo (2011) found that "students who took a library course understood the usefulness of what they had learned as evidenced by their continued use of both the skills and resources taught in the course" (p. 321). Heady et al. (2018) conducted a 20-year longitudinal study examining records of students who had taken an IL course to determine the impact of the course over time. Results of their study were mixed as first-time, full-time students "who did not take the library course had higher graduation rates" (p. 646), versus slightly higher GPA—"roughly 0.1 point"—for those who took the course (p. 647). The study by Mayer and Bowles-Terry (2013) explored how students performed in an upper-level IL course and found them to be more engaged when there was a class theme. The study by Lwoga (2014), though focused on the impact of an IL course, was centered around undergraduate students in a Health Sciences program. Lwoga reported that not only did students continue "to use online searching techniques for their academic assignments eleven months after training" (p. 10), they utilized these search skills in their personal lives, and "the IL module plays an important role in supporting lifelong learning" (p. 11).

Our study is unique in the following two ways: 1) it compares retention and GPA outcomes of students who have taken a library course with those who have not, utilizing propensity score matching techniques; and 2) it explores how students have applied the skills learned in the information literacy course to other research activities, academic and non-academic, via a qualitative survey.

Aim

This study sought to obtain quantitative and qualitative evidence to demonstrate the impact of the LIB102 course on undergraduate student performance throughout their time in college. In particular, the authors examined how this course contributes to student academic success or retention, in support of institutional goals. The following questions guided this study:

- How does the cumulative grade point average (GPA) of students who took LIB102 compare to those in a matched comparison group?
- How do students who took LIB102 perform in mandatory 100-level English general education courses (i.e., ENG111 and ENG151) compared to those in a matched comparison group?
- How do one-year persistence rates of students who took LIB102 compare to students in a matched comparison group?
- How have students who took LIB102 applied the knowledge gained in subsequent academic courses or outside the classroom, and how does this compare to a matched comparison group?

Methods

To determine the impact of the LIB102 course, it was important to compare outcomes for students who participated in the course to outcomes for students who did not enroll in the course. Therefore, a match comparison group was devised using propensity score matching (PSM). Initially introduced by Rosenbaum and Rubin (1983), PSM is a statistical method used to match treated and control subjects using a set of baseline characteristics. For our study, our treated subjects were students who enrolled in LIB102. The control subjects were those who did not and will be referred to as the "matched comparison group" from here on. Baseline characteristics used for matching included: gender, race/ethnicity, Tuition Assistance Program (TAP) or Pell Grant status, degree level, class level, age, and college admissions average (CAA), i.e. CUNY's equivalence for high school average.

The PSM routine was run separately for 10 cohorts of students, from Fall 2014 to Spring 2019. Descriptive statistics were calculated, including frequencies, means, and standard deviations on the demographic, enrollment, and survey data. Multiple regression analyses were conducted to measure the impact of the LIB102 course on student outcomes, specifically cumulative grade point average (GPA) and performance in introductory 100-level English gateway courses, ENG111 and ENG151. Logistic regression measured the impact of the course on one-year persistence. To reduce threats to the study's internal validity, potential confounding factors or covariates that have a relationship with the program or outcome are included in each regression model. Covariates included gender, race/ethnicity, TAP or Pell Grant status, age, degree sought, class status, CAA, and cumulative GPA. Continuous covariates were grade mean centered.

A questionnaire assessed learning outcomes from LIB102 as well as knowledge applied from LIB102 to subsequent academic courses or outside the classroom. The survey instrument was adapted from two similar studies on information seeking behaviours of undergraduate students (Daugherty & Russo, 2011; Lwoga, 2014). It consisted of 23 questions, including four open-ended questions to allow for qualitative reflective statements. The first section asked participants to provide basic demographic information such as class level, major, and other background information (nine questions). The second section consisted of six questions that examined how students applied IL skills in classes other than LIB102. The third section included five questions that sought to find out whether participants used IL skills outside of the academic environment, with questions that spoke to applying lifelong learning skills. The last section included three general questions: two open-ended questions about the course, and the third, which was optional, asked participants to provide contact information to enter a drawing for one of eight $50 Amazon.com gift cards. The questionnaire is included in Appendix A.

Data Collection and Instrumentation

In compliance with CSI's Institutional Review Board (IRB) protocol, and in collaboration with the Office of Institutional Research, the researchers accessed transcripts of students who had participated in LIB102 and an equivalent number who had not participated. Transcript information included student demographic and academic performance data as well as student email addresses. Information on students' prior achievement, as measured by their CAA was also retrieved. These data were used as a resource for the PSM criteria as well as the outcome data around performance. The academic performance data used for outcome analyses included students' cumulative GPA at the end of the semester in which the student took LIB102 and 100-level English grades (if taken during or after LIB102). Retention and graduation data were retrieved one year after participating in the LIB102 course. The retention and graduation data were combined to calculate a persistence rate.

The survey was administered using SurveyMonkey, an online tool, to survey students enrolled in Fall 2019. The survey was emailed to those who had participated in LIB102 and those targeted in the matched comparison group. Interested participants were then directed to a web link where they anonymously filled out the survey. It remained open for six weeks and reminders were sent out four times after the initial deployment in an effort to receive a 15% confidence level of response.

Demographics of Students Who Have Taken LIB102: Beyond Google

Across 10 semesters, Fall 2014 through Spring 2019, LIB102 had enrolled a total of 675 students. More than half (59%) of the students were female, 56% were students of color, and the average age of participating students was 21. Although the course was designed for first-year students, 31% of those enrolled were juniors or seniors. With a cap of 20 students per section, on average, 14.4 students persisted in each section. At the time of enrollment into the study, 57% of the participating students were pursuing a bachelor's degree and the remaining students were pursuing an associate's degree (43%). The average CAA score for this group of 675 students was 79.0.

Multiple regression analyses were conducted using SPSS to measure the impact of the LIB102 course on student outcomes, specifically cumulative GPA and performance in ENG111 and ENG151. Table 1 presents the outcomes of students who took LIB102. Of the 675 students who took the course, 147 of them who were enrolled in ENG111 (Introduction to College Writing) at the same time or after taking LIB102 were found to have a mean GPA of 2.63 (1.30 *sd*).

Table 1
LIB102: Beyond Google Course Student Outcomes

	N	Value
Mean ENG111 GPA (SD)	147	2.63 (1.30)
Mean ENG151 GPA (SD)	162	2.84 (1.22)
Overall Mean GPA (SD)	675	2.63 (0.83)
One-Year Retention (%)	675	53.9

A slightly higher mean GPA of 2.84 (1.22 *sd*) was found in 162 students who were taking ENG151 (College Writing) while being enrolled or after enrolling in LIB102. The overall mean GPA of all 675 students who took LIB102 was 2.63 (0.83 *sd*). Logistic regression was used to measure the impact of LIB102 on the retention of students one year after enrolling in the course. Slightly more than half (54%) of students who took LIB102 were retained or graduated after one year of taking the course. The most recent CSI first-time, full-time freshmen retention rate is 59.5%.

The Matched Comparison Sample

Students in the LIB102 course from Fall 2014 semester to Spring 2019 were matched to the students who did not participate in the course using PSM. Separate PSMs were conducted for each LIB102 cohort. Table 2 follows with the demographic profile of the analysis sample of 458 students in each sample group used for this study. The difference between LIB102 enrollment and the LIB102 analysis sample is the result of missing data in the matching criteria used as well as the attempt to produce highly accurate matches in the PSM model. To determine if the students in the match comparison groups are similar to students in the LIB102 group, statistical significance testing was conducted by cohort of the analysis sample.

Table 2
Demographic Profile of Overall Analysis Sample for the Study by Group

	LIB102 Analysis Sample (N=458)	Matched Comparison Group (N=458)
Female (%)	62.0	62.7
American Indian or Alaska Native (%)	0.0	0.0
Asian or Pacific Islander (%)	13.8	13.8
Black (%)	23.4	17.2
Hispanic (%)	19.4	19.4
White (%)	43.4	49.1
Received TAP or Pell (%)	58.3	59.0
Associate (%)	44.1	37.8
Bachelor (%)	55.9	58.5
Freshmen (%)	48.7	30.8
Sophomore (%)	24.2	31.0
Junior (%)	8.3	22.5
Senior (%)	18.8	15.7
Mean Age	20.8	24.9
Mean College Admissions Average	78.7	77.7

Table 3 presents the outcomes of the overall analysis sample by group. Of the 458 students in the analysis sample, only 105 of them were enrolled in ENG111 during or after taking LIB102 and they were found to have a mean GPA of 2.62. Similarly, 67 students in the matched comparison group who had enrolled in ENG111 were found to have a mean GPA of 2.57.

Table 3
Student Outcomes of Overall Analysis Sample by Group

	LIB102 Analysis Sample		Matched Comparison Group	
	N	Value	N	Value
Mean ENG111 GPA (SD)	105	2.62 (1.26)	67	2.57 (1.38)
Mean ENG151 GPA (SD)	124	2.85 (1.23)	89	2.99 (0.96)
Mean GPA (SD)	458	2.59 (0.83)	458	2.63 (0.90)
One-Year Persistence (%)	458	59.2	458	53.1

Of the 458 students in the analysis sample, there were only 124 students who had taken ENG151 during or after enrolling in LIB102 and they had a mean GPA of 2.85. Likewise, 89 students in the matched comparison group were found to have a mean GPA score of 2.99. Overall, the LIB102 analysis sample had a mean GPA score of 2.59 versus 2.63 for the matched comparison group. The one-year persistence rate for the LIB102 analysis sample was 59.2% versus the 53.1% for the matched comparison group.

Although the PSM resulted in highly similar matched comparison groups, there was no way to identify whether students in the matched comparison groups received instruction similar to that provided in the LIB102 course. As a result, there may be students in the matched comparison groups that received similar instruction (e.g., one-shot library instruction sessions in a 100-level psychology course, or similar

introductory instruction when students attended another college). We are cautious that this could have potentially influenced the outcome results.

Demographics of Survey Participants

The survey was sent to 212 students who were in the LIB102 analysis sample and 143 students in the match comparison group. Table 4 displays the results of students who participated in the survey. Of the LIB102 students who received the survey, 20.2% responded, and 12.6% of the match comparison group students responded. Given these low response rates, we were cautious when analyzing and interpreting the results.

The majority of respondents in the LIB102 group were juniors and seniors, 60.5% of them having earned 61–124+ credits, and the remainder was almost an even split with 20.9% having 60 or less credits, and 18.6% were graduate students. Likewise, the majority of respondents in the matched comparison group were seniors and graduate students, 61.1% of them having earned 91–124+ credits, while 27.8% had 61–90 credits, and 11.2% had 60 credits or less. Of the respondents in the LIB102 group, 97.6% were non-transfer students vs. 44.4% in the matched comparison group. Of the LIB102 group, one-quarter of the respondents were male (23.8%), unlike the matched comparison group where one-third were male (33.3%). With regard to ethnicity, the two groups were very different; only 14.3% of the LIB102 group were White, whereas more than half (55%) of the respondents in the matched comparison group were White. Of note, 50% of the respondents in the LIB102 group checked the box for being the "first in their family to attend college" versus 33.3% of the matched comparison group. In both groups, Social Sciences majors held the highest percentage—65.2% in the LIB102 group and 39.0% in the matched comparison group. Lastly, 38.9% of the LIB102 students were also part of a learning community program (i.e., Accelerated Studies in Associate Programs (ASAP), Black Male Initiative (BMI), and the Perry Ellis Sutton SEEK Program (SEEK)), whereas only 5.6% of the matched comparison group reported that they had been part of a learning community.

Table 4
Profile of Respondents Who Participated in the Survey

	LIB102 Students N=42	Matched Comparison Group N=18
Female	32 (76.2%)	12 (66.7%)
American Indian or Alaska Native	0	0
Asian or Asian American	9 (21.4%)	1 (5.6%)
Black or African American	9 (21.4%)	3 (16.7%)
Hispanic or Latino	13 (31.0%)	1 (5.6%)
White or Caucasian	6 (14.3%)	10 (55.6%)
Two or More Races	3 (7.1%)	0
Prefer not to disclose	2 (4.8%)	3 (16.7%)
0–30 credits	1 (2.3%)	1 (5.6%)
31–60 credits	8 (18.6%)	1 (5.6%)
61–90 credits	14 (32.6%)	5 (27.8%)
91–124+ credits	12 (27.9%)	9 (50.0%)
Graduate student	8 (18.6%)	2 (11.1%)
Non-transfer student	41 (97.6%)	8 (44.4%)
Major:		
Humanities	10 (21.8%)	6 (33.3%)
Science & Technology	4 (8.7%)	5 (27.8%)
Social Sciences	30 (65.2%)	7 (38.9%)
Undeclared	2 (4.3%)	0
First generation to attend college	21 (50.0%)	6 (33.3%)
Students in a learning community	16 (38.9%)	1 (5.6%)

Results

In this section, researchers first report on the findings from the multiple regression and logistic regression analyses to show evidence of the impact of LIB102 on students' academic achievements. Following this, researchers report on the survey results from the same targeted group of students who were currently enrolled at the time of this study.

Impact Findings Using PSM

Multiple regression analyses were conducted using SPSS to measure the impact of the LIB102 course on students' cumulative grade point average (GPA) and performance in 100-level English courses, after controlling for student demographics (i.e., gender, race/ethnicity, TAP or Pell status, age, degree sought, and class level) and previous achievement (i.e., college admissions average). This was done in pursuit of guiding question #1: *How does the cumulative GPA of students who took LIB102 compare to those in a matched comparison group?* Table 5 displays the results of the multiple regression analysis on 916 students' cumulative GPA. LIB102 students' cumulative GPA represents their GPA at the end of the semester in which they took the LIB102 course.

Table 5
Cumulative Grade Point Average Multiple Regression Results (N=916)

	B	B SE
Constant	2.67**	0.07
Female	0.25**	0.05
Black[a]	-0.19*	0.07
Hispanic[a]	-0.21*	0.07
Received TAP or Pell	0.09	0.05
Associate[b]	-0.38**	0.07
Freshman[c]	-0.15	0.08
Sophomore[c]	-0.28	0.07
Age	0.02**	0.01
College Admissions Average	0.02**	0.00
Group	0.08	0.06
R^2	0.21	
F	23.6**	

[a] The comparison group included White or Asian.
[b] The comparison group included bachelor or other degree-seeking students.
[c] The comparison group included juniors or seniors.
* $p < .05$, ** $p < .001$.

The GPA for the matched comparison group represents their GPA in the same semester of their matched LIB102 student. The results indicate that, after controlling for differences in demographics and previous achievement, the students who took the LIB102 course had a 0.08 higher cumulative GPA than the matched comparison group. This difference, however, was not statistically significant. Factors that did have a significant relationship with cumulative GPA include: gender, race/ethnicity, degree level, age, and CAA.

Table 6 displays the results of the multiple regression analysis on 172 students' performance in their ENG111 course and 213 students' performance in their ENG151 course. We conducted this multiple regression analysis in pursuit of guiding question #2: *How do students who took LIB102 perform in mandatory 100-level English general education courses (i.e., ENG111 and ENG151) as compared to those in a matched comparison group?* After controlling for differences in demographics and previous achievement, the results indicate that the students who took the LIB102 course had a 0.22 lower grade in ENG111 than the matched comparison group and a 0.21 lower grade in ENG151 than the matched comparison group. These differences, however, were not statistically significant. Factors that did have a significant relationship with ENG111 performance include: gender, race/ethnicity, and degree level. The CAA is the only factor that had a significant relationship with ENG151 performance.

Table 6
Multiple Regression Results for ENG111 and ENG151

	ENG111 (N=172)		**ENG151 (N=213)**	
	B	B SE	B	B SE
Constant	3.29*	1.30	2.65**	0.40
Female	0.45*	0.20	0.25	0.16
Black[a]	-0.06	0.23	-0.20	0.19
Hispanic[a]	-.071*	0.25	-0.29	0.20
Received TAP or Pell	0.07	0.20	-0.11	0.16
Associate[b]	-0.71*	0.29	-0.16	0.19
Freshman[c]	-0.08	1.31	0.51	0.43
Sophomore[c]	0.05	1.38	0.77	0.45
Age	-0.01	0.02	0.00	0.02
College Admissions Average	0.01	0.01	0.02*	0.00
Group	-0.22	0.26	-0.21	0.21
R^2	0.13		0.09	
F	2.46*		1.87	

[a] The comparison group included White or Asian.
[b] The comparison group included bachelor or other degree-seeking students.
[c] The comparison group included juniors or seniors.
* $p < .05$, ** $p < .001$.

Table 7 displays the results of the logistic regression analysis on 916 students' performance in their one-year persistence after enrollment in the LIB102 course semester, i.e., 458 from the LIB102 group and 458 from the matched comparison group. We conducted this logistic regression analysis in pursuit of guiding question #3: *How do one-year persistence rates of students who took LIB102 compare to students in a matched comparison group?* The results indicate, after controlling for differences in demographics and previous achievement, that the students who took the LIB102 course were retained at higher rates (0.23) than the matched comparison students.

When comparing students who took LIB102 to the matched comparison group, LIB102 students were 1.26 times more likely to return to CSI or graduate the next year. The difference, however, was not statistically significant. Factors that did have a significant relationship on retention include: gender, TAP or Pell status, class level, and CAA.

Table 7
One-Year Persistence Logistic Regression Results (N=916)

	B	B SE	Odds Ratio
Constant	0.11	0.18	1.12
Female	0.29*	0.14	1.34
Black[a]	-0.19	0.18	0.82
Hispanic[a]	-0.17	0.18	0.84
Received TAP or Pell	0.44*	0.14	1.55
Associate[b]	-0.23	0.18	0.79
Freshman[c]	-0.42*	0.22	0.66
Sophomore[c]	-0.13	0.19	0.88
Age	-0.01	0.02	0.99
College Admissions Average	0.02*	0.01	1.03
Group	0.23	0.15	1.26
χ^2	50.4**		

[a] The comparison group included White or Asian.
[b] The comparison group included bachelor or other degree-seeking students.
[c] The comparison group included juniors or seniors.
* $p < .05$, ** $p < .001$.

Survey Findings

Survey results provided rich data that support knowledge gained in LIB102 and the application of that knowledge in other academic courses or outside the classroom.

Application of IL Skills and Techniques in Courses Other Than LIB102

To explore how students have applied LIB102 skills in other academic courses, the survey included questions that prompted the following results (Table 8). Six databases rose to the top as the most commonly used for academic purposes: OneSearch (21.2%), Academic Search Complete (14.4%), *The New York Times* (13.6%), JSTOR (10.6%), *The Wall Street Journal* (10.6%), and Gale Virtual Reference Library (9.1%). Of the matched comparison group, the most commonly used databases were the same, except in different order and with a lower percentage of utilization: OneSearch (14.6%), *The New York Times* (14.6%), *The Wall Street Journal* (12.5%), Gale Virtual Reference Library (10.4%), JSTOR (10.4%), and Academic Search Complete (8.3%). It was rewarding to see that two of three databases regularly taught in the course, OneSearch and Academic Search Complete, were heavily used by the LIB102 group to do research in other academic classes. Given that over 78% of respondents in the control and treatment group were juniors, seniors, and graduate students, we presumed that the high use of *The New York Times* and *The Wall Street Journal* was due to the fact that they would have come across these resources in other one-shot instructional sessions or encountered them by virtue of residing in the state of New York, where both newspapers are published and widely available. Both newspapers are also freely available via an app or online to students, staff, and faculty, a welcome arrangement secured by our parent university.

Table 8
Use of Databases for Academic Purposes

	LIB102 Group	**Matched Comparison Group**
Most Used	OneSearch – 21.2% Academic Search Complete – 14.4% *The New York Times* – 13.6% JSTOR – 10.6% *The Wall Street Journal* – 10.6% Gale Virtual Reference Library – 9.1%	OneSearch – 14.6% *The New York Times* – 14.6% *The Wall Street Journal* – 12.5% Gale Virtual Reference Library – 10.4% JSTOR – 10.4% Academic Search Complete – 8.3%
Least Used	PsycINFO – 6.8% Ebook Central – 3.8% MEDLINE – 2.3% Kanopy – 1.5% Nexis Uni – 1.5% CINAHL – 0.8% Opposing Viewpoints – 0.8%	Ebook Central – 6.3% Kanopy – 6.3% CINAHL – 4.2% MEDLINE – 4.2% PsycINFO – 4.2% Nexis Uni – 2.1% Opposing Viewpoints – 2.1%

Of the 32 responses given by the LIB102 group as to whether they encountered any difficulty using databases, 75% indicated no problems or difficulty. Difficulties that were expressed were user–interface related, e.g., "some websites not user-friendly," and "problems specifying or narrowing search results." However, of the 12 responses given by the matched comparison group, seven (58%) were trouble-free interactions and the remaining five responses were mainly about technical difficulties including "unable to log in," "problems logging on from off campus," and "PDF not available."

Newspaper articles, peer-reviewed articles from journals, and research reports topped the list for both groups at 20%, respectively, when asked about types of materials they were seeking. Magazine articles and statistical information ranked higher for the matched comparison group at 14% and 10%, respectively, whereas the LIB102 group sought these information sources at 10% and 9%, respectively. Of note, there was one recorded response for a podcast search by a respondent in the LIB102 group.

With regard to skills used when searching library databases, keyword searching was the most popular among both groups (21.2% in the LIB102 group vs. 26.5% in the matched comparison group), followed by subject searching (19.2% vs. 22.4%; see Appendix B). Regarding advanced searching, 16.4% of the LIB102 group indicated that they used it, as did 10.2% of the matched comparison group respondents. Though keyword searching remained the number one skill used by both groups, it was heartening to see the high use of the advanced searching option by the LIB102 group, which would indicate a good understanding of using it to yield the best results. Similar proportions (between 8% and 12%) indicated having used Google search operators, phrase searching, and use of synonyms in both groups. Nine respondents in the LIB102 group selected Boolean operators and browsing the index (corresponding to 6% of responses), contrary to our expectations of more use of these skills. Not surprisingly, only 2 respondents (4%) in the matched comparison group indicated that they had used Boolean operators and browsing the index. Remarkably, in the LIB102 group, there were two responses for truncation or wildcard, whereas there were no selections for these by the matched comparison group.

To assess whether students had any difficulty using search terms when utilizing databases for their assignments, respondents were given the opportunity to indicate this in an open-ended question. The majority of responses in both groups signaled that they had no difficulty (73.3% of the LIB102 group and

63.6% of the matched group). Sample statements of difficulty expressed by the LIB102 group include: "Getting the right word can be hard to find the perfect source. It's time consuming," "I wasn't sure when to use the key term," and "Using the right keywords to get the most accurate results." Similarly, sample statements about difficulty using databases from the matched comparison group were mainly expressed as follows: "Could not access Kanopy – a requirement for my French class," "Google gives more exact matches better," "Not finding what I'm looking for," and "Not knowing about other techniques."

Application of IL Skills and Techniques for Non-Academic Purposes

This section of the survey sought to determine use of IL skills outside the academic environment, for personal use. With regard to the LIB102 group, the most common databases used were: Google (30%), OneSearch (13.3%), *The New York Times* (11.1%), and Wikipedia (10%; see Table 9). The top four databases selected for non-academic purposes by the matched comparison group were Google (41.7%), Wikipedia (20.8%), *The New York Times* (8.3%), and MEDLINE (8.3%). Even though the use of Google still reigned supreme for non-academic purposes, it was rewarding to see that the respondents in the LIB102 group had also used library subscription resources for non-academic purposes. This signaled that the LIB102 course, which was designed to enable students to move beyond the incessant use of Google as a research tool for their assignments was playing a large role in their information seeking behaviour for non-academic purposes.

Table 9
Use of Databases for Non-Academic Purposes

	LIB102 Group	**Matched Comparison Group**
Most Used	Google – 30% OneSearch – 13.3% *The New York Times* – 11.1% Wikipedia – 10%	Google – 41.7% Wikipedia – 20.8% *The New York Times* – 8.3% MEDLINE – 8.3%
Least Used	Academic Search Complete – 6.7% *The Wall Street Journal* – 6.7% JSTOR – 4.4% Ebook Central – 2.2% Gale Virtual Reference Library – 2.2% PsycINFO – 2.2% Opposing Viewpoints – 1.1%	CINAHL – 4.2% JSTOR – 4.2% Kanopy – 4.2% OneSearch – 4.2%

When asked in an open-ended question about difficulty using any of the databases for non-academic purposes, 86.2% of respondents in the LIB102 group reported no difficulty, and likewise 90.9% of respondents in the matched comparison group reported the same. Appendix C shows results for use of search skills when seeking information for non-academic purposes, where keyword searching was the most popular among both groups (21.6% in the LIB102 group vs. 27.5% in the matched comparison group). Participants were also asked to identify types of information they would search for non-academic purposes. Both groups identified social/ entertainment as the top subject information sought, with 21.7% for the LIB102 group and 18.9% for the matched comparison group (see Appendix D). Thereafter, the groups differed slightly in subsequent subjects most searched. For the LIB102 group, medical information was second (13.2%), political information was third (12.4%), and nutrition/diet information was fourth (10.9%). For the matched comparison group, it was technological (15.1%), environmental (13.2%), and political and nutrition/diet information were a tie for fourth (11.3%). When asked if they were ultimately

successful in finding the non-academic information needed, a yes/no question, 93% of the respondents in both groups indicated success.

Benefits of Taking the Course and Additional Feedback

The last two questions were open-ended, specifically targeted to the LIB102 group to provide evaluative statements about the course. In the first question, respondents were asked to share any benefits of having taken the course. Out of 43 respondents, 36 provided complimentary responses of how the course had helped them. Some of the comments were as brief as: "It helped me write better papers"; "Being able to use the databases efficiently"; "I learned how to find research material for my other classes quickly and easily"; "Yes, it has helped me be able to identify credible online resources to use for my research papers"; "It has helped [me] develop skills to do research for classes and how to find valid sources and spot bias"; and "Yes it showed me different ways to research and how to identify legitimate sources of information."

Other, lengthier, comments were:

> I learned how to access research materials, as well as the skills necessary for writing citations, annotations, etc. I honestly feel this class should be required core curriculum along with ENG111 & 151.
>
> I took the class during my Freshman year. I found it helpful because I was new to the college where expectations of writings were on a standard, and I did not know that. Taking that class helped me shape my foundation for the expectations of college writing.
>
> It made me ahead of all other students in terms of knowing how to do research papers. Many students don't know that they have access to the library from home.
>
> Yes I have taken LIB102, it helped me with developing new skills when searching for topics from articles on the web by using techniques like typing in keywords and synonyms to narrow down my search.
>
> Yeah! I took LIB102 with [name redacted] which was great. She was wonderful and while a lot of the stuff was intuitive, a lot of my friends are actually very confused by it. It was helpful being walked through it.

The last open-ended question asked respondents in the LIB102 group to share any additional comments or feedback. Out of 30 responses, 26 noted "none" or "nothing," "n/a," or "no." The remaining four were enlightening enough to document here:

> G[r]e[a]t class I think it should be a gen ed requirement for all incoming freshmen.
>
> I think this class should be mandatory for all incoming freshman [sic].
>
> CSI library should send out emails about any updates or specific changes to the website. I also think that the library should send out brief emails with information or instructions on how to do things on

> the library's website just so that taking a class or making a trip to see the librarian isn't the only way of learning how to use the CSI library website.
>
> First, I want to thank you for conducting this study and consider the interests of the CSI students. Second, I feel library resources and search skills learned are not heavily promoted among students because my friends and I sometime[s] would have questions or face problems regarding looking up an article and did not know where to go. Again, thank you for your time.

Discussion

Results of the multiple regression and logistical analyses on outcomes of students who took LIB102 show evidence that the course has had a slight impact on their persistence and GPA. Data from the regression analysis suggest that students who have enrolled in LIB102 gain a slightly higher cumulative GPA than those who have never taken the course. Though the magnitude of effects was small, this study supports results of other studies that have shown that multiple sessions of library instruction increased confidence of first year students in conducting research and, in turn, have slightly impacted their overall GPA (Bowles-Terry, 2012; Daugherty & Russo, 2011, Heady et. al, 2018; Soria et al., 2017). The results of the logistic regression analysis on students' performance in their persistence one year after enrollment in the LIB102 course semester reveal that students were 1.26 times more likely to return to or graduate than the matched comparison students. While the authors are cautioned by the fact that the difference was not considered to be statistically significant, this study does corroborate studies by Catalano and Phillips (2016), Cook (2014), Haddow (2013), and Murray et al. (2016), who also found that an IL credit-bearing course does have an impact on students' academic performance, and in particular pertaining to persistence.

Like Lwoga (2014) and Stonebraker and Fundator (2016), we discovered from the survey that students who have enrolled in LIB102 continue to utilize online searching skills gained in the course both in other academic classes and for non-academic purposes. The LIB102 group differed from the matched comparison group in higher use of academic databases frequently taught in the course, having less difficulty using databases than the matched group, and having less difficulty using search operators, including the use of wildcards and truncations. These findings validate that taking the IL course may assist students in being better at navigating familiar or new information resources. Moreover, in the answers to the open-ended questions, the LIB102 group confirm findings in studies by Daugherty and Russo (2011), Mery et al. (2012) and Soria et al. (2017) that showed that an IL course has a lasting impact on students as they progress through college. In comment after comment, each student indicated how LIB102 had served them well in becoming better at conducting research and writing papers. Their brief but concise testimonies spoke volumes about the goals of the course. Several comments seemed to be directed at librarians requesting that the course be made mandatory for freshmen or first-year students.

Similar to results in the studies conducted by Heady et al. (2018) and Squibb and Mikkelsen (2016), a surprising outcome in this study was the results of the PSM analysis, which revealed a lower performance of the LIB102 group in the mandatory 100-level English courses than the matched comparison group. The lower performance of students in these courses, even after taking LIB102, may be due to several external factors beyond our control. Among them could be the fact that the LIB102 course was taken at the same time as ENG111 and ENG151, and that students were not able to make the association while taking the course. A second possible factor could be that the intention of LIB102, which is to teach students how to conduct research, was not in parity with the designs of ENG111 (Introduction to College Writing) or ENG151 (College Writing), which are designed to teach writing as their titles

indicate. The lower performance by the LIB102 group was surprising given their cumulative GPA was 0.08 points higher than the matched comparison group. The rationale in the study by Heady et al. (2018) was that most students "pass the course with a B or above, which would modestly contribute to their GPA" (p. 647). The authors of this current study agree that this could be a possible explanation, as the average grade in LIB102 over 10 semesters has been a solid B. Either way, this is a revelation that should be further examined and discussed by those teaching in the LIB102 program.

A disappointing outcome was in the low utilization of Boolean operators reported by the LIB102 group. The use of Boolean operators is a skill that is always taught in the course, in a dedicated class session. Librarians emphasize that these same search skills can also be applied when searching in Google to retrieve the most relevant sources. However, two recent students by Lowe et al. (2018) and Lowe et al. (2020) confirm that teaching Boolean searching to first-year students is a waste of class time, and that it is time well spent for upper-level students who find it useful for their discipline-specific databases. Nevertheless, this raises a second question regarding assessment of the ways search skills and techniques are being taught, and whether some of these skills and techniques are still relevant.

Limitations

There are a couple of limitations to note in this study. First, as with any study involving regression analysis, the findings should be interpreted with caution. In our study, while the results show that the matched comparison group performed better in ENG111 and ENG151 than students who had taken the LIB102 course, the analysis reflects their course performance at the same time as or after taking LIB102. It is unknown whether the negative coefficient is greatest when taking ENG111 or ENG151 concurrently with LIB102 or after taking LIB102. Also, although the analyses controlled for student demographics and previous achievement, threats to internal validity still exist. Students in the matched comparison group may have received instruction in IL in other courses that are not controlled for in this study.

Second, while the authors utilized several interventions prescribed by Dillman et al. (2014) to obtain a high response rate and quality data when using web-based surveys, the 30% response rate that is widely considered a robust response in the social sciences was not achieved for this survey. However, the thoughtful and lengthy responses to the open-ended questions were rich contributions to the study.

Implications for Future Study

A strength of this study, at this time of writing, is that this research is among a few studies to utilize the PSM method to discover the impact of a stand-alone IL credit-bearing course with regard to student academic achievements. As with any study, the use of these results should inform an examination of the subject or inform changes to be implemented. If this study were to be repeated, it is advisable to conduct the multiple regression analyses separately for those students who took 100-level English courses at the same time as LIB102 from those who took the English course after LIB102. This might ensure an unambiguous result. The negative coefficient results from the multiple regression analyses suggest ENG111 and ENG151 may not have been the appropriate courses to which LIB102 was linked. It may be worth an in-depth examination of whether the intentions of LIB102 are in parity with the introductory 100-level English courses. Perhaps LIB102 could be better paired with other courses in which students conduct research.

Furthermore, given the results of the logistic regression analysis regarding the one-year persistence of students who have taken LIB102, it would be worth conducting the analysis specifically on first-year

students as compared with non-first-year students. The course was actually designed for first-year students, and we are remiss not to have included this analysis at the outset.

Conclusion

The findings in this study underscore the importance of a stand-alone, credit-bearing IL course for undergraduate students who are primarily first generation in an open access urban institution. While results of the multiple regression and logistical analyses on outcomes of students who took LIB102 show evidence that the course has had a slight impact on their persistence and GPA, our survey findings yield valuable insights and validate why taking this course may well assist students in becoming confident at searching and retrieving information resources for their academic assignments. This is illustrated by the LIB102 group attaining a slightly higher GPA than the matched comparison group, as well as a persistence rate that showed that students were 1.26 times more likely to return one year after taking LIB102. Our findings also show that the knowledge gained in LIB102 is applied in students' personal lives for non-academic purposes, thus recognizing information literacy as a lifelong learning skill. Moreover, the survey revealed numerous positive testimonies of how helpful this course has been to students for academic and non-academic purposes, further validating the value of the course. In their own words, several students emphatically prescribed that the course should be made mandatory for freshmen or included in the general education curriculum. This, the researchers ascertained, comes from students feeling empowered by the skills they learned in LIB102.

The researchers are confident that the quantitative and qualitative evidence presented here not only support the anecdotal feedback that served as an impetus for this study, but also demonstrate the library's commitment to supporting institutional outcomes that pertain to students' development of learning. Indeed, this is a testament to one of the goals in the CSI Department of the Library's (n.d.) mission statement, which states that we "cultivate scholarly inquiry and discovery through teaching information literacy and critical thinking skills." Moreover, this study makes a substantial contribution to the gap in the library literature. In Oakleaf's (2010) comprehensive report for ACRL, she urged academic librarians to be more systematic in collecting data that connect and demonstrate the library's value in institutional terms. This study answers that call, and the authors of this paper aim to conduct follow-up studies.

Author Contributions

Wilma L. Jones: Conceptualization (lead), Methodology, Formal analysis, Writing – original draft (lead), Writing – review & editing (equal) **Tara Mastrorilli:** Conceptualization (supporting), Methodology (lead), Formal analysis (lead), Writing – review & editing (equal)

References

Association of College and Research Libraries. (2000). *Information literacy competency standards for higher education*. http://hdl.handle.net/11213/7668

Association of College and Research Libraries. (2016). *Framework for information literacy for higher education*. https://www.ala.org/acrl/standards/ilframework

Black, E. L., & Murphy, S. A. (2017). The out loud assignment: Articulating library contributions to first-year student success. *The Journal of Academic Librarianship, 43*(5), 409–416. https://doi.org/10.1016/j.acalib.2017.06.008

Bowles-Terry, M. (2012). Library instruction and academic success: A mixed-methods assessment of a library instruction program. *Evidence Based Library & Information Practice, 7*(1), 82–95. https://doi.org/10.18438/B8PS4D

Britto, M., & Kinsley, K. (2018). *Academic libraries and the academy: Strategies and approaches to demonstrate your value, impact, and return on investment*. Association of College and Research Libraries.

Burkhardt, J. M. (2016). *Teaching information literacy reframed: 50+ framework-based exercises for creating information-literate learners*. ALA Neal-Schuman.

Catalano, A., & Phillips, S. R. (2016). Information literacy and retention: A case study of the value of the library. *Evidence Based Library & Information Practice, 11*(4), 2–13. https://doi.org/10.18438/B82K7W

Chiteng Kot, F., & Jones, J. L. (2015). The impact of library resource utilization on undergraduate students' academic performance: A propensity score matching design. *College & Research Libraries, 76*(5), 566–586. https://doi.org/10.5860/crl.76.5.566

College of Staten Island, Office of Institutional Research. (2020). *Semester enrollment: Student demographic profile, Fall 2019*. The City University of New York. https://applications.csi.cuny.edu/Institutional_Profile/SemesterEnroll_Profile.html

Cook, J. M. (2014). A library credit course and student success rates: A longitudinal study. *College & Research Libraries, 75*(3), 272–283. https://doi.org/10.5860/crl12-424

Daugherty, A. L., & Russo, M. F. (2011). An assessment of the lasting effects of a stand-alone information literacy course: The students' perspective. *The Journal of Academic Librarianship, 37*(4), 319–326. https://doi.org/10.1016/j.acalib.2011.04.006

Department of the Library. (n.d.). The City University of New York, College of Staten Island. https://www.csi.cuny.edu/academics-and-research/department-library

Diep, K. C., & Nahl, D. (2011). Information literacy instruction in four Vietnamese university libraries. *International Information & Library Review, 43*(4), 198–206. https://doi.org/10.1016/j.iilr.2011.10.002

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons.

Haddow, G. (2013). Academic library use and student retention: A quantitative analysis. *Library & Information Science Research, 35*(2), 127–136. https://doi.org/10.1016/j.lisr.2012.12.002

Hauck, J. (2017). From service to synergy: Embedding librarians in a digital humanities project. *College & Undergraduate Libraries, 24*(2–4), 434–451. https://doi.org/10.1080/10691316.2017.1341357

Heady, C., Morrison, M. M., & Vossler, J. (2018). Ecological study of graduation rates and GPA in a library credit course. *The Journal of Academic Librarianship, 44*(5), 642–649. https://doi.org/10.1016/j.acalib.2018.07.010

Inuwa, S., & Abrizah, A. (2018). Embedded librarianship in research in Nigerian universities: Practices and sources of practice knowledge. *The Journal of Academic Librarianship, 44*(6), 738–746. https://doi.org/10.1016/j.acalib.2018.10.002

Luetkenhaus, H., Borrelli, S., & Johnson, C. (2015). First year course programmatic assessment: Final essay information literacy analysis. *Reference & User Services Quarterly, 55*(1), 49–60. https://doi.org/10.5860/rusq.55n1.49

Lowe, M. S., Maxson, B. K., Stone, S. M., Miller, W., Snajdr, E., & Hanna, K. (2018). The Boolean is dead, long live the Boolean! Natural language versus Boolean searching in introductory undergraduate instruction. *College & Research Libraries, 79*(4), 517–534. https://doi.org/10.5860/crl.79.4.517

Lowe, M. S., Stone, S. M., Maxson, B. K., Snajdr, E., & Miller, W. (2020). Boolean redux: Performance of advanced versus simple Boolean searches and implications for upper-level instruction. *The Journal of Academic Librarianship, 46*(6), 102234. https://doi.org/10.1016/j.acalib.2020.102234

Lwoga, E. T. (2014). Mapping information literacy outcomes and learning experiences of health sciences undergraduate students. *Partnership: The Canadian Journal of Library and Information Practice and Research, 9*(1). https://doi.org/10.21083/partnership.v9i1.2695

Mackey, T. P., & Jacobson, T. E. (2010). *Collaborative information literacy assessments: Strategies for evaluating teaching and learning*. Neal-Schuman.

Mayer, J., & Bowles-Terry, M. (2013). Engagement and assessment in a credit-bearing information literacy course. *Reference Services Review, 41*(1), 62–79. https://doi.org/10.1108/00907321311300884

McDevitt, T. R. (2011). *Let the games begin! Engaging students with field-tested interactive information literacy instruction*. Neal-Schuman.

Mery, Y., Newby, J., & Peng, K. (2012). Why one-shot information literacy sessions are not the future of instruction: A case for online credit courses. *College & Research Libraries, 73*(4), 366–377. https://doi.org/10.5860/crl-271

Murray, A., Ireland, A., & Hackathorn, J. (2016). The value of academic libraries: Library services as a predictor of student retention. *College & Research Libraries, 77*(5), 631–642. https://doi.org/10.5860/crl.77.5.631

Oakleaf, M. (2010). *The value of academic libraries: A comprehensive research review and report.* Association of College and Research Libraries. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/val_report.pdf

Oakleaf, M. (2015). The library's contribution to student learning: Inspirations and aspirations. *College & Research Libraries, 76*(3), 353–358. https://doi.org/10.5860/crl.76.3.353

Oliveira, S. M. (2018). Retention matters: Academic libraries leading the way. *New Review of Academic Librarianship, 24*(1), 35–47. https://doi.org/10.1080/13614533.2017.1365003

Pierard, C., & Graves, K. (2007). Research on student retention and implications for library involvement. In L. Hardesty (Ed.), *The role of the library in the first college year* (pp. 155–168). University of South Carolina, National Resource Center for the First-Year Experience and Students in Transition.

Polger, M. A., & Sheidlower, S. (2017). *Engaging diverse learners: Teaching strategies for academic librarians*. Libraries Unlimited.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*(1), 41–55. https://doi.org/10.2307/2335942

Rysavy, M. D. T., Michalak, R., & Wessel, A. (2017). 8 years of institutional assessment feedback: Students' satisfaction with library services. *Reference Services Review, 45*(4), 544–561. https://doi.org/10.1108/RSR-03-2017-0005

Soria, K. M., Fransen, J., & Nackerud, S. (2013). Library use and undergraduate student outcomes: New evidence for students' retention and academic success. *portal: Libraries and the Academy, 13*(2), 147–164. https://doi.org/10.1353/pla.2013.0010

Soria, K. M., Fransen, J., & Nackerud, S. (2014). Stacks, serials, search engines, and students' success: First-year undergraduate students' library use, academic achievement, and retention. *The Journal of Academic Librarianship, 40*(1), 84–91. https://doi.org/10.1016/j.acalib.2013.12.002

Soria, K. M., Fransen, J., & Nackerud, S. (2017). The impact of academic library resources on undergraduates' degree completion. *College & Research Libraries, 78*(6), 812–823. https://doi.org/10.5860/crl.78.6.812

Squibb, S. D., & Mikkelsen, S. (2016). Assessing the value of course-embedded information literacy on student learning and achievement. *College & Research Libraries, 77*(2), 164–183. https://doi.org/10.5860/crl.77.2.164

Stonebraker, I. R., & Fundator, R. (2016). Use it or lose it? A longitudinal performance assessment of undergraduate business students' information literacy. *The Journal of Academic Librarianship, 42*(4), 438–444. https://doi.org/10.1016/j.acalib.2016.04.004

Swanson, T. A., & Jagman, H. (2015). *Not just where to click: Teaching students how to think about information*. Association of College and Research Libraries.

Tumbleson, B., Burke, J., & Long, J. (2019). Assessment, analytics, and analysis: Demonstrating the impact of LMS embedded librarians on student learning. *Journal of Library & Information Services in Distance Learning, 13*(1–2), 196–214. https://doi.org/10.1080/1533290X.2018.1499252

U.S. Census Bureau. (2019). *Staten Island borough, Richmond County, New York*. https://data.census.gov/cedsci/profile?g=0600000US3608570915

Appendix A
Questionnaire

Impact of an Information Literacy Course

I. Demographics

1. Please identify your current academic status. How many credits will you have earned by the end of this semester?
   a. ___ 0 – 30 credits
   b. ___ 31 – 60 credits
   c. ___ 61 – 90 credits
   d. ___ 91 – 124+ credits
   e. ___ Graduate Student
   f. ___ Other

2. Gender:
   a. ___ Female
   b. ___ Male
   c. ___ Prefer not to disclose
   d. ___ Other

3. Ethnicity (check all that apply):
   a. ___ American Indian or Alaska Native
   b. ___ Asian or Asian American
   c. ___ Black or African American
   d. ___ Latino or Hispanic
   e. ___ Native Hawaiian or Other Pacific Islander
   f. ___ White or Caucasian
   g. ___ Prefer not to disclose
   h. ___ Other _____

4. What is your current major/intended major?
   a. (drop down menu that includes all majors, including "undeclared" major)

5. Are you a Transfer student to CSI?
   ___ Yes ___ No

6. Are you (or your siblings) the first in your family to attend College?
   ___ Yes ___ No

7. Are you part of any one of the learning community programs below:
   a. ___ ASAP – Accelerated Studies in Associated Program
   b. ___ BMI Program – Black Male Initiative Program
   c. ___ C-STEP – College Science & Technology Entry Program
   d. ___ Macaulay Honors College
   e. ___ SEEK Program – Search for Education, Elevation, & Knowledge Program
   f. ___ Teacher Education Honors Academy
   g. ___ Verrazano School
   h. ___ Other _____
   i. ___ No, I was never enrolled in a learning community

8. Have you taken the course "Beyond Google: Research for College Success" labeled as LIB102 or LIB501?

   ___ Yes ___ No

(if the answer is NO, software skips to #10)

9. What type of LIB102/LIB 501 did you take?
   a. ___ Hybrid (where you had 3 or 4 classes held online)
   b. ___ In Classroom (where you had face-to-face interactions for all 7 class meetings)

II. Applications of IL skills and information resources in classes other than Beyond Google: LIB102 / LIB 501

10. Please identify the type(s) of class project(s) you have taken at CSI (select all that apply):
    a. 3-5 page research paper/project
    b. 6-10 page research paper/project
    c. 10-20 page research paper/project
    d. Technical report for science lab course
    e. Undergraduate seminar project
    f. Master's thesis
    g. Capstone research project
    h. Other _____

11. Please indicate which of any of the library databases you have used for your class projects (select all that apply):
    a. None
    b. OneSearch
    c. Academic Search Complete
    d. CINAHL Complete
    e. Ebook Central
    f. Gale Virtual Reference Library
    g. JSTOR
    h. Kanopy
    i. Lexis-Nexis (now Nexis Uni)
    j. MEDLINE
    k. *The New York Times*
    l. Opposing Viewpoints
    m. PsycINFO
    n. *The Wall Street Journal*
    o. Other(s) _____

12. Please explain <u>any</u> difficulty you encountered when using any of the identified databases above.
    _____
    _____
    _____

13. What types of information were you searching for while using the above identified databases? (Select all that apply:)
    a. Newspaper articles
    b. Magazine articles
    c. Peer-reviewed articles
    d. Research reports
    e. Government documents
    f. Statistical information
    g. Blogs or Websites
    h. Podcasts
    i. Films or Video-clips
    j. Other _____

14. Please indicate which searching skills or techniques you used (select all that apply):
    a. Keyword searching
    b. Subject searching
    c. Boolean operators (AND, NOT, OR)
    d. Advanced searching
    e. Use of synonyms
    f. Google search operators (site, link, source, filetype, etc.)
    g. Browsing the index
    h. Phrase searching
    i. Truncation or wildcard (?, *)
    j. Physical navigation of the stacks
    k. Other _____
    l. None of the above

15. Please explain <u>any</u> difficulty you encountered when using those skills or techniques:
    _____
    _____
    _____

III. Applications of IL skills and information resources for non-academic purposes

16. Please indicate which information resources you have used for non-academic purposes. Examples of non-academic purposes: finding information on future employer/corporation, researching a product you wish to purchase (i.e., car, washer/dryer, etc.), or locating medical information on treatment of a disease for a family member. (Select all that apply:)
    a. None
    b. OneSearch
    c. Academic Search Complete
    d. CINAHL Complete
    e. Ebook Central
    f. Gale Virtual Reference Library
    g. Google
    h. JSTOR
    i. Kanopy
    j. Lexis-Nexis (now Nexis Uni)
    k. MEDLINE
    l. *The New York Times*
    m. Opposing Viewpoints
    n. PsycINFO
    o. *The Wall Street Journal*
    p. Wikipedia
    q. Other _____

17. Please indicate which searching skills or techniques you have used (check all that apply):
    a. Keyword searching
    b. Subject searching
    c. Boolean operators (AND, NOT, OR)
    d. Advanced searching
    e. Use of synonyms
    f. Google search operators (site, link, source, filetype, etc.)
    g. Browsing the index
    h. Phrase searching
    i. Truncation or wildcard (?, *)
    j. Physical navigation of the stacks
    k. Other _____
    l. None of the above

18. Please explain <u>any</u> difficulty you encountered when using those skills or information resources?
    _____
    _____

19. Were you ultimately successful in finding the non-academic information you were looking for?
    ___ Yes ___ No

20. What type(s) of information were you trying to find? (Check all that apply:)

a.	Social/Entertainment	f.	Financial/Economic
b.	Political	g.	Environmental
c.	Legal	h.	Technological
d.	Medical	i.	Exercise
e.	Nutrition/Diet	j.	Other_____

21. If you have taken LIB102/LIB 501 "Beyond Google," has it helped you in any way? Any benefits?
    _____
    _____

22. Do you have any additional comments or feedback that you would like to share?
    _____
    _____

23. If you would like to participate in the drawing to win one of eight (8) $50 Amazon.com gift cards, please provide your <u>name</u> and <u>email address</u> (it does not have to be your CSI address) in the slot below.

Thank you for your time and contribution in completing this survey.

Appendix B
Search Skills Used for Academic Purposes

	LIB102 group	Matched comparison group
Search skills	Keyword searching – 21.2% Subject searching – 19.2% Advanced searching – 16.4% Google search operators – 9.6% Phrase searching – 8.2% Use of synonyms – 8.2% Boolean operators – 6.2% Browsing the index – 6.2% Physical navigation of the stacks – 2.1% Truncation or wildcard (?, *) – 1.4%	Keyword searching – 26.5% Subject searching – 22.4% Advanced searching – 10.2% Phrase searching – 10.2% Use of synonyms – 8.2% Boolean operators – 4.1% Browsing the index – 4.1% Physical navigation of the stacks – 2.0%

Appendix C
Search Skills Used for Non-Academic Purposes

	LIB102 group	Matched comparison group
Search skills used for non-academic purposes	Keyword searching – 21.6% Google search operators – 18.9% Subject searching – 14.4% Advanced searching – 12.6% Use of synonyms – 10.8% Phrase searching – 7.2% Boolean operators (AND, NOT, OR) – 5.4% Browsing the index – 4.5%	Keyword searching – 27.5% Subject searching – 22.5% Google search operators – 12.5% Advanced searching – 10% Use of synonyms – 10% Phrase searching – 7.5% Browsing the index – 5% Boolean operators (AND, NOT, OR) – 2.5%

Appendix D
Types of Information Sought for Non-Academic Purposes

	LIB102 group	Matched comparison group
Types of information sought for non-academic purposes	Social/Entertainment – 21.7% Medical – 13.2% Political – 12.4% Nutrition/Diet – 10.9% Environmental – 8.5% Exercise – 8.5% Technological – 8.5% Financial/Economic – 8.5% Legal – 6.2% Other – 1.6 %	Social/Entertainment – 18.9% Technological – 15.1% Environmental – 13.2% Political – 11.3% Nutrition/Diet – 11.3% Medical – 9.4% Financial/Economic – 7.5% Exercise – 5.7% Legal – 3.8% Other – 1.9 % Personal – 1.9%