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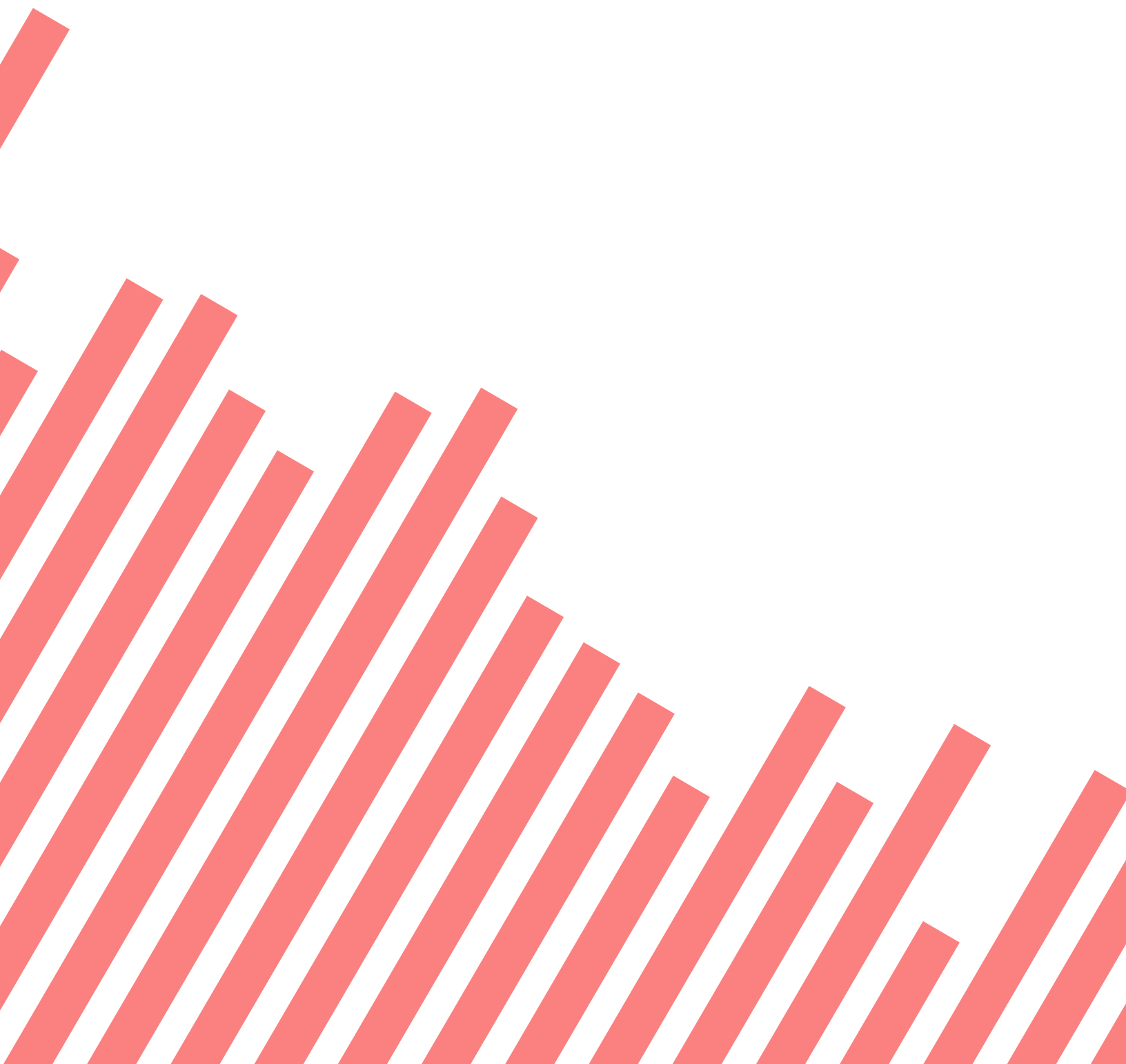
In This Issue

Editor's Note

M. Sue Baughman, ARL Deputy Executive Director and RLI Editor

Academic and research libraries have been increasing their efforts for a number of years to demonstrate their contributions to student learning outcomes in support of the institutional educational mission. Whether through one-shot instruction or credited classes, libraries invest a great deal of time and effort in instructional programs. A key challenge is the development of assessment methods that provide data useful for understanding the impact of these offerings. This issue of *Research Library Issues* includes two case studies that explore various data sources to assess student learning outcomes and experiences.

In the first article, "The Impact of Academic Library Resources on First-Year Students' Learning Outcomes," a team from the University of Minnesota presents the findings of their recent study. By examining student-reported feedback about use of library resources (checking out books, using electronic resources, engaging in reference services, etc.) and about high-level learning outcomes (critical thinking and analytical skills, writing skills, and reading comprehension), the team argues that the use of library resources does play a role in students' development of learning outcomes.

Cornell University Library staff describe their exploration of a variety of data sources to assess students' experiences, not just their skills, in the second article, "Multi-Method Assessment to Improve Library Instruction." This study examined faculty perceptions of students' information literacy skills and use of library instruction as well as students' opinions about the usefulness of library instructional offerings. Coupling these survey results with information gleaned from student focus groups, the library decided to conduct a pilot project with Cornell's College of Engineering. The well-received pilot project produced short, instructional videos to help students develop specific library skills on an as-needed basis.

Both teams approached their projects with somewhat similar goals—to better understand the impact of the library on student learning outcomes and experiences. They used different methodologies in examining their research questions and they share interesting results. Both teams also provide helpful conclusions and next steps.

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The Impact of Academic Library Resources on First-Year Students' Learning Outcomes

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Colleges and universities are under increasing pressure to demonstrate their contributions to students' learning and development.[1] In fact, over a decade ago, all of the regional accrediting agencies in the United States agreed to emphasize college students' learning as central to the accrediting process.[2] Under these increasingly pervasive expectations to demonstrate students' learning, fully 85% of Association of American Colleges & Universities (AAC&U) members reported that they have a common set of learning outcomes for all undergraduates.[3] Additionally, nearly 90% of Association of American Universities (AAU) member institutions reported using quantitative data to collect information on student learning outcomes, with 70% reporting that they had one employee or office specifically charged with developing, coordinating, or implementing assessments of student learning.[4]

Amid the increasing calls for accountability to demonstrate students' learning, colleges and universities are currently confronting competing demands for fewer resources;[5] consequently, it is even more vital that programs and services demonstrate their contributions to student outcomes. Academic libraries are no exception and, over the last decade, researchers have expanded their efforts to better understand how libraries contribute to students' success, including students' retention[6] and academic achievement.[7] One critical area of students' learning and development often explored by library

researchers includes students' development of information literacy,[8] with close to 70% of library strategic plans listing information literacy as a paramount focus.[9] Also the *Ithaka S+R US Faculty Survey 2015* indicated "an increase in the share of faculty members who believe that their undergraduate students have poor research skills and a substantial increase in the perceived importance of the role of the library in helping undergraduate students develop research, critical analysis, and information literacy skills."[10]

Libraries, in turn, have a long history of teaching and assessing information literacy and of focusing on student learning. Efforts like the Association of College & Research Libraries (ACRL) Information Literacy Immersion Assessment Workshop, the ACRL's *Information Literacy Competency Standards for Higher Education*, and now the ACRL *Framework for Information Literacy for Higher Education*[11] attest to the connections between libraries and student learning. As a result, the library community is much more likely to create student learning outcomes and use a variety of formative and summative student learning assessments.[12] However, at a substantial number of institutions, the majority of instruction programs are built on a "one-shot model and tend to capture limited amounts of information, e.g., only one librarian's class, one group of students, or one assessment method."[13]

Some libraries offer credit-bearing courses and have built deeper, richer student learning assessments.[14] However, librarians often continue to find themselves in an awkward position in supporting student learning of critical thinking, analytical thinking, written communication skills, and reading comprehension. These higher-order skills take time and practice to develop, and time and practice are inherently not part of a one-shot session. Thus, there remains a significant gap with regard to the libraries' role in students' development of other critical learning outcomes common across colleges and universities. The absence of data related to these outcomes is concerning given Oakleaf's recommendation that

academic librarians collect "systematic, coherent, and connected evidence to establish the role of libraries in student learning"[15] and the clear imperatives created by internal and external stakeholders for colleges and universities to demonstrate their contribution to students' development.

Our study works to apply large-scale data collection, including course-integrated instruction, workshops, and one-shots, but also the multitude of experiences students have with the libraries, which support their learning—from using a database or e-book to chatting with a librarian. Instead of focusing on the direct measure (e.g., grades) in a course, this methodology takes a 10,000-foot view and makes correlations to the bigger, rich pictures of what academic libraries have to offer and how they contribute to undergraduate student learning outcomes as outlined by campus strategic plans and accreditation bodies. We are following Oakleaf's construct, that "because libraries exist within educational institutions, it might be argued than nearly all library resources and services contribute, directly or indirectly, to learning."[16]

> **Instead of focusing on the direct measure (e.g., grades) in a course, this methodology takes a 10,000-foot view and makes correlations to the bigger, rich pictures of what academic libraries have to offer and how they contribute to undergraduate student learning outcomes as outlined by campus strategic plans and accreditation bodies.**

The purpose of this study is therefore to explore the impact of library resources on first-year college students' development of learning outcomes. We utilized quasi-experimental procedures (propensity score matching techniques) to construct control (non-library users) and treatment (library users) groups similar to those found in randomized experiments. We took these steps to reduce the potential bias found within students' self-selection to use specific library resources. In this study, we explored the average treatment effect to examine differences in learning between students who used academic library resources (the "treatment" group) and those who did not use academic library resources (the "control" group).

Conceptual Framework

We used Astin's input-environment-output model as our conceptual framework given its relevance to the research design.[17] The "inputs" within this model include students' pre-college characteristics, experiences, and demographics. The environment includes experiences during higher education and the outputs include students' self-reported development of critical thinking and analytical skills, written communication skills, and reading comprehension skills. Inputs can have an effect on both environmental experiences and outcomes, which is why we entered these variables in our statistical models. In order to test the potential impact of environmental experiences, it is important to consider the direct effects of input variables on outcomes while also examining the potential effects those input variables have on the environmental variables. In the case of students' use of academic libraries, for instance, self-selection bias may contribute to systematic differences between students who use library resources and those who do not use the same library resources.

To reduce self-selection biases, educational researchers use quasi-experimental designs in their analyses. In most experimental studies, researchers randomly assign participants to a control group or a treatment group to better test the effects of the treatment; however, such randomization is not often possible in educational settings. It would be unethical, for instance, to prohibit the use of academic library resources to students who may be randomly assigned to a control condition. Quasi-experimental techniques can simulate the characteristics of experimental designs by matching groups of students based upon demographic variables or other observable characteristics, with the only differences between these students the type of "treatment" received (e.g., using academic libraries).[18] The resultant effects of such steps can help researchers to better estimate the effects of "treatments" on outcomes with a greater degree of accuracy. Therefore, in the present study, we utilized

propensity score matching techniques to estimate the effects of first-year students' use of academic libraries on their development of three learning outcomes: critical thinking and analytical skills, written communication skills, and reading comprehension skills.

Methodology

Sample

We drew the sample used in this study from the 2014 entering class of first-year undergraduates at the University of Minnesota (*n* = 5,368). During spring 2015, all students at the university were invited to take the Student Experience in the Research University (SERU) survey, a multi-institutional, comprehensive census in which students are asked to report upon their experiences in higher education, including their satisfaction, involvement, and development. Of the 472 first-year students at the University of Minnesota who responded to the SERU survey and were paired after matching techniques, there were more females (*n* = 346, 73.3%) than males (*n* = 126, 26.7%). Additionally, 1.9% were international students (*n* = 9), 4.7% Hispanic (*n* = 22), 1.5% American Indian or Native American (*n* = 7), 13.1% Asian (*n* = 63), 3.2% Black (*n* = 15), 0.4% Hawaiian (*n* = 2), 74.8% White (*n* = 353), and 0.2% (*n* = 1) did not specify race/ethnicity.

Measures

Covariate measures. The independent variables utilized for propensity score matching analyses were intentionally selected because of their known relationships to students' use of academic library resources. The covariate measures included students' race/ethnicity,[19] sex,[20] on- or off-campus residency,[21] first-generation status,[22] participation in an honors program,[23] college of enrollment,[24] socioeconomic status as measured by Pell Grant,[25] and incoming ACT/SAT scores.[26] All indicators were derived from institutional records. When ACT scores were missing, we converted SAT scores to ACT

scores according to ACT concordance tables. Students' college of enrollment was dummy-coded with the liberal arts college (which admits the greatest proportion of first-year students) serving as a common referent.

Environmental measures: Students' use of academic libraries.
The environmental or "treatment" variables included students' use of academic libraries at least once during the academic year based upon at least one use in five primary areas: checking out books (including interlibrary loans and electronic books), using electronic resources (including academic journals accessed, websites used, and databases searched), logging into library computer workstations, engaging in library instruction sessions (introduction courses, workshops, or course-integrated instruction), and reference services used (e.g., meeting with a peer research consultant or chatting with a reference librarian). The sample of 472 was equally matched such that half of the students had used a library resource at least once and half had never used a library resource.

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We extracted collection loans—primarily book checkouts and renewals—from the university's Ex Libris Aleph catalog transaction records[27] and no distinctions were made between initial checkout and renewal. E-book views, database logins, and electronic journal logins used a "click-through" script to capture usage of these resources. Computer workstation use at the libraries required that users log in through a shared computer management software service called Cybrarian.[28] Login data included Internet ID and date of transaction, which we extracted from the Cybrarian database. We gathered reference transactions that occurred via live Internet chat from QuestionPoint[29] and we parsed the data into a list of Internet IDs. Library services staff train undergraduates (a.k.a. peer research consultants) to help students narrow down

their research topic, choose keywords, evaluate articles and websites, and learn other key research skills. We gathered Internet IDs for students who met with a peer research consultant.

Outcomes measures: Students' learning outcomes. The dependent variables of interest in this study included first-year students' self-reported development of three learning outcomes: critical thinking and analytical skills, written communication skills, and reading comprehension skills. In the SERU survey, students were asked to indicate their skill levels when they started at the university and their current skill levels on a scale from 1 (very poor) to 6 (excellent). We subtracted students' skills when they started at the university from their current skills to develop variables measuring students' growth or regression in those areas.

Data Analyses

We utilized propensity score matching techniques in SPSS 23.0 using the procedures outlined by Thoemmes.[30] We began by using binary logistic regression to compute propensity scores for individual students. We used the binary variable of using the library (yes or no) as a dependent variable and the independent covariates listed above in the regressions to calculate the probabilities of using a library resource at least once. Next, we used 1:1 nearest neighbor matching, meaning that each student in the treatment condition is matched to a student in the untreated condition who has the most similar estimated propensity score. We matched without replacement and discarded all units that fell outside of the area of common support to avoid extrapolation to units that were so dissimilar that no comparisons could be made to other units.[31]

Next, it was important to check whether the matching procedures balanced the distribution of variables in both the treatment and control groups. We examined the standardized mean differences (the mean differences between the two groups divided by the

standard deviation of the control group) in the treatment and control groups before and after matching. We detected no large imbalances above .25 after matching in each analysis, meeting the threshold suggested by Rosenbaum and Rubin.[32] Before matching procedures were implemented, the covariates within the treatment and control groups differed significantly. These results also suggest that the propensity score matching decreased bias by making the observed and treatment groups more similar with regard to their covariates.

Finally, we used ordinary least squares regression to examine the relationships between library users and non-library users' development of learning outcomes. We included the propensity scores as controls to remove the component of their correlation that is due to the assignment process.[33] We tested assumptions of multicollinearity, homoscedasticity, linearity, and independent/ normal errors. We found that multicollinearity assumptions were not violated and, in testing homoscedasticity, we found random scatter and variability in scatterplots of standardized residuals against the standardized predicted values. In producing histograms of standardized residuals and normal probability plots comparing the distribution of standardized residuals to a normal distribution, we found evidence for normality. Examinations of matrix scatterplots suggested the relationships between the predictor and outcome variables were relatively linear and the residual errors were independent across models. Overall, the results of these tests suggested that the assumptions were not violated for ordinary least squares regressions in this study.[34]

Results

The first model assessed whether first-year students who used a library resource at least once were significantly more likely to report development of critical thinking and analytical skills. The results of the first regression suggest that first-year students who used any library resource at least once had significantly higher

development of this learning outcome compared to their peers who did not use the library resource ($\beta = .290$, $p < .001$). These results held when we controlled for the propensity scores in the model.

The second regression model assessed whether first-year students who used a library resource at least once were significantly more likely to report development of written communication skills. The results suggest that first-year students who used any library resource at least once had significantly higher development of this learning outcome compared to their peers who did not use the library resource ($\beta = .226$, $p < .001$). These results held when we controlled for the propensity scores in the model.

Finally, the third regression model assessed whether first-year students who used a library resource at least once were significantly more likely to report development of reading comprehension skills. The results suggest that first-year students who used any library resource at least once had significantly higher development of this learning outcome compared to their peers who did not use the library resource ($\beta = .207$, $p < .001$). These results held when we controlled for the propensity scores in the model.

Discussion, Limitations, and Recommendations

The results of this study suggest that first-year students who used a library resource at least once were significantly more likely than their peers who did not use the library to report development of critical thinking and analytical skills, written communication skills, and reading comprehension skills. As researchers continue to explore the potential ways in which academic libraries contribute to students' success, this study—along with others[35]— suggests that the attendant benefits can also include students' development of learning outcomes beyond information literacy.

There are some limitations to this study that are noteworthy; for instance, data utilized in this study were drawn from a large, public, research-extensive university, a factor that may limit generalization to other institutional types.[36] Although we used propensity score matching analyses to achieve a degree of balance in the covariates, it is indeed possible that important unobserved covariates were not included in analyses that may contribute to students' use of academic library resources, their completion of the SERU survey, or their learning and development. Without inclusion of variables such as academic motivation, estimated treatment effects of library use may be biased and should be interpreted with caution.[37]

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Additional limitations are related to the sample size: 472 students reflects only 8.5% of the entire 2014 first-year class ($n = 5,530$). The sample was also skewed significantly in terms of students' sex—in 2014, 52.5% of the first-year class was female and 47.5% was male—a trend that we have observed in our surveys on this campus. We were not able to capture additional variables related to students' use of libraries that may be important markers of their libraries experiences such as study rooms or other physical spaces in the library.[38] These limitations should be taken into consideration by readers and future researchers.

Recommendations for future research include studying a different type of university population, using a larger sample that is equally composed of females and males, and including students' self-ratings of their academic motivation and students' use of specific types of library spaces as covariates.

Conclusion

Given the evidence presented here, academic library resources may prove to play an important role in students' development of learning outcomes beyond information literacy. While research at our institution continues, we encourage all academic libraries to gather data on students' use of academic library resources and connect those data points with other sources of data to better understand the potential impact of academic libraries on student outcomes.

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Multi-Method Assessment to Improve Library Instruction

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Introduction

Improving students' information literacy skills[1] has long been a significant part of academic libraries' core mission, tying them directly to the fundamental educational mission of their institutions.

It is not surprising, then, that academic libraries invest a lot of time and effort into instruction, both collectively and individually. In 2013–2014, for instance, 122 member libraries of the Association of Research Libraries (ARL) reported 140,510 library presentations to groups, 119,148 of which were held at 114 academic libraries in the US and Canada.[2] Even accounting for other types of presentations, variations in reporting, human error, or other ambiguities of interpretation, it is reasonable to assume that about 100,000 of those presentations were bona fide library instruction sessions. Assuming an average length of an hour per session, and a very conservatively estimated preparation time of two hours per session, the ARL community spent an estimated 300,000 hours or the equivalent of 7,500 workweeks on library instruction in 2013–2014. Averaged out over the 114 academic ARL members that reported in this category, the average library taught 877 sessions and spent 2,632 hours or 66 workweeks on these classes.

Much more precise calculations can be performed for individual institutions, including the total number of hours each instructor spent either teaching or preparing for a class, if the number of instructors is known. At Cornell University Library, for instance, in 2014–2015 we recorded 1,098 instruction sessions. Using the same

estimate of 1 hour of class time and 2 hours of preparation time per session, we spent 3,294 hours either teaching or preparing to teach. With a high estimate of 50 librarians whose assignments included instruction among many other responsibilities for that particular year, each instructor spent around 66 hours that year on instruction. Clearly, library instruction is a major area of resource investment both at our institution, and in the ARL community as a whole.

Given the amount of effort invested in library instruction, it is understandable that the profession has long emphasized both guiding and assessing these efforts. The *Information Literacy Competency Standards for Higher Education,*[3] approved by the Board of Directors of the Association of College & Research Libraries (ACRL) in 2000, have guided library instruction efforts for 16 years. These standards define information literacy as a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." It was only in June 2016 that the ACRL's Board of Directors rescinded the standards, having adopted the much broader *Framework for Information Literacy for Higher Education* in January 2016.[4] The latter focuses on information literacy through six "frames": authority is constructed and is contextual, information creation is a process, information has value, research as inquiry, scholarship as conversation, and searching as strategic conversation.

The question of assessing library instruction is pertinent to both the *Standards* and the *Framework,* although the methodologies are somewhat complicated. For a long time (and perhaps still to some extent), library instruction evaluation depended primarily on the use of input measures. However, in recent years, outcomes-based assessment has heavily influenced the library instruction community. Elaborating meaningful outcomes-based assessment measures for the six frames is arguably harder than for the earlier standards, as the skills associated with the frames are more dependent on and influenced by the whole educational experience of the student and not just library instruction.

Input measures are the easiest to collect and compare, of course: e.g., number of sessions and number of participants over time, possibly benchmarked against other institutions. Although input measures are relationally useful (how are we doing compared to past periods or to our peers?), there has been a lot of interest in developing outcome measures for more meaningful evaluation. Reaccreditation guidelines in higher education have advanced practices of learning outcomes assessment, so measuring student skills against learning goals has become more widespread. It is relatively easy to develop outcomes-based assessment for the ACRL standards for information literacy competency by measuring the degree to which the students are able to meet the learning goals of locating, evaluating, and effectively using information pre- and post- library instruction. This kind of outcomes-based assessment of library instruction is universally accepted theoretically, even if not yet practiced everywhere. Creating an outcomes-based assessment methodology and constructing relevant instruments to measure whether students have mastered and can transfer knowledge related to the six information literacy frames will probably take longer and may very well reach the impasse that seems to define the current debate around correlating library instruction (or use of the library in general) to student learning outcomes.[5] All of the frames are going well beyond library instruction and, in that sense, it would be difficult to argue for any correlation, much less causation, between library instruction and critical thinking development, for instance.

While useful learning outcomes–based assessment measures that are grounded in the *Framework for Information Literacy* are the aspirational goal, critical thinking, and especially growth in critical thinking over time, is notoriously difficult to assess. In the meantime, as an active participant in the process of higher education, the academic library is required to evaluate the success of library instruction, both for service improvement and resource allocation, or as a performance indicator for library instructors.

The evaluation can employ various formats and methodologies—from satisfaction surveys, through measuring learning goals achievement (or perception thereof) at the end of library instruction sessions, to anecdotal evidence, which can span the spectrum from repeat customers to thank-you notes. Very often, these are all conducted or received immediately following an instruction session, which can impact the responses positively.

What happens if overall perceptions of helpfulness and value from the two most important stakeholders of library instruction—faculty and students—are collected long after a specific library instruction session in the broader context of an overall assessment of the library or the entire academic experience? What can we learn from such data and how can we use what we learn to improve our instructional offerings or rethink library instruction altogether? And how can we reconcile data that seem contradictory?

Below we describe a Cornell University Library project—a case study of triangulating from various data sources and using findings and further investigation to create and assess the success of a pilot project intended to improve the student experience, not just their skills.

Faculty See Student Need and Positive Impact of Library Instruction

Cornell University Library conducted a locally designed census survey of all its faculty in 2014 with an overall response rate of 46% (48% among tenured and tenure-track faculty).[6] The survey subjects answered questions about a wide range of topics including their perception of the information literacy skills of their students, their use and the perceived impact of library instruction, and, for those who don't use library instruction, the reasons for forgoing this service.

Faculty are less than satisfied with the information skills of their students. University-wide 33–39% of faculty said that fewer than

half of their undergraduates meet their expectations when it comes to the following four major information literacy competencies:

- Citing sources, according to 33% of faculty
- Finding appropriate scholarly information on their research topic, according to 38% of faculty
- Developing and refining research topics, according to 39% of faculty
- Evaluating information sources critically, according to 35% of faculty (Figure 1)
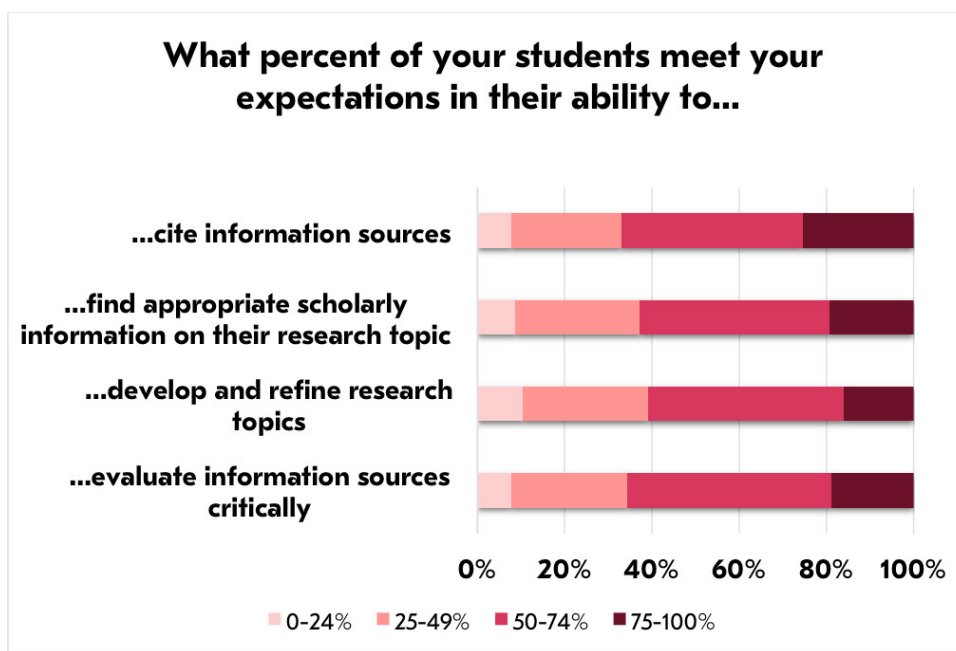

Figure 1: In 2014 33—39% of Cornell faculty said that fewer than half of their undergraduate students meet their information literacy expectations.

On a more granular level, at some Cornell colleges and schools the situation is even more dire. For example, at one particular school up to 73% of faculty found that fewer than half their students had these important skills.

The next survey question asked about the use of library instruction sessions designed to help build these skills in students. Only 31% of respondents had used these services, 69% had not. Of those who had

worked with librarians in the classroom to build students skills, 56% found that the sessions provided a great deal of help, 35% said they were a fair amount of help, and 9% found them to be of a little help. Nobody responded that the sessions were not helpful. (Figure 2)
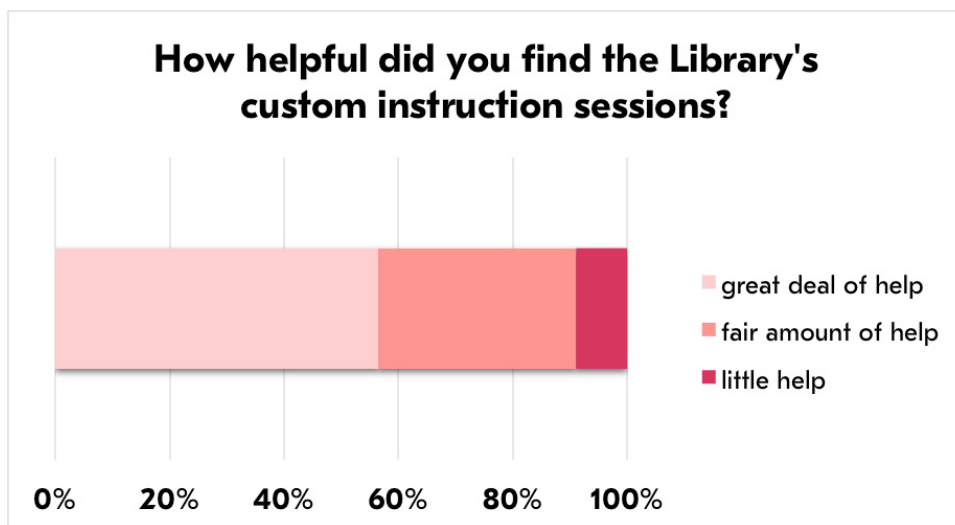

Figure 2: In 2014 Cornell faculty rated the helpfulness of library instruction sessions. No respondent chose the "were of no help" option.

The respondents who had not used library instruction were asked to identify all the relevant reasons why they hadn't made use of the service. Overall, the reason identified by most respondents, 41%, was lack of awareness of the service. In one school this number was as high as 70%. The second reason, chosen by 30% of faculty was that these classes are not relevant to the specific classes taught. 8% don't look to the Library for help in this area, 6% find student skills sufficient, 4% said the gain does not justify giving up class time, 1% said they had tried using the service before but it wasn't helpful. 10% identified other reasons. (Figure 3)
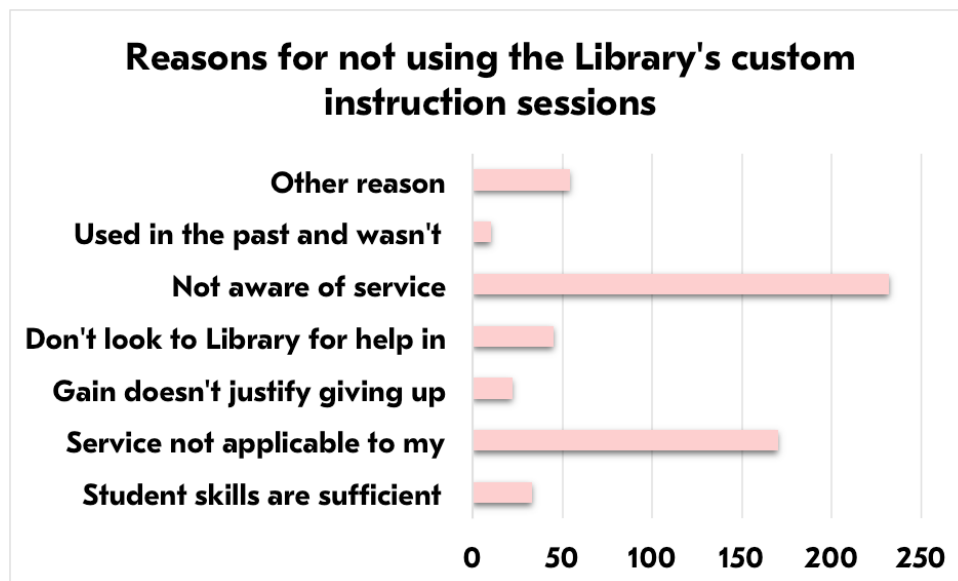
Reasons for not using the Library's custom instruction sessions

Reason	Value
Other reason	~55
Used in the past and wasn't	~10
Not aware of service	~230
Don't look to Library for help in	~45
Gain doesn't justify giving up	~20
Service not applicable to my	~170
Student skills are sufficient	~35

Figure 3: The most common reasons Cornell faculty did not use library instruction session in 2014 were lack of awareness and lack of applicability to their specific classes.

These survey results show that overall faculty see a need to improve information literacy skills in their undergraduates, that they find library instruction to be a helpful tool to build skills, and that the biggest obstacle to their using instruction is lack of awareness that it exists. By looking at this data by itself we could conclude that overall our instruction program is quite successful, all we need to do is promote it more to those faculty who are not yet aware of its existence and value.

Many Students Don't Find Library Instruction Helpful

Faculty are obviously a major part of the educational equation, and so are students. Finding out how students feel about the helpfulness of library instruction was the next step in assessing the perception of the library instruction program by major stakeholders. Cornell identified the 2015 Consortium on Financing Higher Education (COFHE) Enrolled Student Survey (ESS) as a potentially useful vehicle to gauge undergraduate perception both at Cornell and at as many of the other COFHE schools as possible. With Cornell's

leadership, a group of librarians from a handful of libraries approached COFHE and worked with them to formulate an optional panel of library-related questions that the participating universities and colleges could choose to add to the consortial core of the instrument. We also worked to alert the libraries at the COFHE institutions to the availability of this panel and encouraged them to talk to their institutional research offices if they wanted to see these questions asked. Out of the 34 universities and colleges that ran the survey that year, 29 (85%) ran questions from the new library module, and 27 (79%) chose formulations that were directly comparable. Figure 4 shows the participating institutions and their response rates.

2015 COFHE ESS response rate
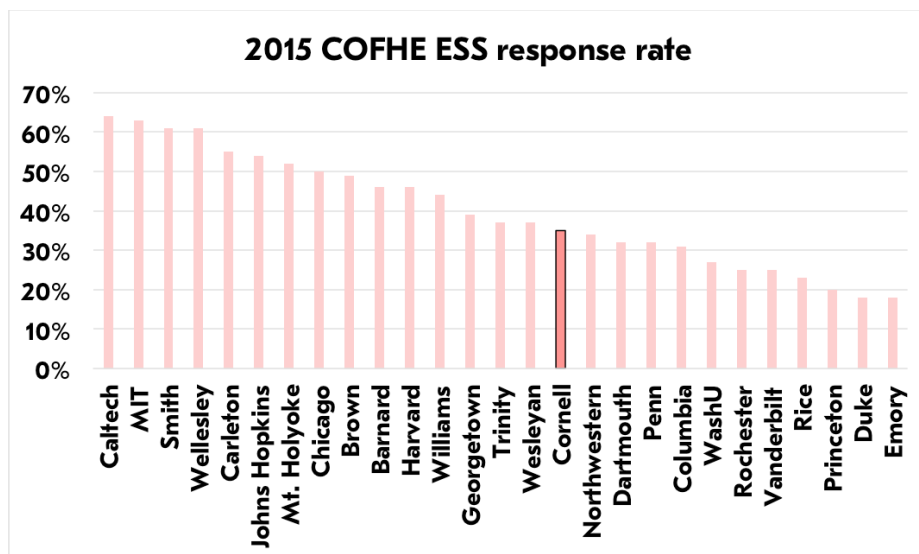
Figure 4: Participating institutions and their response rates in the 2015 Consortium on Financing Higher Education (COFHE) Enrolled Student Survey ESS—universities and colleges that included the same question about the helpfulness of library instruction.

The survey question relevant to instruction was: During the current academic year, how helpful have library classes and presentations been to you? The possible answers were: not very helpful, somewhat helpful, very helpful, and didn't use. At Cornell 54% of respondents reported having used library classes and presentations in the current academic year. This proportion was somewhat lower at the peer institutions, 42% at the other Ivy League institutions

and 40% at the non-Ivies (the two normative categories that COFHE provided for our benchmarking analysis). (Figure 5)
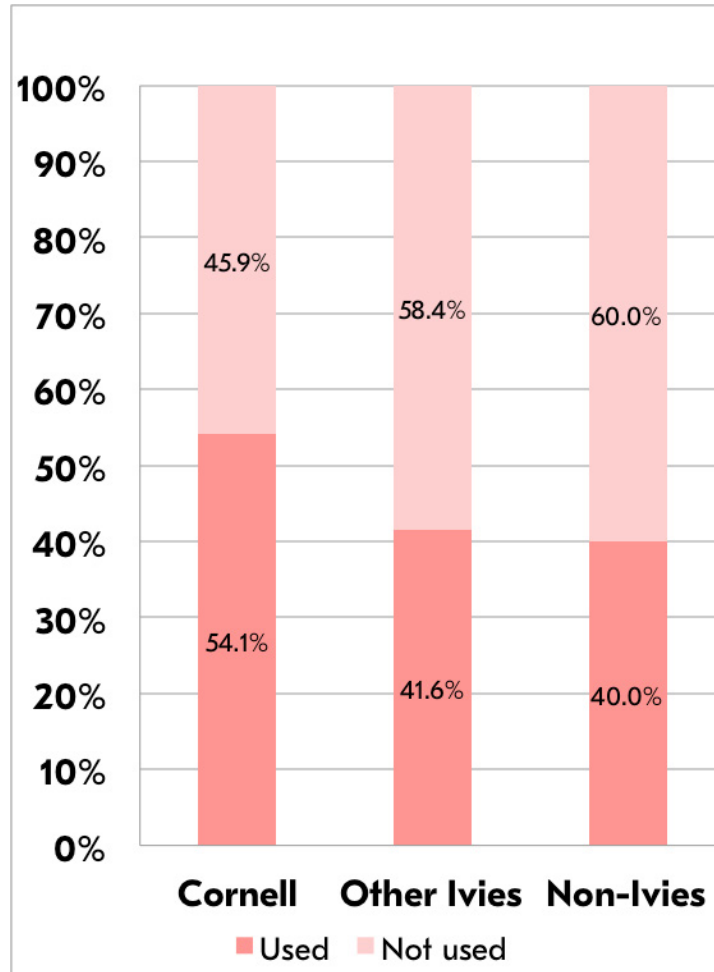

Figure 5: The 2015 COFHE ESS survey shows a slightly higher rate of library instruction participation at Cornell than at the peer institutions.

While there were some differences between Cornell and the normative peer groups in rate of use, the perceived level of helpfulness of the classes and presentations was quite uniform: an astonishingly high 38–40% found them not very helpful, 39–41% rated them somewhat helpful, and only 20–21% said they were very helpful (Figure 6). The remarkable similarity of these results across the normative groups

seems to indicate that these findings are valid for the current state of library instruction without major institutional differences.
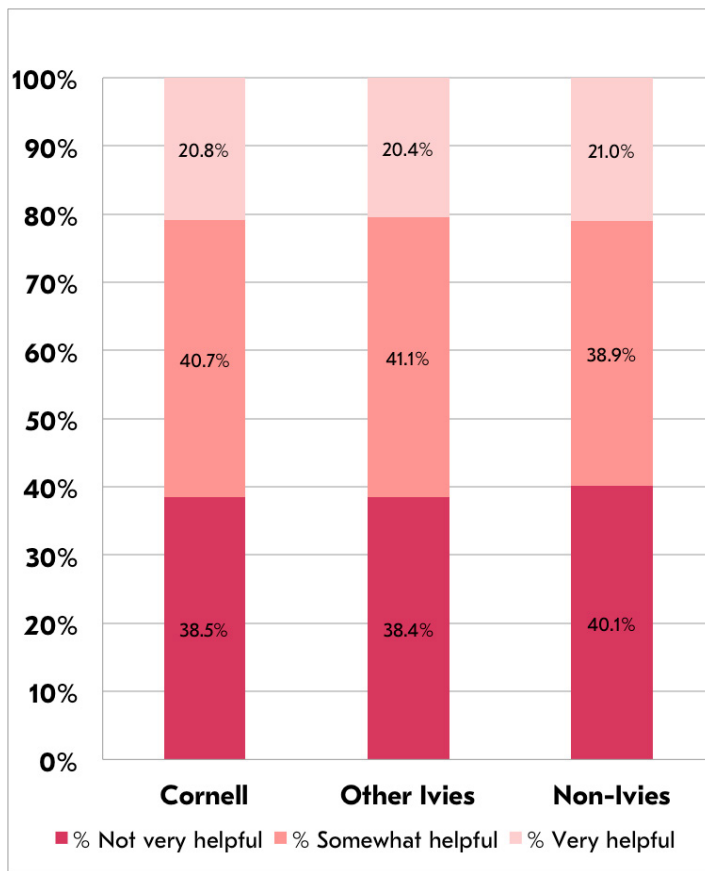
Figure 6: Student's perceptions of library instruction's helpfulness are shown to be uniformly low in the 2015 COFHE ESS.

These disappointing results came as a stark contrast to the positive view of the faculty. These results were also very different from numerous satisfaction surveys that we had conducted immediately following instruction sessions with the respective participants. For instance, a specially convened assessment task force worked on an instrument in the fall 2015 semester and recruited volunteer library instructors teaching classes with a specially designed research assignment to administer the survey at the end of their classes. Please note that only classes with research assignments were assessed, since one possible explanation of why the COFHE results were

so disappointing was the fact that students were remembering various tours, general workshops, or general introductory sessions when they were rating the helpfulness of their overall experience. Whether this assumption is correct or not is immaterial since with the 2015 assessment study we wanted to test the hypothesis that the presence of research assignments in the class increases the (perceived) helpfulness of library instruction sessions.

There were 291 students who took the post-session survey and 98% of them rated the instruction as helpful (Figure 7):
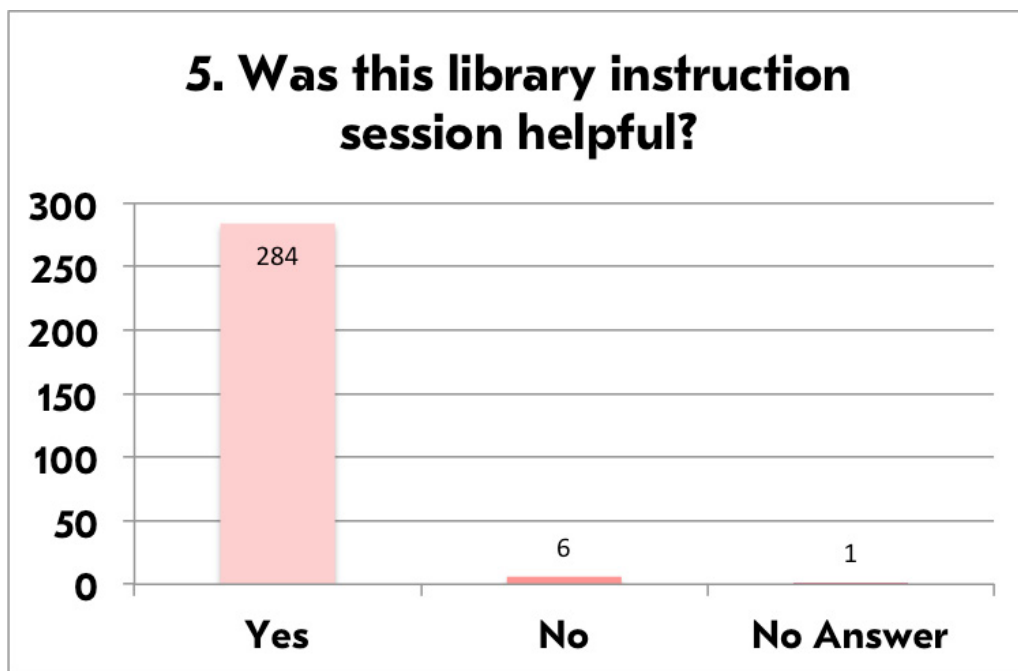
Figure 7: Student perception of the helpfulness of library instruction sessions measured immediately after sessions with research component (Cornell, 2015).

Student Focus Group Shows Issues with Scaffolding

Even though the hypothesis of "presence of research assignment results in higher levels of satisfaction" might appear to have been confirmed by the results above, there still remained untested variables. Does time influence the memory of library instruction negatively? Does the presence of the instructor while the survey is administered impact students' perception of its helpfulness in a positive way?

In order to understand better what might be behind the contradictory results, we decided to use a self-selected student group, the standing Student Library Advisory Council (SLAC) and discuss the results with them. The students on SLAC are representative of the student population at Cornell in the sense that each college or school dean nominates two representatives to serve on the council. However, they are not a representative sample in that they have been nominated precisely because they are invested in the library and its engagement with the academic enterprise in one way or another. Their investment in the success of the library, as well as the fact that we already had experience working with the group (the university librarian and the associate university librarian for research and learning services meet with the group monthly) and were familiar with how vocal and frank with their concerns they could be, suggested to us that we would get useful feedback.

We presented the results of the faculty and student surveys and asked the members of SLAC to brainstorm reasons why such considerable differences in perceptions of helpfulness and value existed, as well as suggest ideas of how library instruction might be improved.

The reasons proposed as an explanation of the low ratings library instruction received on the COFHE survey, included:

- Library instruction is forced
- Many students have gone through library instruction in high school

- Instruction is redundant: during their Cornell years, students experience "effectively the same presentation" multiple times
- Quality of instruction varies (it is often not engaging enough; instructors just "throw tools at you")
- Conceptually, library instruction is often too centered on fairly intuitive search engines; or it is too general

Asked about possible explanations of why at the end of library instruction sessions 98% of the students rated them helpful, while on the end-of-year ESS survey 38.5% of those who participated in library instruction found it not very helpful, the students offered various explanations: students forget what they learned, at the end of the session they feel bad if they don't rate positively, on the COFHE survey they were rating library instruction in relation to their overall academic experience, etc. Ultimately, the agreement coalesced around the perception that library instruction is too tool-based and is not teaching critical thinking.

The suggestions for improving it included:

- Replace instruction sessions with one-on-one sessions
- Turn instruction into a Q&A session
- Divide classes into smaller groups so that individual questions can be addressed

All of the suggestions clearly connected to the flipped classroom model where the content (or part of it) is delivered online and face-to-face interaction is reserved for customized help.

Pilot Project

In order to address some of the points made by the members of the Student Library Advisory Council, especially those about redundancy and "experiencing effectively the same

presentation," we decided to create a pilot project that emphasized customization, the flipped classroom, and specific assignments.

When we discussed the findings about the library's instruction program with the director of teaching excellence of Cornell's College of Engineering, she proposed a collaboration with two of the engineering courses that she was helping to redesign at the time. Tying in with the flipped classroom concept employed in the course redesign, the library produced a number of short instructional videos, each to develop a specific skill. All of the videos were of the "how-to" type: how to find high-impact articles; how to find authoritative, scholarly articles; how to find phase diagrams; how to find high-quality videos of experiments; etc. These videos were then embedded in the Blackboard syllabus to accompany specific assignments needing such skills for a truly on-demand, just-in-time instruction experience, where students who already have the appropriate skills can easily skip the items they don't need. This partnership made even more sense because, among all the Cornell colleges, the engineering faculty's evaluation of the usefulness of library instruction was one of the least positive. The pilot project targeted two fall 2015 engineering courses and produced a total of eight videos by two subject librarians. The length of the videos was between two and eight minutes. Two different methods were used for presentation. One used a split-screen method that showed the librarian, subtitles, as well as screen capture of the information resources being discussed. The other used only the screen capture with narration and subtitles. All videos were entitled "Ask a Librarian," followed by the content of the video posed as a question. The reasoning behind this approach was to also use this opportunity to brand the library and show students the kind of research help they can expect to get from a librarian.

Project Evaluation and Conclusion

We evaluated the video project in various ways. An indication of usage was the number of times the videos had been accessed along with

the average viewing length. The logs revealed that the videos were viewed 701 times excluding views by the instructors, with an average length of 1–3 minutes. Of the 701 views, 220 show no time for the duration watched, which we surmise means that someone clicked on the link and then immediately closed it. There were 481 views that recorded time watched, with various lengths—from 1.2 seconds to the full length. We are still not sure what to count as legitimate "views."

To put the numbers in perspective, the overall number of the students enrolled in the classes was around 150. One class had 100, the other had 50 students. The number of unique users for each video varied between 89–100 for the larger class and 26–43 for the smaller class. The two videos that were available for both classes ("Getting Access to Library Resources" and "How Do I Find High-Quality Lab Videos") were accessed by 74 and 43 unique users respectively.

A mid-term survey was administered to the students enrolled. When asked if the videos helped them complete the assignments, 79% replied yes.

The free-text comments varied from positive to critical. An example of a positive comment is: "I think your presentation is very good—and that is part of why I like it so much. The other part is that many professors expect you to know how to do research often without really teaching you." The critical comments focused on the content, not the form: "I found it to be poor advice to stick to PubMed and Web of Science compared to Google Scholar. Their main criticisms of Google Scholar actually have solutions on the GS page, they just didn't go over that."

The librarians who produced the content and were featured in the videos received some unsolicited feedback, which was overwhelmingly positive, as this one illustrates:

> I just wanted to drop you a quick line and say that I found some of the Panopto videos that you made very useful and informative. I am

in a class for [Prof. X] [who] gave us some links to specific ones.

I think you've done a great job of explaining things clearly and that the video format is a good way to create a resource that can keep on working that you can send people to rather than only dealing with questions one on one. So I wanted to say, that I thought they were really well done, and then also ask you if there is a way to access all of the ones you have made?

[Prof. X] gave us links through Blackboard to about 5–7 videos but I didn't know if there was some central hub where I could see all the ones that have been made?

Finally, we used the same group of Student Library Advisory Council members to show these assignment-specific videos, and two other library online modules created previously—one on general library research, one on business research. We asked the students to rate the videos and then discuss their ratings. The newly created engineering videos were the highest-ranked because they were specific and short. They were also clearly preferred because of the newer technology used, e.g. captions, the ability to speed up or slow down, etc.

Next Steps

What are the data-driven decisions about library instruction that we have made based on the triangulation of data?

In the absence of a required information literacy course at Cornell, and considering the demands on librarians' time, both from instruction and from other priorities, as well as the sentiment expressed by students that they get "basically the same presentation" in different classes, we have decided to focus on quality over quantity.

This translates into several points. First and foremost, our instruction efforts should be focused on classes with research assignments or components, which means that one big portion of our engagement—

teaching of freshmen writing seminars—may very well have to be contracted. If the writing class has no genuine research assignment, and since 98% of the students who had library instruction in connection to a research assignment found it helpful, then we should not be spending precious energy and resources on general sessions for classes with no research component. Another way to look at it is that it is imperative for library instructors to work with faculty to have library instruction be an intrinsic part of their syllabi, rather than an add-on, or a filler. This may very well mean that we teach upper-level classes more often than we teach freshmen writing seminars, or that we flip the freshmen writing seminar classes into essentially an upper research-level class by working with the instructor to create a research assignment. Undoubtedly, our numbers will go down, both in terms of number of sessions and participants reached, but if that translates into better-quality library instruction that students perceive as helpful and valuable, our efforts would have been well spent.

Second, we are focusing on teaching critical thinking skills, not on tool demonstration and explanation. This is where the ACRL *Framework for Information Literacy* comes in—we are not teaching students how to complete a particular assignment, but educating them about research. As important as citation guides, for instance, might be, there is hardly a student (or a faculty member, for that matter), who upon reading a citation guide, would exclaim, "This totally changed the way I am thinking about my research topic." With the profound changes that affect higher education, research, and teaching in the digital environment, how-to information is easier to capture and process digitally than the elusive "aha" moment. The valuable face-to-face interactions should be reserved for the "aha" moments.

In practice, this means that everything that is procedural or how-to information should be transitioned to online videos/tutorials and classroom time should be reserved for unique help. Classroom time could take the form of one-on-one consultations on specific research projects or answering questions in a small group. This could also mean that librarians meet only with

students who come with questions that have not been answered by tutorials because they are unique to their projects.

Our first step towards flipping the classroom for library instruction has been the creation of an online learning task force. This group is charged with creating videos and increasing staff proficiency so that instructors can easily create short videos on their own following best practices of communication and branding. This will free up time for face-to-face interactions that tackle unique problems and teach students not how to do research, but what research is.

Acknowledgments

Endnotes

[1] The Association of College & Research Libraries (ACRL) defined information literacy as the ability to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" in their *Information Literacy Competency Standards for Higher Education* (Chicago: ACRL, 2000), http://www.ala.org/acrl/sites/ala.org.acrl/files/content/standards/standards.pdf.

[2] Martha Kyrillidou, Shaneka Morris, and Gary Roebuck, comps. and eds., *ARL Statistics 2013–2014*, "Personnel and Public Services: Summary Data," (Washington, DC: Association of Research Libraries, 2015), http://publications.arl.org/ARL-Statistics-2013-2014/36.

[3] ACRL, *Information Literacy Competency Standards*.

[4] ACRL, *Framework for Information Literacy for Higher Education* (Chicago: ACRL, 2015), http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/Framework_ILHE.pdf.

[5] For a very useful summary, see Megan Oakleaf, "The Library's Contribution to Student Learning: Inspirations and Aspirations," *College & Research Libraries* 76, no. 3 (March 2015): 353–358, http://crl.acrl.org/content/76/3/353.full.pdf+html.

[6] The survey instrument, summary, and full results can be found on the Cornell University Library Assessment & Communication website at https://ac.library.cornell.edu/data#FacSurvey.

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