Answering "How" and "Why" Questions of Library Impact on Undergraduate Student Learning

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Introduction

The ACRL *Value of Academic Libraries* report reviewed the current state of the art in library impact and value research.[1] The report closes by describing a broad research agenda intended to move library impact research forward. The agenda is structured around several essential research questions and suggested approaches to close gaps in the literature. One of the most important questions to answer is 'How does the library contribute to undergraduate student learning?'[2]

The search for methods to detect and communicate library impact on student learning has been long and difficult. In 1992, Ronald Powell noted the lack of methods appropriate to this task and called for new work in this area.[3] More recently Joe Matthews has noted the need for effective methods and has suggested approaches based on findings from the literature of college impact.[4] However, as Roswitha Poll and Philip Payne[5] point out, there are several methodological challenges associated with this kind of work. For instance, they note that the diversity and time-consuming nature of most methods have limited the comparability of results. They also observe that libraries face challenges in accessing the student performance data necessary for measuring library impact on student learning.[6]

As librarians, each time a new article appears on this topic, we may hope that finally someone has an answer to this question: "Yes—we finally have evidence that libraries contribute to student learning!" In truth, we know libraries make a difference. What the profession is really seeking are methods that can be used to answer these questions in a local institutional context: How does library use contribute to student learning? And how can libraries communicate that impact in terms that make sense to stakeholders? Instead of finishing the conversation with a definitive 'yes' or 'no' response, librarians need methods that bring them into the important conversations about student learning currently taking place on college campuses across the country.

Approaches and instruments for detecting and communicating academic library impact on student learning must meet three criteria:

1. First, they need to make credible connections between library use and student learning outcomes.
2. Second they need to get behind the numbers and illustrate why students use or do not use the library and how that use makes a difference.
3. Third assessment resources are finite, so library impact assessment instruments must work at scale.

This essay addresses each of these points using the example of a flexible suite of instruments called the Understanding Library Impacts (ULI) protocol.

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## About the Understanding Library Impacts protocol

The Understanding Library Impacts protocol is designed to help libraries detect and communicate their impact on undergraduate student learning. A conceptual framework is used to guide the selection of metrics, units of analysis, and research methods. The ULI framework is based on a series of straightforward assertions: Students use library resources, services, and facilities during high-impact academic experiences in the academic major. These are times when students develop and demonstrate general education and discipline-specific student learning outcomes (SLOs) defined and assessed by faculty and most highly valued by stakeholders. Finally, impact on student learning should be communicated to stakeholders using general education and discipline-specific learning outcomes frameworks.

The ULI protocol features two instruments. The Critical Incident Technique (CIT) is used in questionnaire form to gather both quantitative and qualitative data about student use of library resources, services, and facilities during academic work. The CIT has been used widely in library and information science (LIS) research to examine the factors that contribute to the success or failure of information seeking and use activities.[7] The method relies on observation or more commonly self-reports, as participants are asked to "please think back to a memorable time when …" they were engaged in the activity in question.

Undergraduate student responses to the ULI questionnaire are stored in a database along with an encrypted student identifier. Responses can be examined by individual student or in the aggregate by discipline, institution, or level (2-year versus 4-year institution). Gathering and storing data at the individual student level allows institutions to link ULI responses to other institutional datasets such as assessment results or library use data.

The ULI protocol also uses a 'Learning Activities Crosswalk' that supports connections between library use and two student learning outcomes frameworks. Until recently, the absence of agreed upon expectations for student learning in college has long been a major obstacle to this kind of analysis and reporting. Fortunately, the ULI protocol can leverage work being done by other groups who are creating and validating frameworks for general education and discipline-specific learning outcomes.

FIGURE 1
A Conceptual Framework for the ULI Protocol
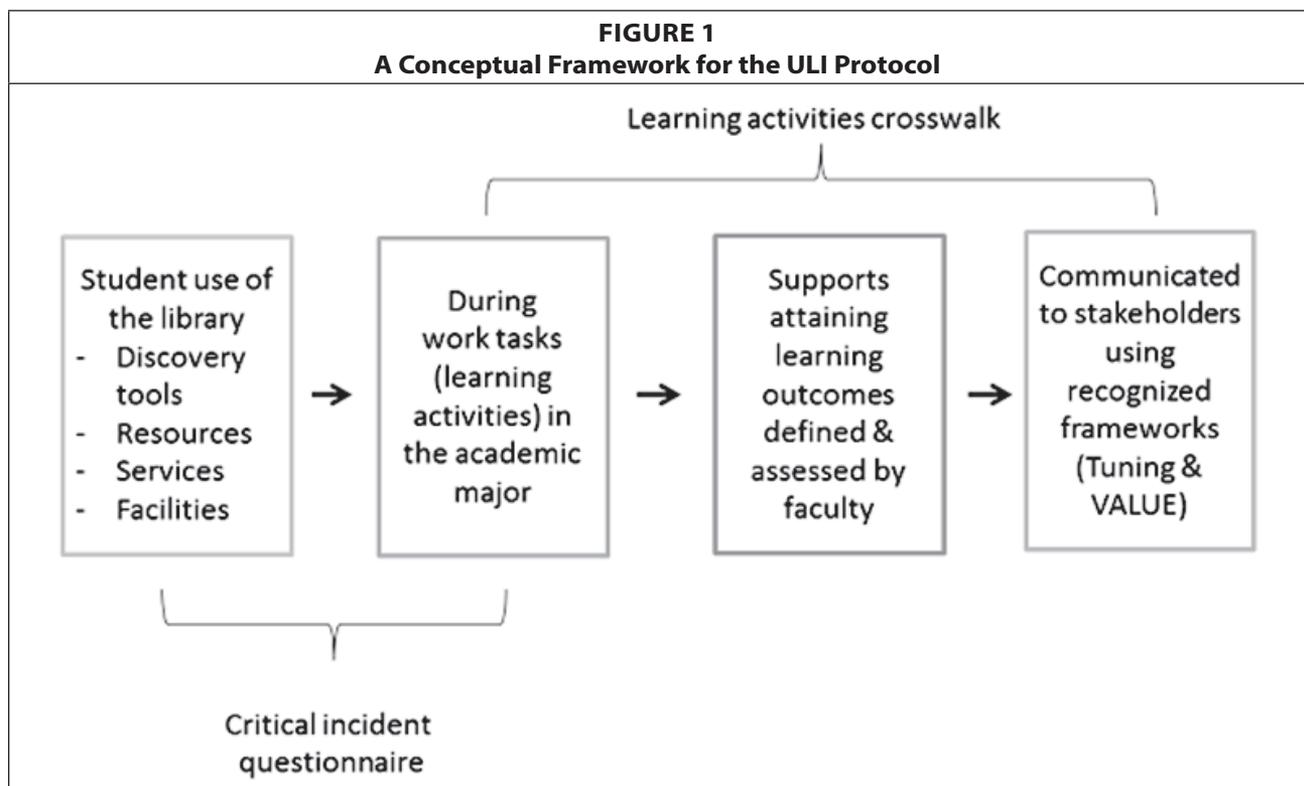
The Association of American Colleges and Universities (AAC&U) defined Essential Learning Outcomes expected of all college graduates.[8] The AAC&U also developed VALUE rubrics in areas such as critical thinking, information literacy, quantitative reasoning, and written and oral communication intended to guide local development of rubrics for assessing student competency in these broad abilities in general education.[9]

Discipline-specific frameworks are emerging from Tuning projects funded by the Lumina Foundation. A Tuning project is a collaborative process in which faculty, recent graduates, and employers create a shared understanding of what competencies are expected of graduates in a given academic discipline such as chemistry, history, or education.[10] Projects conducted in the last 4 years have generated "Tuning outcomes" in several disciplines at the associates, bachelors and master's degree levels.[11] Tuning outcomes can guide teaching practices, the assessment of student learning, and communicating student competencies to stakeholders.

The ULI protocol has been used in ten library assessment projects over the past 2 years. Six projects with students enrolled in undergraduate history courses were conducted at four-year institutions during the 2011 calendar year and three more history projects are underway during academic year 2012-2013. Examples from these projects will illustrate the three criteria for effective library assessment instruments: creating credible connections, answering how and why questions of library impact, and working at scale.

Creating Credible Connections

Academic libraries need to be able to generate credible connections between library use and student achievement of intended learning outcomes. Librarians need to trust their assessment methods and believe in the results. Methods should also be rigorous and meet the standards of institutional research and assessment professionals in our institutions. Finally, methods need to make connections to the student learning outcomes that are defined by faculty and are relevant to stakeholders. The ULI protocol addresses these issues in the selection of metrics and units of analysis.

Student learning outcomes (SLOs) describe what "faculty intend for students to think, know, or do as a

result of completing their education."[12] The ULI protocol examines library impact on student learning outcomes defined for a given discipline. For instance, a recent graduate in the discipline of history would be expected to demonstrate the abilities to 'develop a thesis statement', 'build an argument based on evidence', and 'communicate the argument in a coherent paper or presentation.' Learning outcomes expected of graduates within an academic major describe the competencies most clearly defined by faculty and best understood by stakeholders.

Next, a research design needs appropriate levels of analysis. Library assessment projects often focus on independent information interactions or cumulative use of resources over time. The ULI project takes a different approach and examines information use during high-impact learning activities when students are developing and demonstrating the SLOs expected for graduates in a discipline. High-impact educational activities are those "practices that educational research suggests increase rates of student retention and student engagement."[13] Students engaged in activities such as first-year experiences, writing-intensive courses, undergraduate research, and capstone courses work hard, interact meaningfully with faculty and fellow students, and report higher learning gains than other students.[14]

ULI projects in history conducted over the last 2 years have focused on student effort in writing-intensive and capstone courses.[15] Capstone courses are end-of-course culminating experiences in which undergraduate students complete a project "that integrates and applies what they've learned"[16] demonstrating the SLOs expected of graduates in their major.

Capstone projects make a logical focus for examining library impact. Faculty expectations are high and student effort should be as well. Capstone project assessment results also serve multiple purposes. First, they serve as a summative assessment of individual students' competencies in their discipline. Second, capstone assessment results can be considered in the aggregate for program-level reviews.[17] If the academy is already focused on learning expectations for the capstone project and its assessment, it makes sense to examine how students use the library during these experiences.

Library Use in ULI Studies to Date
In 2011 and 2012 almost 200 students completed the

CIT questionnaire in ULI history projects. Response rates have ranged from 30% to 80% and patterns are emerging. These trends will be illustrated drawing from fall 2012 responses of undergraduate students working on research papers or capstone projects.

Library use is essential to these students' experiences as 98% of respondents who were working on research papers in history used discovery tools like library catalogs and article databases, 96% used electronic resources like electronic journals and electronic primary sources, 95% used traditional resources like books and archival resources, 94% reported using library facilities or equipment, and 84% reported using library services like reference, instruction, and interlibrary loan. Respondents claimed to use an average of 13.5 different types of tools, resources, services and facilities when completing projects.

Drilling down into these data it is no surprise that books (used by over 90% of students), the library catalog (89%), electronic primary sources (60%), and interlibrary loan (37%) are heavily used by these students working on their history projects. Several independent projects report that many students start their research with internet search engines.[18] The student participants in these ULI projects are no exception

as 60% of respondents working on research papers in the fall 2012 projects claimed to use search engines, yet only a few claimed search engines were their most important tools. Instead the library catalog, electronic journals, and electronic primary sources are frequently cited as most important discovery tools or e-resources.

The proportion of students claiming use of in-person services such as reference or research consultations has been refreshingly high in these projects. In the 2011 projects, 48% of students claimed use of in-person services; in 2012 projects the figure stands at 50%. And in all studies conducted in 2011 and 2012 students who claim benefits from library instruction were also more likely to use reference and research consultations than those who did not. Students using in-person library services were more likely to report increases in confidence after completing their projects. These trends will be followed and reported as the ULI dataset grows.

Use by Learning Activity

When responding to the ULI questionnaire, students identified the learning activities they were engaged in when using their most important discovery tools, electronic and traditional resources, library facili-

FIGURE 2
Proportion of Respondents Reporting "Most Important" Library Uses,
by Learning Activity—Fall 2012 (N=46)
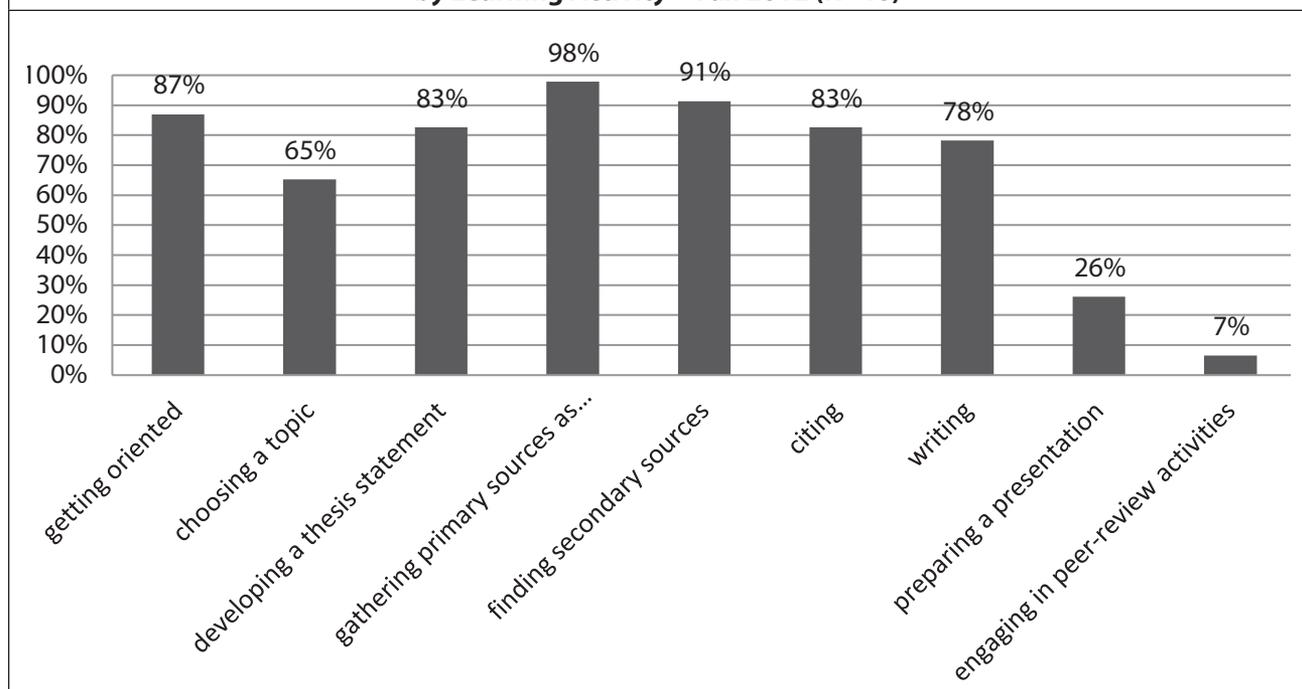
ties and equipment, and library services. In history projects the learning activities reflect the stages that students go through when completing their work, including:

- getting oriented,
- choosing a topic,
- developing a thesis statement,
- gathering primary sources as evidence to support an argument,
- finding secondary sources,
- creating a bibliography,
- writing,
- preparing a presentation, and
- engaging in peer-review activities.

Over 75% of respondents in the fall 2012 history projects working on research papers used their 'most important' discovery tools, information resources, services, or facilities in 6 of 9 learning activities during the project (Figure 2). It is hardly a surprise that students use the library when gathering evidence or finding secondary sources; but it is affirming that students are making use of the library during topic formulation and writing stages. Participation rates in these activities have remained high in all of the ULI studies conducted to date, suggesting their validity among these samples.

Drilling down into the data, figure 3 depicts student use of 'most important' library uses by type of use and learning activity.

Tracking library use by learning activities supports connections between library use and student learning outcomes frameworks. For example Tuning projects in history were conducted in Indiana and Utah in 2009.[19] The Indiana project generated outcomes in four areas: knowledge, thinking and analysis, communication, and personal motivation. The learning activities crosswalk maps use during each learning activity to associated Tuning outcomes. For instance, students gathering primary sources as evidence to support an argument are working toward the Indiana Tuning outcomes of

- Finding and handling information
- Evaluating texts and primary sources, and
- Formulating and testing hypotheses

As shown in figure 2, over 95% of the respondents in fall 2012 ULI studies working on history research papers used library-provided discovery tools, information resources, services, and facilities when gathering primary sources as evidence to support an argument. This illustrates clear evidence that library use is one of the factors contributing to student achievement of SLOs. Other data gathered in the remainder of the protocol help illustrate how that use makes a difference.

Answering How and Why Questions of Library Impact

Generating correlations between library use and student learning tells only half of the story. Libraries

FIGURE 3
Proportion of Respondents Reporting "Most Important"
Library Uses, by Learning Activity and Type of Use—Fall 2012 (N=46)
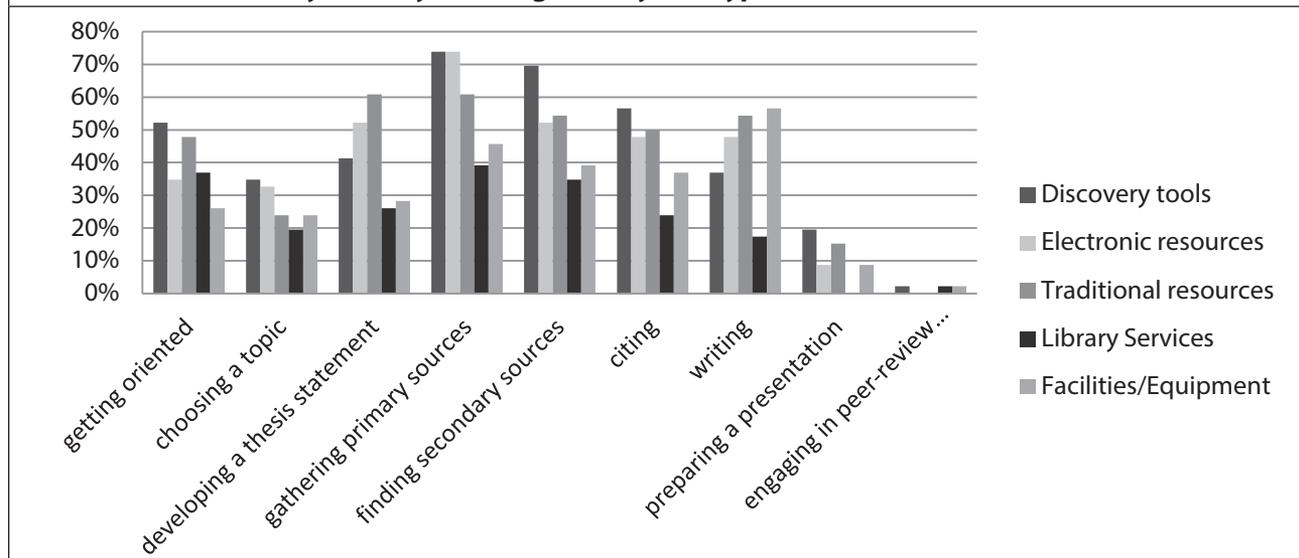
need to know why students choose to use the library and how that use makes a difference. Answers to these questions can be used to support improvement and advocacy. The Critical Incident Technique is well-suited to this task allowing a researcher to gather rich details about an event detecting the "nuances of quality that are lost in most survey data collection."[20] The CIT questionnaire used in the ULI protocol includes several partially-open questions that probe student experience.

As James Neal wrote in 2011, our profession needs "qualitative measures which help us to understand library contribution to successful graduates, productive faculty, and institutional advancement."[21] However, as Poll and Payne write, qualitative data are subjective and "… should be compared with results of quantitative methods or with statistics of library use in order to validate the results."[22] The ULI questionnaire meets this challenge by using the CIT to gather both quantitative and qualitative data about library impact. Responses to open-ended questions generate rich stories that, as Poll and Payne write, are "invaluable in reporting to the public and the institution, as it serves to make statistics understandable and believable."[23]

Use of Library Space

For instance, sixty-eight percent of 2012 ULI respondents working on research papers in history reported using library space. Predictably, students claimed use throughout their projects but use of most important facilities peaked during the writing and citing stages of these projects (see Figure 3). These students also reported 285 distinct 'helps' and 'problems' related to their use of facilities. Ninety-five percent of these 'space-users' valued quiet space to study alone, 45% valued space for studying with friends, and 36% reported used library space to work with project partners. Seventy-one percent of these students valued space because of its proximity to information sources needed for their work and 33% valued library space because of its proximity to in-person services.

Responses to open-ended questions about library space provide anecdotes that reinforce these figures:

> "Library facilities were excellent and provided students with the resources to succeed."

> "I felt very satisfied with the library facilities and equipment. I also like that there are group study rooms and that food is permitted. That's nice."

> "I really liked being able to use the project rooms because it gave my partner and me a room in which to work on our project without distractions"

Complaints also signaled the importance of space, such as these complaints.

> "Make more study spaces"

> "Computer availability is sparse. Sometimes the floors are too loud."

> "The facility was not always open … hours are too short."

Challenges Faced

Another set of open-ended questions elicits feedback regarding a challenge students faced when completing their projects. Forty-two of 46 students working on research papers in fall 2012 ULI projects reported challenges. Twenty (47%) reported on challenges related to the assignment and 22 (53%) reported on issues related to library-provided resources, services, or facilities. Each challenge was also categorized by task type. Many respondents report on problems with information seeking tasks such as these comments:

> "I had trouble finding secondary sources to incorporate into my work."

> "Finding primary sources."

Other students reported challenges related to academic work tasks:

> "Narrowing my topic down and establishing a thesis."

> "Trying to determine what my thesis would actually be and begin conducting research."

> "I was not sure how to take the sources I did find and organize them into a coherent argument"

Students also identified the learning activities during which each challenge was faced. As seen in Figure 4, challenges were faced throughout project life-cycle. The fact that these patterns parallel those

seen in Figures 2 and 3, provides further evidence of the stability of the learning activities and the credibility of students' responses. Finally, almost one half of the challenges faced were related to aspects of the assignment. Associated comments exposed rich data about students' problems with certain academic work tasks, generating data of great utility to faculty partners in these projects.

Working at Scale

As noted in the introduction to this essay, Roswitha Poll and Philip Payne pointed out several scale-related challenges associated with detecting library impact. Among these include the time-consuming nature of most methods, the difficulty of accessing student performance data, and the fact that a diversity of research methods limit benchmarking and data reuse. The ULI project and other projects conducted in the last two years have begun to address these challenges.
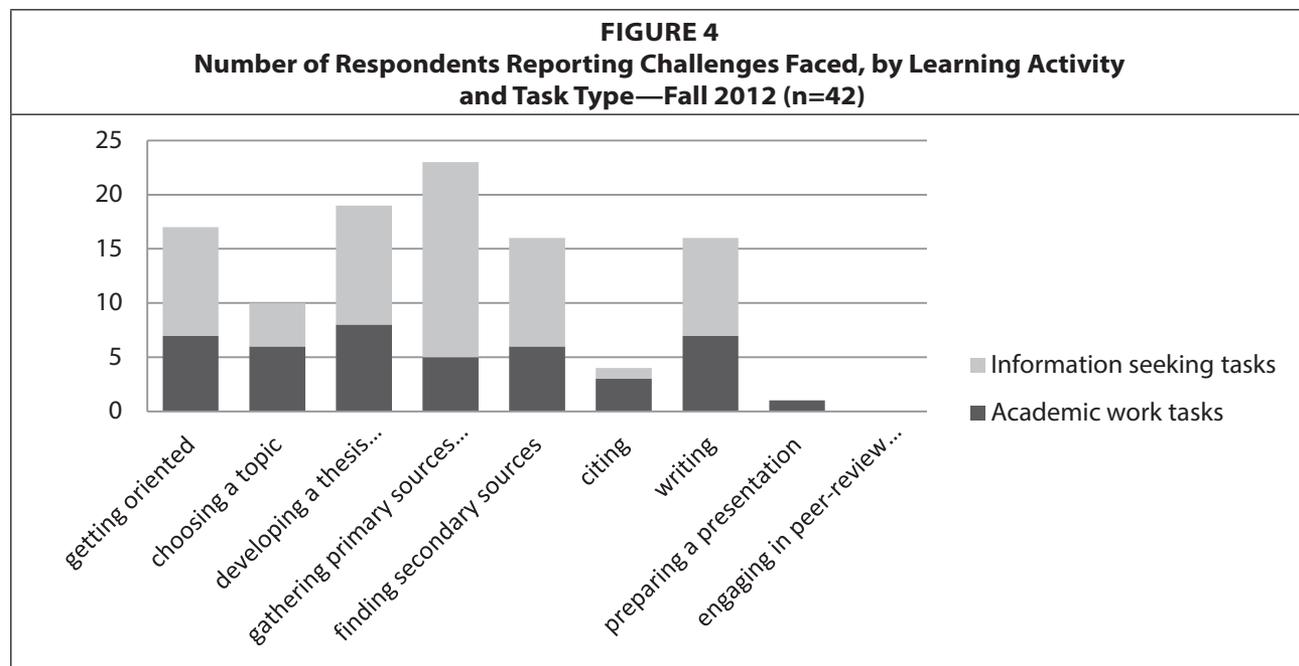
Improving Efficiency

The ULI project has tackled the problem of efficiency by automating the data collection and analysis life-cycle. Although initially developed and refined in interview-based studies, the ULI questionnaire is now presented online using the Qualtrics[24] survey application. Students enter their institutional student identifiers when completing the ULI questionnaire. The identifiers are encrypted and stored with each response in a MySQL database for storage and analysis. Finally, the ULI database supports analysis and reporting as results are released to project sites through secure database-driven web portals. Tracking responses by site, discipline, semester, and individual student identifier allows a wide range of analysis and reporting for individual sites or across all projects. Two 'history capstone' ULI projects are demonstrating these capabilities at a liberal arts college and a state university during 2012-2013. Students completing extended research papers in capstone history courses at these institutions respond to ULI questionnaires about their experiences. Encrypted student identifiers are stored with each response.

Gaining Access to Student Performance Data

Several projects conducted over the past two years have broken down perceived barriers to accessing student performance data including academic standing,[25] retention, and GPA.[26] In the history capstone projects currently underway, the ULI protocol collects student performance data at the level of the discipline-specific student learning outcome. At the conclusion of each semester, faculty members involved in these projects use department-wide rubrics to assess student performance on the senior capstone papers. Again, using encrypted student ids, these rubric scores are incorporated into the ULI dataset linking library use to student performance data.

FIGURE 4
Number of Respondents Reporting Challenges Faced, by Learning Activity and Task Type—Fall 2012 (n=42)

There are several advantages to collecting performance data at the granular level of student learning outcome. First, ULI projects take advantage of assessment work that faculty already carry out as part of conducting their course. Students do not have to take additional examinations and librarians do not need to collect and analyze artifacts of student work. Second, as noted above, rubric scores for performance in capstone coursework support both summative assessment of individual students' performance and academic department program reviews. Connections between library use and performance data at this level in ULI projects brings librarians directly into important conversations about student learning. Another benefit to this work is that librarians and faculty gain access to assessment results to support library service improvements or curricular enhancements.

Working at Scale Means that Library Impact Data are Reusable

The ULI data model supports reporting aggregate results but tracks responses by individual student. Encrypted identifiers provide more than privacy and confidentiality to respondents. ULI responses could also be linked to library usage data to corroborate self-reports. Tracking responses with encrypted identifiers can also support longitudinal studies. In one current ULI project, first year students, sophomores, and juniors complete ULI questionnaires about their experiences in survey courses and writing-intensive seminars in history. As these students progress through their major, the project site will gather more responses from each student allowing longitudinal analysis of student information behaviors by cohort and individual. Finally ULI responses for each project are stored in partitions of a common database allowing analysis and comparisons across multiple institutions, while protecting the privacy and confidentiality of students, faculty, and librarians. Each new ULI project is a replication study, adding further evidence of library impact to the ULI database.

Working at scale also means using research methods that can be adapted for multiple settings. In one ULI project being conducted in academic year 2012-2013, the protocol has been adapted to assess the impact of a specific library unit on student learning in the social sciences. A project in the planning stages now will focus on the experience of students enrolled in 2-year institutions. These projects will test the flex-ibility of the ULI framework and the ULI instruments themselves.

Implications and Conclusion

The ULI project has demonstrated an approach for creating credible connections between library use and student learning and getting behind the numbers to understand how the library makes a difference. The project has found ways to work at scale, lowering the costs of carrying out library impact research while increasing the reach and reusability of research findings. The careful selection of units of analysis and construction of the ULI instruments and data model has generated a sustainable approach for continuing this line of research.

Returning to Poll and Payne's observations from 2006, the biggest challenge in library impact research is detecting library impact on student learning independent of other influences.[27] Accordingly, librarians and researchers should track other factors beyond the library's control which influence students' information behaviors and academic performance. In ULI projects, demographic characteristics such as gender, academic year, and academic major have been shown to influence student information behaviors. A non-traditional student status scale is also used. As many as 70% of U.S. college students exhibit one or more characteristics of the non-traditional student such as working full-time, attending college part-time, having dependents, being financially independent, or beginning college after age 22.[28] Understanding and addressing the needs of this growing student population is critically important. It is also important to acknowledge the influences of academic discipline, pedagogical approaches, and task type. Learning goals and information use patterns will vary by discipline and task type so it stands to reason that library impact on student learning will vary as well.

As libraries embark on new library impact projects new study designs will be created. However, a remarkable amount of progress has been made toward meeting the goals of the Value of Academic Libraries research agenda in the past two years.[29] The LIS research community should take stock of this progress and pursue replication and longitudinal studies in partnership with faculty and institutional research colleagues. Doing so will strengthen the growing body of library impact research and bring libraries into important campus conversations about student learning.

Notes

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3. Ronald R. Powell, "Impact assessment of university libraries: A consideration of issues and research methodologies," *Library and Information Science Research,* 14(1992): 245-257.

4. Joseph R. Matthews, *Library Assessment in Higher Education*. Westport, CT: Libraries Unlimited, 2007.

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6. Ibid., 550.

7. See for instance, Carol Tenopir, Don King, Sheri Edwards, and Lei Wu, "Electronic journals and changes in scholarly article seeking and reading patterns," *Aslib Proceedings* 61(2009):5-32; Marie Radford, "The Critical Incident Technique and the Qualitative Evaluation of the Connecting Libraries and Schools Project," *Library Trends,* 55(2006):46-64; and Joanne G. Marshall, "The impact of the hospital library on clinical decision making: the Rochester study," *Bulletin of the Medical Library Association* 80(1992):169–78.

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13. George D. Kuh, *High-Impact Educational Practices: what are they, who has access to them, and why they matter*. Washington, DC: American Association of Colleges and Universities, 2008, p. 9

14. Ibid.

15. Understanding Library Impacts projects have been conducted at seven U.S. institutions in five states including liberal arts colleges, comprehensive state universities, and research universities. For an overview of the 2011 study see Derek Rodriguez, "Answering questions about library impact on student learning," IntheLibrarywithTheLeadPipe, April 4, 2012. Retrieved on 2/17/2013 from www.inthelibrarywiththeleadpipe.org/2012/answering-questions-about-library-impact-on-student-learning/

16. Kuh, 11.

17. Nichols and Nichols, 99-100.

18. See for instance OCLC. *College Students' Perceptions of Libraries and Information Resources: A Report to the OCLC Membership*. Dublin, Ohio, 2006 and Alison J. Head and Michael B. Eisenberg, "Lessons Learned: How College Students Seek Information in the Digital Age, Project Information Literacy First Year Report with Student Survey Findings," University of Washington's Information School, 2009, p. 20. Retrieved on 2/17/2013 from http://projectinfolit.org/publications/

19. Indiana Commission for Higher Education. *Tuning USA Final Report: The 2009 Indiana Pilot,* 2010. http://www.in.gov/che/files/Updated_Final_report_for_June_submission.pdf and Tuning USA Final Report - Utah, November 18, 2009. http://www.quickanded.com/wordpress/wp-content/uploads/2010/06/Utah-Final-Tuning-USA-Report.pdf. The Indiana project generated outcomes in history, chemistry, and education. The Utah project generated Tuning outcomes in history and Physics. A project conducted in Minnesota Tuned biology and graphic arts www.ohe.state.mn.us/pdf/FinalTuningReport11-30-09.pdf. The Lumina Foundation has funded two new Tuning projects in the last two years. The Midwest Higher Education Consortium is Tuning psychology and marketing in Illinois, Indiana, and Missouri www.mhec.org/ProgrammaticInitiatives and the American Historical Association is beginning a nationwide Tuning project in the field of history http://blog.historians.org/news/1568/history-faculty-begin-nationwide-tuning-project.

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23. Ibid.

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27. Poll and Payne, 550-551.

28. Tamara J. Reeves, Leslie A. Miller, and Ruby A. Rouse, *Reality Check: A Vital Update to the Landmark 2002 NCES Study of Nontraditional College Students*, Apollo Research Group, 2011. Accessed on 2/17/2013 http://apolloresearchinstitute.com/sites/default/files/reality_check_report_final_0.pdf

29. See for instance the broad range of studies supported by the Lib-Value project http://libvalue.cci.utk.edu/content/lib-value-project