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A Survey of Instructional Support for Undergraduate Research Programs

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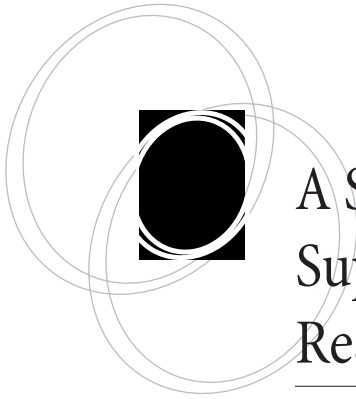
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A Survey of Instructional Support for Undergraduate Research Programs

Merinda Kaye Hensley

abstract: Undergraduate research and other high-impact educational practices simulate real-world learning environments and present an opportunity for high-level information literacy teaching to be better incorporated into the curriculum. The purpose of this survey is to examine efforts of libraries currently offering IL instruction to undergraduate research programs. The study provides crucial background and data for librarians and campus administrators of undergraduate research programs to deepen their understanding in developing meaningful information literacy experiences.

Introduction

The academy has been searching for dynamic ways to revitalize curriculum to better prepare college graduates for a workplace that is constantly changing and unpredictable. One of the largest and most visible efforts comes from the Association of American Colleges & Universities (AAC&U). The AAC&U highlights ten high-impact educational practices designed to provide assessable experiential learning while improving student engagement and retention.[1] One of these practices, undergraduate research, has gained significant momentum since the oft-cited Boyer Report, *Reinventing Undergraduate Education: A Blueprint for America's Research Universities*. The report issued a call to action in 1998: "The goal is to involve students with actively contested questions, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions."[2] Since then, undergraduate research has increasingly become synonymous with a rich undergraduate educational experience. George Kuh calls for students to participate in at least two high-impact activities before they graduate.[3] This paper provides critical background regarding undergraduate research programs, presents the results of a survey exploring the content of information literacy (IL) currently provided for students and faculty in undergradu-

ate research programs, and makes the argument that undergraduate research opens a door to authentic learning experiences that is solidly aligned with IL learning outcomes.

What Is Undergraduate Research?

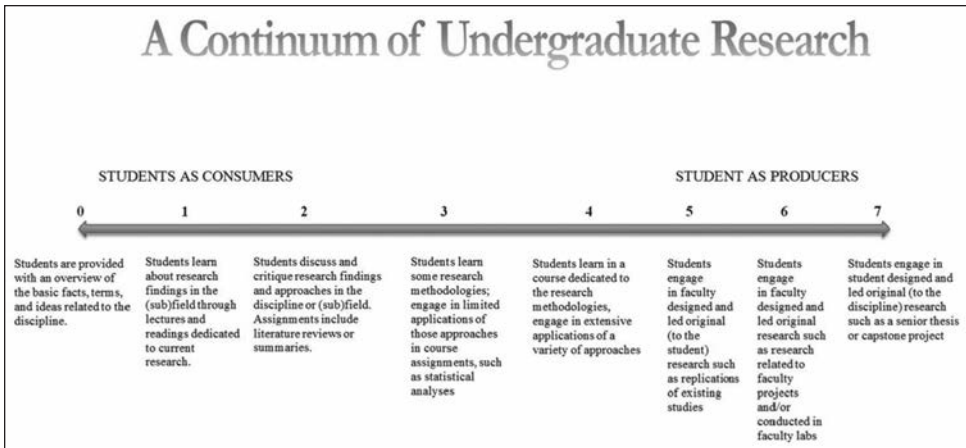Undergraduate research is an inquiry-based learning experience, where students practice research methods, ask complex questions, and search for answers under the mentorship of teaching faculty and graduate students. Students participate in the complete research cycle, working in the role of apprentice within a discipline. Perhaps most significantly, undergraduate research is engaged learning where students contribute to the process of knowledge creation, often presenting their work at student conferences or publishing in an undergraduate research journal. The Council on Undergraduate Research (CUR) defines undergraduate research as "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline."[4] However, there are multiple understandings for what constitutes undergraduate research, depending on the discipline or the level of engagement with a faculty mentor. The University of Illinois at Urbana-Champaign's Office of Undergraduate Research designed a continuum of undergraduate research efforts where students start as consumers of knowledge and move toward knowledge production (see Figure 1).[5] The undergraduate research experience differs from typical course-related assignments, as Anthony Stamatoplos summarizes:

> In contrast [to course-related assignments], independent research experiences entail real hands-on experience in research conception, design, conduct, and dissemination and make inherent contributions to a discipline. Independent undergraduate research projects often derive from or relate to the scholarship of the faculty mentor and are expected to create new knowledge or creative scholarship as well as to be disseminated in a public forum.[6]

Of the ten high-impact educational practices, undergraduate research seems the most ubiquitous and accessible for all students. Undergraduate research occurs at all types of institutions, across all disciplines. While the Boyer Report focused solely on the impact of undergraduate research at research universities, such research programs have also spread widely across liberal arts institutions and community colleges.[7]

Undergraduate research can take many forms. A common experience is the Undergraduate Research Opportunities Program (UROP), a course-based, semester- or yearlong research opportunity organized by an academic department or a campus-wide office of undergraduate research. Universities usually offer these opportunities within a specific discipline, but there are increasing interdisciplinary examples.[8] Nationally funded campus programs include the McNair Scholars Program, which focuses on increasing graduate degrees for underrepresented groups.[9] Immersive summer opportunities,

> **Undergraduate research is engaged learning where students contribute to the process of knowledge creation, often presenting their work at student conferences or publishing in an undergraduate research journal.**

A Continuum of Undergraduate Research

STUDENTS AS CONSUMERS   **STUDENT AS PRODUCERS**

0   1   2   3   4   5   6   7

0	1	2	3	4	5	6	7
Students are provided with an overview of the basic facts, terms, and ideas related to the discipline.	Students learn about research findings in the (sub)field through lectures and readings dedicated to current research.	Students discuss and critique research findings and approaches in the discipline or (sub)field. Assignments include literature reviews or summaries.	Students learn some research methodologies; engage in limited applications of those approaches in course assignments, such as statistical analyses	Students learn in a course dedicated to the research methodologies, engage in extensive applications of a variety of approaches	Students engage in faculty designed and led original (to the student) research such as replications of existing studies	Students engage in faculty designed and led original research such as research related to faculty projects and/or conducted in faculty labs	Students engage in student designed and led original (to the discipline) research such as a senior thesis or capstone project

fellowships to recognize upper-class students for their commitment to research, and internship programs also help support undergraduate research.[10]

Undergraduate research occurs across the disciplinary spectrum, though it is decidedly most robust within the sciences. One of the best-known programs is the National Science Foundation (NSF)'s Research Experiences for Undergraduates (REU), a program for students in the sciences and engineering.[11] The Distributed Research Experiences for Undergraduates (DREU) is a nationally recognized science-based undergraduate research experience whose primary goal is to recruit women

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and underrepresented groups into computer science and engineering.[12] Science-based undergraduate research experiences generally train students in a laboratory setting, where they work on intensive lab and field experiments under the supervision of faculty mentors to learn proper lab procedures, how to handle data, and increasingly, how to present research results at student conferences or through publications.[13] The humanities, social sciences, and interdisciplinary programs are also developing robust undergraduate research programs.[14] For example, Emblematica Online at the University of Illinois at Urbana-Champaign is an internationally grant-funded digital humanities project that works with undergraduate students to transcribe the mottos of emblems and create complex metadata from Renaissance texts and images.[15] Students learn how to work with rare materials while researching book history and investigating the issues associated with digital content creation. An example of an undergraduate research program in the social sciences is the Ethnography of the University Initiative (EUI) at the University of Illinois Urbana-Champaign. EUI is an effort to study campus culture and environment using ethnographic and archival research methods.[16] Students conduct original research, often using primary-source material in the library and archive's collections, and report their results each semester at a conference through panels, posters,

and multimedia presentations.[17] The institutional repository archives the presentations for future students to revisit and expand upon them.

The benefits for students participating in undergraduate research, as outlined by the Council on Undergraduate Research, are numerous. Advantages include enhanced student learning through mentoring relationships with faculty; increased retention rates and enrollment in graduate education while providing career preparation; development of critical thinking, creativity, problem solving, and intellectual independence; gaining an understanding of research methodology; and promoting an innovation-oriented culture.[18]

For librarians interested in learning more about undergraduate research programs, the Council on Undergraduate Research regularly publishes recent developments, including a thorough review of the history of undergraduate research and two online publications, *The CUR Quarterly* and *CURQ on the Web*.[19] The two primary documents for best practices in undergraduate research are CUR's "Characteristics of Excellence in Undergraduate Research (COEUR)" from 2012 and the Council for the Advancement of Standards in Higher Education's 2011 revised standards, "The Role of Undergraduate Research Programs."[20] As undergraduate research programs have grown across institutions, the disciplinary literature discussing such research has deepened significantly.

Undergraduate Research and Information Literacy

How do these examples of undergraduate research programs translate into an opportunity for teaching librarians and information literacy efforts? Undergraduate research mirrors learning outcomes for IL in that both attempt to address critical thinking and problem-solving skills. Much as librarians seek to engage students in the complete research cycle, research opportunities draw undergraduates into the entire research process by developing original questions, investigation, evaluation and analysis, and creation of new knowledge.[21] Undergraduate research, similar to all high-impact practices, opens a door for teaching librarians seeking authentic learning experiences in which to collaborate with faculty mentors and develop ongoing relationships with students within their disciplinary work.

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In a previous study, Merinda Kaye Hensley, Sarah L. Shreeves, and Stephanie Davis-Kahl examined types of support provided by libraries for undergraduate research programs.[22] The services identified included space, instruction, collections, extended loan periods, design and printing of research posters, and awards. Undergraduate research efforts also benefited from unconventional library support, including hosting student journals, serving on advisory boards, funding research awards, and sponsoring symposia events. Of all the services offered by libraries, however, instruction was the most common (86 percent; N = 141). Libraries that had a librarian dedicated to support undergraduate

research efforts were more likely to offer specific information literacy instruction. A small percentage of libraries indicated involvement with curriculum design and responsibility for credit-bearing courses. Examples of basic instruction included "advanced database searching, citation management, and creation of online guides and instructional videos." The research also examined involvement in scholarly communication instruction, evidenced by a smaller portion of libraries offering coaching related to the publishing process, copyright, and assistance with securing rights, including advocacy and education around open-access publishing. Consequently, Hensley, Shreeves, and Davis-Kahl hypothesize that there are benefits to "developing pedagogical strategies for teaching students about the authoring process, and more closely aligning instructional programming for the undergraduate research experience with those of the graduate researcher (examples include data management, scholarly communication)."[23]

The research in this paper reconnects with libraries that specifically offer information literacy instruction for undergraduate research programs from the original 2014 survey by Hensley, Shreeves, and Davis-Kahl (N = 141). The study seeks to uncover if and how librarians' instructional practices align with undergraduate research programs. The results of this research offer insight into how libraries increasingly invest time and resources in creating IL experiences for undergraduate research, even if the library may not directly support undergraduate research programs (as opposed to serving all undergraduates). This study contributes crucial background and data for librarians, faculty mentors, and campus administrators of undergraduate research programs to deepen their understanding of how to create meaningful information literacy experiences that complement and build upon learning outcomes for undergraduate research programs.

Literature Review

The Council on Undergraduate Research has worked with faculty mentors since the late 1970s in advocating for meaningful and real-world research experiences for undergraduate students. It was not until the Boyer Report was published in 1998, however, that undergraduate research began to gain momentum across all types of institutions. Why does this matter in libraries? As Hensley, Shreeves, and Davis-Kahl posit, "While libraries by definition support undergraduates' general information needs, with increased attention and formal support for programs on the discipline and university level, libraries have an opportunity to engage and influence future scholars during the formative undergraduate research process."[24] Collaborating systematically on information literacy throughout undergraduate research programs is a new venture for librarians, and the library literature in this arena has grown in the past decade but is still limited.[25] The author reviewed the literature for work related to IL and collaborations with faculty, integrating information literacy into the curriculum of high-impact educational practices, and breaking away from lower-level IL instruction.

Working with students begins by reaching out to faculty. Librarians who teach have long sought opportunities to move away from the ubiquitous one-shot library instruction session. Finding concrete avenues to collaborate with faculty in order to align information literacy with disciplinary outcomes is often a challenge to librarians. Complicating matters, William Badke argues that IL is "invisible" to faculty as a viable

academic subject, in part because they do not remember how research skills were developed other than through trial and error.[26] Since undergraduate researchers lack the depth of experience and habits of mind of a faculty member (or even a graduate student), it becomes clear why support for fostering IL skills becomes essential for students engaging in research at a level new to them. As Badke argues, "Without significant instruction, students do not learn to do research well simply by doing research."[27] Furthermore, in examining perceptions and beliefs of faculty, Claire McGuinness investigated internal and external factors that perpetuate barriers between librarians and teaching faculty regarding information literacy instruction.[28] Her research revealed a consistent theme that faculty believe "that the extent to which students develop as information literate individuals depends almost entirely on personal interest, individual motivation and innate ability, rather than on the quality and format of the available instructional opportunities."[29]

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Stamatoplos, who wrote a seminal article on library involvement with undergraduate research programs, focuses on the student-mentor relationship as a cornerstone of a successful undergraduate research experience. He challenges librarians to devise ways of supporting the mentoring process, namely by "helping mentors become more effective teachers."[30] He points out, "Students engaged in such activities may have greater and more complex overall need for quality information and evaluative skills than the average student engaged in course-related activities."[31] Stamatoplos also published an extensive annotated bibliography on faculty mentoring of undergraduate research across the disciplines, which may be helpful to librarians looking to better understand the unique relationship undergraduate research programs bring about between undergraduate students and teaching faculty.[32]

Catherine Fraser Riehle and Sharon A. Weiner examined how five high-impact experiences, including undergraduate research, incorporated information literacy competencies into the curriculum.[33] They point out that high-impact educational practices include "active, contextual pedagogies, span the college experience, and engage students in the learning process."[34] The results suggest that high-impact learning, in fact, presents an opportunity for a team of librarians, instructional designers, and faculty to embed IL throughout undergraduate research programs. Riehle and Weiner call for three improvements within high-impact educational practices: further development of information literacy assessment tools in determining students' incoming and post-experience skill level; adding critical reflection into the student experience to improve IL; and increased planning efforts to add information literacy within disciplines and across institutions.

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Embedded librarianship is another pathway for building rapport with faculty that could lead to more systematic instruction efforts. Jeffrey A. Knapp, Nicholas J. Rowland, and Eric P. Charles discuss embedding librarians within undergraduate research programs. Such involvement theoretically accords several benefits, including contributing to student retention, helping to secure external funding for research, and aiding in the general push toward increased student-centeredness.[35] In this case study, a librarian was embedded in a social sciences lab at Penn State Altoona, where he worked at the experimental design phase to help undergraduate researchers examine the scholarly literature and perform background research. The effort led to a partnership with two teaching faculty in designing course curriculum for a proposed first-year research seminar.

Perhaps the greatest opportunity for information literacy instruction within undergraduate research is the chance to break away from teaching lower-level skills to focus instead on advanced research and information management, such as scholarly communication. Hensley, Shreeves, and Davis-Kahl highlight a weak link in current IL efforts:

> Information literacy instruction, for example, continues to be a major initiative within libraries, but is largely focused on locating information during course-related instruction as opposed to developing critical thinking skills addressing the undergraduate student's role as an author, an essential element in a formal undergraduate research program.[36]

There is a movement within information literacy instruction to use the publication and dissemination process as pedagogy, which could significantly benefit the undergraduate research process. For example, Char Miller and Char Booth argue that open access has "teaching and learning potential" and that creating access to undergraduate student work "challenges traditional hierarchical dynamics in academia and publishing and gives student authors space to assert their intellectual agency."[37] Additionally, a librarian at the University of Guelph in Ontario, Canada, shared her experience working with an undergraduate nanoscience course as the editor in chief of an open-access journal, assisting students through the peer-review process.[38] And finally, Sharon A. Weiner and Charles Watkinson assessed student journals, surveying a wide variety of stakeholders and providing insight and data regarding the impact of student learning on the scholarly communication process.[39]

As evidenced by the literature, librarians can take several initial steps in focusing IL instruction for undergraduate research programs. First, teaching librarians should work on improving relationships with faculty mentors, reminding them of students' burgeoning IL-related research skills and collaborating on IL assessment efforts. Second, librarians should work to broaden IL instruction to include faculty mentors and instructional designers as partners. And third, since students are challenged to be content creators as part of undergraduate research programs, librarians should include scholarly communication issues within their instruction.

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Methodology

As noted, the literature on the interplay of undergraduate research programs and IL programs in libraries is scant. The purpose of this study is to help to fill this gap and to identify benchmarks for information literacy instruction to inform conversations between librarians, faculty, and campus administrators around support of undergraduate research programs. The survey also explores the curriculum development process, including partnerships and disciplines associated with undergraduate research. Finally, the author hoped to find out how, if at all, librarians address the needs of students as content creators through classroom instruction.

Survey Design

The instrument was a branched survey consisting of fourteen questions with the opportunity to input up to ten examples of instruction (for the survey instrument, see the online version of this article at http://muse.jhu.edu/journals/portal_libraries_and_the_academy/vol15/15.4.hensley_supp01.pdf). Only one question, Question 1, was required to be answered. The majority of the questions centered on the respondent providing examples of instruction specifically designed for undergraduate research programs. The survey was divided into three sections:

- Areas of undergraduate research supported and the associated responsibilities of the respondent (Questions 1–5)
- Input of instructional examples, including one open-ended question (Questions 6–13)
- Demographic and contact information (Questions 13–17)

At the beginning and before each example, the survey reminded respondents of the Council on Undergraduate Research (CUR) definition of undergraduate research as well as that the definition does not include research conducted as part of normal classwork.[40]

The first part of the survey asked if the respondents provide instruction for programs as defined by the CUR description (Question 1) and, if they were not providing instruction, to identify the barriers keeping them from doing so (Question 2). If participants answered no, they were taken to the end of the survey to answer basic demographic information. While the survey population was specifically targeted based on a previous survey indicating instruction in this area, the survey may have gone to another person in the organization who was not currently engaged with instruction for formal undergraduate research programs.

Next, the survey focused on identifying the disciplinary areas in which the respondent provides library instruction (Question 3). This question was important for noting areas of instruction in addition to the examples chosen by the person who answered. For consistency across the line of research, the definitions of disciplinary areas paralleled those in the original survey.[41] The survey asked if the respondent currently served as a liaison to a campus undergraduate research program—for example, a campus honors program, McNair Scholars, Summer Research Opportunities Program (SROP), or the like (Question 4). The poll also asked if the participant had consulted with a campus department or undergraduate research program on incorporating information literacy principles into the curriculum (Question 5).

The next part of the survey asked respondents to elaborate on the type of instruction they provide for formal undergraduate research programs on their campus (Questions 6–11). Recognizing that librarians may teach more than one type of session, the survey allowed up to ten examples. It provided a sample answer so that the respondents would be prepared to provide details of their instruction. The survey included six questions for each example including:

- Format of instruction, for example, one-shot, course-integrated, workshop, and the like (Question 6)
- Titles or positions of collaborators (Question 7)
- Disciplinary area of instruction session (Question 8)
- Twenty-five topics to choose from covered during the instruction, including an open-ended response (Question 9).
- An open-ended question to gather more information regarding the instruction—for example, did the respondent use any specific active learning strategies? (Question 10)
- URLs for any websites, online research guides, or instructional videos that were created to support this example of instruction (Question 11).

At this point in the survey, respondents were asked if they wanted to enter another example (Question 12). The survey allowed up to ten specific examples. If the person answered no, he or she was taken to the final qualitative question, "Please share any additional information or perspectives regarding your involvement in teaching for undergraduate research programs" (Question 13). To finish the survey, all respondents were asked for demographic data (Questions 13–17), including name of institution, job title, if they were willing to be contacted for a follow-up interview, and if so, an e-mail address. All demographic information was optional. The investigator gathered demographic information to analyze data based on type of institution.

The draft of the survey was developed with input from local survey construction experts. The Institutional Review Board at the University of Illinois at Urbana-Champaign reviewed the survey instrument and protocols and found them to be exempt given that the study focused on services offered by institutions. Librarians with demonstrated interest in undergraduate research from two different types of institutions field-tested the survey, and the author made revisions accordingly before distributing it.

Survey Population and Dissemination

The population identified for this survey came from the original research by Hensley, Shreeves, and Davis-Kahl. The library deans and directors contacted for the first survey were identified by their membership in at least one of the following organizations: Council on Undergraduate Research (CUR), Association of Research Libraries (ARL), Oberlin Group, or National Institute for Technology in Liberal Education (NITLE) (N = 758). Of the respondents who indicated they were providing library services for undergraduate research programs (n = 164), 86 percent (n = 141) reported they were specifically providing library instruction services.[42] Of the 141 institutions, 131 were identifiable from the completed demographic information. This group was sent a targeted invitation to participate in the new survey.

Hensley, Shreeves, and Davis-Kahl used the Carnegie Basic and Control Classifications to characterize the original survey population.[43] Of the 131 institutions surveyed, less than half were private, not-for-profit (n = 58), 54.2 percent (n = 71) were public institutions, and two were international institutions. Thirty-six percent (n = 47) were doctorate-granting institutions, 28.2 percent (n = 37) were masters' colleges or universities, 32.1 percent (n = 42) were baccalaureate, and 2.3 percent (n = 3) were associate, special focus, or tribal institutions, with two institutions unidentifiable.

The author updated the e-mail list of deans and directors for accuracy since some leadership had changed between the two surveys and sent an invitation with a link to the Survey Monkey instrument. Because deans and directors may not be doing the teaching, the invitation requested to be forwarded to the librarian or librarians who were responsible for teaching as part of their campus's formal undergraduate research program. This procedure meant that more than one librarian at each institution could be asked to complete the survey.[44] The e-mail invitation included a reminder of the definition of undergraduate research and a link to the preprint of the original survey results. The survey was open from July 10 to August 9, 2013, with two reminders sent to those institutions that had not yet responded on July 23 and on August 5.

Survey Results and Discussion

Of the 131 library deans and directors who received the survey invitation, there were 73 total respondents (55.7 percent). In addition to the 131 institutions that received the survey, two respondents were not on the original e-mail list. Further investigation indicated that these were branch campuses that had been forwarded the survey, as requested by the e-mail sent to the library deans and directors, for a total of 133 campuses invited to respond. Three responses were determined to be invalid, likely recipients testing the instrument before deciding whether or not to complete the survey. Hence, there were 70 total respondents for an initial response rate of 52.6 percent. In answering Question 1, five institutions indicated that they do not provide instruction specifically for undergraduate research programs. When they were removed from the final data analysis, the overall response rate was 48.9 percent (n = 65). There were several institutions that completed the survey more than once: one institution had five respondents answer the survey, one institution had three, and two institutions had two. Of the 47 institutions that provided identifying information, there were 39 individual institutions, for a 29.3 percent unique response rate. Forty-four percent (n = 17) were private, not-for-profit institutions; and 56.4 percent (n = 22) were public institutions. Eighty percent (n = 31) were members of CUR, 17.9 percent (n = 7) belonged to NITLE, 17.9 percent (n = 7) were members of the Oberlin Group, and 35.9 percent (n = 14) were ARL libraries. Of the named institutions (N = 39), 33.3 percent (n = 13) were baccalaureate institutions, 23.1 percent (n = 9) were masters' colleges or universities, and 64.1 percent (n = 25) were doctorate-granting institutions. No associate, special focus, or tribal institutions answered the survey. Twenty-three institutions did not provide identifying information.

Of the 70 responses to the survey, 92.9 percent (n = 65) indicated that they do provide specialized instruction for formal undergraduate research programs on their campus. Five institutions reported that they do not offer undergraduate research instruction.

When asked why, three said that they offer the same services to all undergraduates, three had not been approached to provide support, one indicated that the undergraduate research program did not want library support, and one respondent answered, "I don't know."[45] Since the libraries invited to respond to the survey had originally claimed to offer instruction to undergraduate research programs, this result indicates there may be some miscommunication. The survey does rely on the librarians' knowledge of campus undergraduate research programs.

Questions 3 to 5 focused on the respondents' main responsibilities surrounding undergraduate research. With the possibility of subject liaisons serving multiple departments concurrently, Question 3 aimed to identify disciplinary areas or campus programs for which the responding librarian provided instruction (N = 65; 100 percent). For consistency, the disciplines matched the list provided from the original survey and respondents could check all that apply. The majority of those who answered work with the social sciences, including anthropology and psychology (n = 37; 56.9 percent). The life sciences (n = 30; 46.2 percent), humanities (n = 29; 44.6 percent), and interdisciplinary programs (n = 27; 41.5 percent) were

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also strongly represented. Respondents also work with the physical sciences, including engineering, mathematics, and computer science (n = 25; 38.5 percent); fine arts (n = 24; 36.9 percent); education (n = 17; 26.2 percent); and business (n = 15; 23.1 percent). Nursing represented the lowest percentage of library instruction (n = 10; 15.4 percent). In comparison with the original survey, there was less representation of the physical sciences in the current survey and more representation from the social sciences.[46] Twenty-five respondents (38.5 percent) provide instruction for their campus Undergraduate Research Opportunities Program (UROP) or Summer Undergraduate Research Opportunities Program (SROP), and twenty-seven collaborate with their campus honors program (41.5 percent). Several mentioned working one-on-one with students, which is not surprising given that students may not do undergraduate research as part of a course; rather, they are assigned to a one-on-one relationship with a faculty mentor.

For Question 4 (n = 59; 90.8 percent response rate), only one-third of respondents indicated they serve as a liaison to an undergraduate research program—for example, campus honors programs, McNair Scholars, or SROP (n = 20; 33.9 percent). One respondent mentioned working with scientific and technical writing courses, including a Writing for Business course.

Question 5 (n = 60; 92.3 percent response rate) took the collaboration question a step further. It asked if respondents had consulted with an academic department (for example, sociology) or campus program (for example, McNair Scholars) regarding the integration of information literacy principles into the curriculum of an undergraduate research program. Two-thirds of participants indicated they had consulted on curriculum (n = 37). Several "yes" responses added clarification. While many indicated partnerships with specific departments, others stated that they systematically worked across their entire academic curriculum looking for areas to introduce information literacy. One

respondent noted, "We have consulted with most departments and campus programs as a part of our campus IL-across-the-curriculum effort." Others reported success:

> The UG Research program hosts a yearly Symposium. I have been able to incorporate limited instruction in literature exploration, evaluation, and presentation skills. The Libraries teach a formal 1-credit course within the Honors Program that relates IL principles within the process of their honor's thesis research.

One respondent mentioned a common struggle aligning IL with curricular goals: "We have consulted with faculty about this, but there is a gap between what the departments and programs think students already know and what librarians experience when working with students. In other words, we've talked about it, but it hasn't gone anywhere yet." One respondent had implemented Stamatoplos's encouragement for increased outreach with faculty mentors by providing faculty training for undergraduate research. Two responses showed success in the publication and dissemination of student work. One said, "I worked with American Studies program in designing a course that was team-taught by a faculty member and myself that resulted in a student produced online OA journal." The other described helping students to identify appropriate journals for publication.

Specific Examples of Instruction

The overriding purpose of the survey was to identify and examine specific examples of information literacy support for undergraduate research programs. Respondents had up to ten opportunities to provide examples. Twenty percent of the participants entered more than one example, and 80 percent entered only one. Questions 6 to 11 asked respondents to detail examples of their choosing of IL instruction geared toward undergraduate research programs. The data do not represent exhaustive examples for any one institution; the survey was only trying to gauge a range of possibilities. Respondents were free to submit any example they chose.

Thirty-nine institutions entered a total of 99 examples. Of the 99 examples, 81.8 percent of the respondents (n = 81) identified the discipline in which they provided the information as literacy instruction (Question 8). Interdisciplinary programs (n = 22; 33.3 percent), social sciences (n = 13; 19.7 percent), and humanities (n = 11; 16.7 percent) were most strongly represented. See Table 1 for a breakdown of the format of sessions offered by discipline.

There were several instruction formats in Question 6 from which to choose: one-on-one with student, faculty mentor, or both as subject liaison; one-on-one, course-integrated, or workshop for lab groups or student organizations; one-shot; course-integrated; open workshops (for example, anyone can attend and possibly geared to the independent researcher); team-teach with a faculty member; team-teach with a campus organization (for example, writing center); instructor of record for a semester-long credit-bearing course; and I don't know. Eighteen respondents left the format of the session blank (18.2 percent). One person noted that a group of librarians were "co-teachers" for a McNair program that evolved into one-on-one interactions throughout the student's academic career, indicating that the course may have led to the development of a longer-term relationship between the student and the librarian. Another respondent mentioned that his or her institution planned to offer a credit course in the coming semester.

Table 1.
Breakdown of examples by discipline and type of instruction (N=99)

Disciplines	One-on-one with faculty member and/or student as subject liaison	One-one-one, course-integrated, or workshop for lab groups or student organizations	One-shot	Course-integrated	Open workshops	Team-teach with a faculty member	Team-teach with a campus organization (e.g., writing center)	Instructor of record for a semester-long, credit-bearing course	I don't know	Left blank (Note: not included in % total)
Business (n = 2)			1	1						
Education (n = 1)			1							
Fine arts (n = 1)	1									
Humanities (n = 11)	3		3	3	1	1				
Interdisciplinary program (n = 23)	2		7	9	3		1	1		
Life sciences (n = 4)	1		1	1		1				
Nursing (n = 3)			2		1					
Physical sciences (n = 5)	1		2		1			1		
Social sciences (n = 13)	2		5	3	1	2				
I don't know (n = 2)				1					1	
Any and all disciplines (n = 1)		1								
Left blank (n = 33)	4		1	4	6					18
Total	14 (17.3%)	1 (1.2%)	23 (28.4%)	22 (27.2%)	13 (16%)	4 (4.9%)	1 (1.2%)	2 (2.5%)	1	18
(N = 81 + 18 left blank = 99)										

Sixty-one respondents (61.6 percent) indicated engagement with some level of collaboration with undergraduate research programming (Question 7). The open-ended response elicited a wide range of faculty and campus partners, including teaching faculty, librarian colleagues, archivists, honor's program coordinators, directors of campus undergraduate research programs, McNair program faculty members, writing center staff, campus assessment staff, and one dean.

Question 9 asked respondents to identify topics covered during their teaching sessions. There were 25 different options plus "I don't know" and an "other" field where participants could add their own topic. There were a total of 400 responses to this question, with many instruction examples including more than one topic. Twenty percent of the respondents added additional information through the "other" category. The topics generally fell into several areas: library orientation and how to find research materials, information management, and scholarly communication issues. It should be noted that these topics may not be clearly representative of what is taught in the classroom for students engaged in undergraduate research, because they are just examples chosen by the respondents of this survey. See Table 2 for a complete list of topics aligned by discipline.

The most frequently taught IL topics were related to database searching and techniques, including locating statistical information. The next most common subjects

> **The most frequently taught IL topics were related to database searching and techniques, including locating statistical information.**

included citation management (n = 35; 8.8 percent), conducting a literature review (n = 25; 6.3 percent), and differentiating between primary and secondary sources (n = 27; 6.8 percent). The less frequently taught topics included the areas of scholarly communication, such as developing a data management plan (n = 2; 0.5 percent), open access (n = 3; 0.7 percent), author's rights (n = 4; 1 percent), and how to prepare and submit research to a journal (n = 4; 1 percent). Respondents added a wide variety of topics in the "other" category: using Google for academic research, concept mapping, evaluating sources, personal information management (for example, cloud computing, e-mail management), interlibrary loan, the peer-review process, photo editing and manipulation, how to use Microsoft Excel, and creating web pages to share student research.

Question 10 was a qualitative question that asked for any additional information the respondent was willing to share regarding the example instructional session. Forty percent (n = 26) of the respondents provided additional information. Seven answers alluded to, in some manner, developing a relationship with the student beyond the instruction session, usually in the form of meetings throughout the semester. One respondent noted, "One-on-one appointments are conversations and times for intense work, usually focused on a question or need of the student, not to offer broader instruction." Several respondents have developed instruction sessions around modeling research behavior for inexperienced undergraduate students, often pushing the boundaries of traditional library instruction to what could be better described as critical thinking skills. The participants explained this teaching in several ways. One respondent clarified, "Before students come to the class, they have already read the scholarly article which we'll discuss. There are 10 or so questions we go through, including the audience, writing style, references used,

Table 2.
Teaching general topics by discipline

Discipline	Business (n = 2)	Education (n = 1)	Fine arts (n = 1)	Humanities (n = 11)	Life sciences (n = 4)	Nursing (n = 3)	Physical sciences (n = 5)	Social sciences (n = 13)	Interdisciplinary program (n = 33)	Any and all disciplines (n = 1)	No discipline indicated (n = 23)	No discipline indicated (n = 33)	I don't know
Library orientation (includes building tours, circulation policies, etc.) 18 (4.5%)			1	3	1		2	2	4		5	5	
Developing searching skills (e.g., keyword vs. subject searching, Boolean operators) 52 (13%)	2	1	1	7	4	3	4	7	14		8		1
Academic integrity and avoiding plagiarism 19 (4.8%)			1	4	1	1	1	2	4		4		1
Database searching 59 (14.8%)	2	1	1	8	4	3	5	10	15		9		1
How to conduct a literature review 25 (6.3%)			1	1	2	1	2	6	10		1		1
How to write an annotated bibliography 13 (3.3%)				1	1		1	3	3		4		

Table 2. continued

Discipline	Total	Business (n = 2)	Education (n = 1)	Fine arts (n = 1)	Humanities (n = 11)	Life sciences (n = 4)	Nursing (n = 3)	Physical sciences (n = 5)	Social sciences (n = 13)	Interdisciplinary program (n = 33)	Any and all disciplines (n = 1)	No discipline indicated (n = 23)	No discipline indicated (n = 33)	I don't know
How to find gray literature (e.g., conference proceedings, dissertations)	12 (3%)				3	1		1	2	5				
How to find and prepare a proposal for grants, fellowships, and scholarships	6 (1.5%)					1		1	1	1	1	1		1
Citation management (e.g., RefWorks, Mendeley, Zotero)	35 (8.8%)			1	3	2	2	2	8	9		7		
Current awareness skills (e.g., how to set up a feed reader and e-mail / RSS alerts)	10 (2.5%)					1		1	2	1		5		
Citation analysis (e.g., journal impact factors, Web of Science, altmetrics)	13 (3.3%)					2		3	2	3		3		
Primary versus secondary sources	27 (6.8%)	1	1	1	4	3	1	1	4	5		4		1
Searching for and using government information	12 (3%)			1		2			1	1	4		3	

Multimedia and digital literacy (e.g., how to use images in research) 14 (3.5%)		2			1	8		2		
Searching for statistical information 20 (5%)	1	1		1	1	5	6	1	4	1
Numeric and spatial data including Geographic Information Systems (GIS) 4 (1%)						2			2	
Data visualization techniques (e.g., how to prepare data for presentation, how to use a free online program such as Piktochart) 3 (0.7%)		1			1			1		
Developing a data management plan (e.g., generating metadata, preserving data) 2 (0.5%)		1			1	1				
Scanning and digitizing including software programs (e.g., optical character recognition [OCR] software such as ABBYY Fine Reader) 1 (0.3%)			1							

Table 2. continued

Discipline	Business (n = 2)	Education (n = 1)	Fine arts (n = 1)	Humanities (n = 11)	Life sciences (n = 4)	Nursing (n = 3)	Physical sciences (n = 5)	Social sciences (n = 13)	Interdisciplinary program (n = 33)	Any and all disciplines (n = 1)	No discipline indicated (n = 23)	No discipline indicated (n = 33)	I don't know
Copyright education 13 (3.3%) (e.g., the basics of copyright law, fair use, assistance with securing rights for images, text, music, etc.)				2	1			1	7		1	1	1
Author's rights 4 (1%) (e.g., how to negotiate a copyright agreement with a publisher to submit to an institutional repository)					1	1				1		1	
Open access 3 (.7%) (e.g., providing information about SPARC http://www.sparc.arl.org/)					1	1				1			
How to submit 5 (1.3%) student work to the campus institutional repository				1	1	1		1	2				
How to prepare and 4 (1%) submit research to a journal (e.g., campus undergraduate research journal or a professional journal)					1	1	1		1				

Preparing for symposia (e.g., how to develop a research poster or present on a research panel) 6 (1.5%)	6	4	7	1	1	14	26	62	4	8

I don't know

Total (N = 380)	6	4	46	33	14	26	62	180	1

etc." Several of the participants mentioned building active learning into their sessions. As one respondent described the process, "Slowly, we piece together the puzzle, and in the process, demonstrate how analyzing a variety of types of sources helps to create a rich argument." Finally, 16 respondents entered 33 URLs for websites, online research guides, or instructional videos that have been created to support a specific example of instruction for undergraduate research (Question 11).

Instruction by Discipline

The following is a qualitative analysis of the three most frequent information literacy examples by discipline geared toward the needs of students participating in undergraduate research programs.

Interdisciplinary Program

The interdisciplinary program examples (n = 23; 23.2 percent) were primarily taught as course-integrated (n = 9) or one-shot (n = 7) sessions. Not surprisingly, the majority of respondents collaborated with the coordinators of these programs, including several teaching faculty. Six of the respondents clarified that these sessions were organized by some type of honors program and included students across a spectrum of disciplines. Several participants mentioned library assistance for thesis development and support. Most of the instruction examples revolved around developing search skills and finding information (for example, statistics), in addition to how to conduct a literature review. However, there were

> **Most of the instruction examples revolved around developing search skills and finding information (for example, statistics), in addition to how to conduct a literature review. However, there were also a number of entries that included copyright education.**

also a number of entries that included copyright education (n = 7). The one area that stands out for the humanities is a focus on multimedia and digital literacy (n = 8). A few respondents mentioned helping students prepare for symposia (for example, how to develop a research poster or present on a research panel). One answer in particular noted, "You can consider our approach both hybrid and classroom-flipped in nature." The examples provided for one-shot sessions and face-to-face interactions as subject liaison with students or faculty mentors involved a wide variety of topics, in some cases five or more topics for each example, indicating a desire to cover as much ground as possible for the session.

Social Sciences

The social science examples (n = 13) were primarily taught as course-integrated and open workshops, with two examples focusing on team-teaching with a faculty member. Several mentioned collaborations with teaching faculty and campus coordinators of undergraduate research programs, and one course-integrated session involved partnering with both, plus assessment staff on campus. These examples also heavily represented

library instruction focused on developing search skills, including locating statistical information. Other areas of instruction were how to write an annotated bibliography and citation management. One respondent mentioned expanded citation analysis: "Tracing concepts forward and backward through citations (not strictly citation analysis)." There was little or no mention of scholarly communication issues being covered by the social sciences, although one librarian team-taught with a faculty member and helped students prepare their work for publication. Another respondent noted burgeoning research team behavior, "Dialogue among the faculty, librarian and the student (other students chime in too) to explore and refine their topic, brainstorm spheres of influence, identify bodies of relevant literature."

Humanities

The humanities examples (n = 11) were almost equally divided between course-integrated sessions, one-shot sessions, and face-to-face meetings with a faculty member, student, or both as subject liaison. There were scant collaborations in this area, although there was one mention of partnering with a dean. Learning how to find research materials was paramount in the humanities as well and, not surprisingly, included instruction on identifying primary and secondary sources. Unlike the social sciences and interdisciplinary programs, there was a stronger focus on academic integrity and avoiding plagiarism. One respondent teaches a variety of scholarly communication issues, including open access and author's rights. Others of interest were a mention of interlibrary loan as a valuable resource for students and the development of one-on-one relationships with the students, which seemed to be more valuable than group instruction.

Discussion

Most of the data collected in the survey point toward traditional information literacy approaches; however, we can begin to see some instruction aligned with undergraduate research programs beginning to emerge. The data revealed a cross section of current information literacy efforts supporting undergraduate research. Librarians are aware of expanding undergraduate research on their campuses and are beginning to develop instruction to support student needs within the disciplines and for interdisciplinary programs (for example, campus honors programs, McNair Scholars). The survey results show that librarians are working to address increasingly advanced research needs: fewer of the submitted instruction examples focused on library orientation skills and more emphasized scholarly communication issues. Indeed, one respondent said that undergraduate researchers have expressed a desire to tackle new material: "It was extremely rewarding to work

The survey results show that librarians are working to address increasingly advanced research needs: fewer of the submitted instruction examples focused on library orientation skills and more emphasized scholarly communication issues.

with some of the best, most motivated students on our campus. We could 'push' them and they wanted more!"

What would a starting point look like for librarians who are considering updating IL instruction and research support services for undergraduate research programs? One respondent shared an introductory example: "We are gradually shifting to a more conceptual approach for IL instruction. Of course, we still teach database selection and searching, and citation management, and the like, but we really emphasize evaluation of sources and creative uses of sources first." Other places to look for inspiration may come from expanding partnerships with faculty and campus affiliates, current instruction efforts designed for graduate students, and the recent development of the Framework for Information Literacy for Higher Education.

Jennifer L. Bonnet and her coauthors remind us, "There is no formula for instruction; indeed, the best instruction will involve collaboration between the librarian and instructor and will be deeply woven into the syllabus and assignment sequence of a given course."[47] While well-documented and successful efforts of course-integrated instruction and embedded librarian models will continue to provide ample opportunities to work with faculty and students, high-impact educational practices open new doors for collaboration. For example, in partnering with writing and tutoring centers, instructional designers, campus information technology, media and visual resource centers, student services organizations, and even student groups, librarians may be able to insert information literacy into previously unexplored areas while taking inspiration from the experiential learning of undergraduate research. As Riehle and Weiner point out, "Truly integrated, deep learning experiences could be more easily and effectively achieved and assessed if groups across campuses more often collaborated to develop strategies to instill information literacy."

Second, librarians can examine current models of instruction for graduate students and rethink teaching through the lens of an "apprentice researcher."[48] There are many topics that undergraduate researchers may be ready to delve into, albeit at a beginner's level, including data management, copyright, author's rights, and more. One respondent noted that he or she collaborates with the campus teaching center to offer a wide range of topics geared toward the needs of faculty and graduate students; honors students are specifically invited and any student can participate. Data from the survey also show that librarians value one-on-one relationships with students and are working to gain the trust of faculty mentors. An added benefit in getting to know students as scholars is that librarians will be better able to informally and formally assess the gaps in IL instruction.

And finally, librarians are increasingly paying attention to the needs of students as "content creators" as exhibited by the revised Framework for Information Literacy for Higher Education.[49] This concern brings scholarly communication to the forefront of IL discussions. The undergraduate research experience, no matter which discipline is being taught, provides a teachable moment regarding the ins and outs of the publishing process. Often, "publishing" for undergraduate researchers translates into presenting at a campus research symposium, but it can also mean "publishing" a final paper in an institutional repository, writing an article for an undergraduate research journal, or even coauthoring with faculty or graduate students. For example, one respondent from the survey mentioned that students were contributing to a book with a professor. There

are many information literacy topics that could shape a more meaningful and impactful publishing experience for undergraduates, including understanding author's rights, open access, copyright and creative commons, intellectual property, and data management. The Framework starts the discussion of experimenting with new pedagogical approaches in this area by acknowledging that students "have a greater role and responsibility in creating

> **The undergraduate research experience, no matter which discipline is being taught, provides a teachable moment regarding the ins and outs of the publishing process.**

new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and scholarship ethically."[50] Overall, the Framework challenges librarians to create a multifaceted instructional approach that is interwoven in the fabric of the undergraduate research experience.

It should be noted that the research only skims one element for how libraries currently support high-impact educational practices. Librarians are challenged by authentic opportunities to meet students where they are and contribute to student success. The survey results can serve as a start to examining how information literacy, in particular, can be adapted to meet the needs of undergraduate researchers; however, there is much more that can be explored in this area. One survey respondent was hopeful regarding the inroads librarians have made at his or her institution:

> Every semester we make a little more progress with these programs. We're educating the faculty about undergrad research habits and the shortcomings of research skills infusion in the core curriculum and in departmental curricula. They will come around soon. It's just a matter of time.

IL efforts within high-impact educational practices can not only pair successfully with faculty goals but also contribute to the success of institutional learning outcomes.

Conclusion

What makes undergraduate research and high-impact educational practices powerful is their ability to engage the student in a semester-long project, often defined and designed wholly by student interests. High-impact experiences are immersive, they extend throughout an entire semester, and their format can dramatically differ from the typical semester-long course. Kuh highlights several "unusually effective" benefits of high-impact educational practices that should resonate with librarians. He mentions that students frequently interact with faculty and peers about substantive

> **IL efforts within high-impact educational practices can not only pair successfully with faculty goals but also contribute to the success of institutional learning outcomes.**

matters, typically over extended periods. Moreover, these practices offer rich opportunities for immediate formal and informal feedback through the integration of knowledge

that is essential to deep, meaningful learning experiences.[51] This model can provide two-fold benefits for improving information literacy efforts: first, more interactions with students can nurture a longer-term relationship with faculty and students; and second, a more complex IL curriculum can be uniquely incorporated into the students' overall experience.

It should come as no surprise that the most frequently taught topics revolve around assisting undergraduate researchers to search for and find research materials—in other words, standard library instruction practices. However, given the push by the AAC&U for institutions to offer high-impact educational practices for every student, the teaching librarian has an opportunity to revamp and re-envision information literacy efforts. Undergraduate research and other high-impact educational practices, such as service learning and writing across the curriculum, provide opportunities to incorporate high-level IL teaching into the curriculum. Specifically, librarians should be asking: what IL skills do students need assistance with to succeed within an undergraduate research experience? As Stamatoplos reminds us, there is room for growth:

> Undergraduate research and other high-impact educational practices, such as service learning and writing across the curriculum, provide opportunities to incorporate high-level IL teaching into the curriculum.

> Though their [undergraduate researchers'] needs can in many ways resemble those of faculty researchers, such students understandably might not always think like experienced scholars. The librarian becomes a critical ally in the research process and a welcome guide to a more sophisticated approach to scholarship.[52]

There is common ground with teaching faculty in this arena, most significantly our commitment to incorporating experiential learning into our teaching practices. The knowledge gained from this survey could benefit significantly from the perspective of faculty mentors. Other areas for further research include identifying the areas where undergraduate researchers need the most information literacy instruction to succeed in their programs, exploring the pedagogical approaches that are most beneficial to the undergraduate researcher, and examining the Framework for Information Literacy for Higher Education for how it could impact teaching the wider scope of high-impact educational practices. As undergraduate research opportunities continue to grow and evolve, librarians would find it helpful to pursue a comprehensive understanding of how such research activities impact the national sphere of higher education as well as initiatives on their own campus.

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48. Ibid., 37.

49. Association of College and Research Libraries (ACRL), Framework for Information Literacy for Higher Education, accessed March 8, 2015, http://www.ala.org/acrl/standards/ilframework.

50. Ibid., 1.

51. Kuh, *High-Impact Educational Practices*, 14–17.

52. Stamatoplos, "The Role of Academic Libraries in Mentored Undergraduate Research," 240.

Appendix A

E-mail to Library Deans or Directors

Dear [first name, last name],

During spring 2012, my colleagues and I invited your institution to participate in a survey investigating library support for formal undergraduate research programs. The results of the survey indicated that your library provides instructional support for your campus' undergraduate research programs. We appreciated your feedback and are now inquiring for specific examples of this instruction.

This follow-up survey examines the types of instruction that libraries provide to support undergraduate research. Would you please forward this survey to the librarian(s) who are responsible for teaching for your campus formal undergraduate research program?

As a quick reminder: The Council on Undergraduate Research (CUR) defines undergraduate research as: an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline. (http://www.cur.org/about.html).

Examples of such programs include:

1. Formal undergraduate research opportunities program (such as those offered through http://www.cmu.edu/bio/research/undergrad_research/)

2. Undergraduate research symposiums that highlight original and creative undergraduate work (such as http://www.learning.wisc.edu/ugsymposium/)

3. Undergraduate research journals that publish original undergraduate research (such as http://digitalcommons.iwu.edu/uer/)

4. Undergraduate honors programs (such as http://advising.ahs.illinois.edu/JamesScholar/)

5. Other formal initiatives that foster original undergraduate research or creative works (such as http://www.eui.illinois.edu/).

The survey will take approximately 15–20 minutes to complete and will be available until August 9, 2013.

https://www.surveymonkey.com/s/ur_instruction

Thank you for your continued support,

Merinda Kaye Hensley

Results of the spring 2012 survey are available as a preprint: "A Survey of Library Support for Formal Undergraduate Research Programs," *College & Research Libraries*, http://crl.acrl.org/content/early/2013/02/06/crl13-458.full.pdf+html.

Appendix B

Survey Instrument

Page 1

Investigating Library Instructional Support for Formal Undergraduate Research (UR)

Last spring, my colleagues Sarah Shreeves (University of Illinois at Urbana-Champaign) and Stephanie Davis-Kahl (Illinois Wesleyan University) and I conducted a survey to benchmark the current landscape of library support for undergraduate research programs. This second phase survey follows up with the 86% of libraries that indicated they offer instructional support for undergraduate research programs in order to more closely examine instructional efforts.

Results of the spring 2012 survey are available as a preprint: "A Survey of Library Support for Formal Undergraduate Research Programs," *College & Research Libraries*,

http://crl.acrl.org/content/early/2013/02/06/crl13-458.full.pdf+html.

In this survey, you will be asked to elaborate on the type of instruction offered as well as the content provided to undergraduate students engaged in formal undergraduate research programs.

This survey is being administered by Merinda Kaye Hensley at the University of Illinois at Urbana-Champaign and has been reviewed and approved by the Institutional Review Board at the University of Illinois at Urbana-Champaign. Information that could identify the responses of a specific institution in our analysis will not be shared, only the aggregated results and anonymized comments will be included in publication or presentation. Survey results will aid libraries and librarians by benchmarking the current state of library instruction to undergraduate research programs and will inform the next stage of research: examining best practices and strategies for library instructional support of undergraduate research programs.

This survey contains approximately 15 questions and should take approximately 15–20 minutes to complete; the exact time depends on how many examples you choose to include. All survey data are anonymous unless you want to provide your contact information for further follow-up.

The survey will close on August 9, 2013.

If you have any questions about your rights as a participant in this study or any concerns or complaints, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

By entering the survey, you are acknowledging your consent to participate. If you would prefer not to participate, please exit your browser.

Survey Questions

As a survey respondent, you are answering questions regarding your teaching activities. If there are other librarians at your institution who teach students and faculty involved in undergraduate research, feel free to forward this survey.

The Council on Undergraduate Research (CUR) defines undergraduate research as "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline" (http://www.cur.org/about.html).

Examples of such programs include:

1. Formal undergraduate research opportunities program (such as those offered through http://www.cmu.edu/bio/research/undergrad_research/)

2. Undergraduate research symposiums that highlight original and creative undergraduate work (such as http://www.learning.wisc.edu/ugsymposium/)

3. Undergraduate research journals that publish original undergraduate research (such as http://digitalcommons.iwu.edu/uer/)

4. Undergraduate honors programs (such as http://advising.ahs.illinois.edu/JamesScholar/)

5. Other formal initiatives that foster original undergraduate research or creative works (such as http://www.eui.illinois.edu/).

Excluded from this definition is research conducted as part of normal classwork (outside the framework of any of the programs described above) or work completed with an individual faculty member for compensation.

1. Do you provide instruction for a formal undergraduate research (UR) program as described above? * [Y/N/I don't know/Other]

If Yes, respondent taken to page 4.

If No, respondent taken to page 3.

If "I don't know," respondent taken to page 12.

If "Other," respondent taken to page 4.

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You have indicated that you *do not provide* instruction for formal undergraduate research (UR) programs. What are the barriers at your institution keeping you from providing instruction for UR programs?

[check all that apply]

1. We don't have the staffing required.

2. We don't have the resources (e.g., space or funds) required.

3. We offer the same services to all undergraduates.

4. We have not been approached to provide support.

5. The UR programs on our campus have indicated that they do not need library support.

6. I don't know.

7. Other (please specify).

Upon submit, respondent taken to page 18 to answer demographic information.

Page 4

1. Please identify all disciplinary areas or campus programs for which you provide instruction for undergraduate research programs. [check all that apply]

    a. Business

    b. Education

    c. Fine arts

    d. Humanities

    e. Life sciences (including health and agriculture)

    f. Nursing

    g. Physical sciences (including engineering, mathematic, and computer science)

    h. Social sciences (including anthropology and psychology)

    i. Interdisciplinary program

    j. Your campus Undergraduate Research Opportunities Program (UROP) or Summer Undergraduate Research Opportunities Program (SROP)

    k. Your campus honors program

    l. I don't know

    m. Other (please specify) [text box].

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1. Are you assigned as a liaison to one of your campus's formal undergraduate research programs? (e.g., your campus honors program, McNair Scholars, Summer Research Opportunities Program) [Y/N]

If yes, please specify [text box].

1. Have you consulted with an academic department (e.g., sociology) or campus program (e.g., McNair Scholars) regarding the incorporation of information literacy principles into the curriculum of an undergraduate research program? [Y/N]

If yes, please specify [short answer text box].

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What you can expect for upcoming survey questions

The following questions will ask you to elaborate on the type(s) of instruction you provide for formal undergraduate research programs on your campus.

Please remember that the questions are referring to the CUR definition of undergraduate research (UR), "inquiry or investigation conducted by an undergraduate student that makes an original

intellectual or creative contribution to the discipline." This definition **does not** include research conducted as part of normal classwork. It may be possible that you teach for multiple undergraduate research courses/sections/groups. The survey will allow you to input up to 10 examples.

For example, if you are the special collections archives librarian, you may do several one-shot instruction sessions for an English course each semester. An example may look like the following:

1. Format: One-shot

2. Collaboration: English faculty member

3. Discipline: Humanities

4. Topics: How to conduct a literature review and open access

5. Any additional information you would like to share regarding your session

6. URLs for instructional materials that support this particular instructional session.

You will now be asked to enter your examples of instruction for undergraduate research one at a time.

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Example Number 1:

1. Please choose the most appropriate format for this example of undergraduate research (UR) instruction: [choose one]

   a. One-on-one with student and/or faculty mentor as subject liaison

   b. One-shot

   c. Course-integrated

   d. Open workshops (e.g., anyone can attend and possibly geared to the independent researcher)

   e. Team-teach with a faculty member

   f. Team-teach with a campus organization (e.g., writing center)

   g. Instructor of record for a semester-long credit-bearing course

   h. I don't know

   i. Other (please specify) [text box].

2. For this example, if you are collaborating with another librarian, a faculty member, or a campus organization, please indicate each person's title or position on campus (optional) [three text boxes].

3. Please choose the discipline for which you teach this example session: [choose one]

   a. Business

   b. Education

   c. Fine arts

    d. Humanities

    e. Life sciences (including health and agriculture)

    f. Nursing

    g. Physical sciences (including engineering, mathematic, and computer science)

    h. Social sciences (including anthropology and psychology)

    i. Interdisciplinary program

    j. I don't know

    k. Other (please specify) [text box].

4. Please choose the general topic(s) that you are covering for this instruction: [check all that apply]

a. Library orientation (includes building tours, circulation policies, etc.)

b. Developing searching skills (e.g., keyword vs. subject searching, Boolean operators)

c. Academic integrity and avoiding plagiarism

d. Database searching

e. How to conduct a literature review

f. How to write an annotated bibliography

g. How to find gray literature (e.g., conference proceedings, dissertations)

h. How to find and prepare a proposal for grants, fellowships, and scholarships

i. Citation management (e.g., RefWorks, Mendeley, Zotero)

j. Current awareness skills (e.g., how to set up a feed reader and e-mail/RSS alerts)

k. Citation analysis (e.g., journal impact factors, Web of Science, altmetrics)

l. Primary versus secondary sources

m. Searching for and using government information

n. Multimedia and digital literacy (e.g., how to use images in research)

o. Searching for statistical information

p. Numeric and spatial data including Geographic Information Systems (GIS)

q. Data visualization techniques (e.g., how to prepare data for presentation, how to use a free online program such as Piktochart).

r. Developing a data management plan (e.g., generating metadata, preserving data)

s. Scanning and digitizing including software programs (e.g., optical character recognition [OCR] software such as ABBY Fine Reader)

t. Copyright education (e.g., the basics of copyright law, fair use, assistance with securing rights for images, text, music, etc.)

u. Author's rights (e.g., how to negotiate a copyright agreement with a publisher to submit to an institutional repository)

v. Open access (e.g., providing information about SPARC http://www.sparc.arl.org/)

w. How to submit student work to the campus institutional repository

x. How to prepare and submit research to a journal (e.g., your campus undergraduate research journal or a professional journal)

y. Preparing for symposia (e.g., how to develop a research poster or present on a research panel)

z. I don't know

aa. Other (please specify) [text box]

5. Please share any additional information regarding your example instructional session (e.g., do you use any specific active learning strategies?) [long answer text box].

6. Please provide URLs for any websites, online research guides, or instructional videos that you've created to support this example of instruction for undergraduate research for your campus [5 open text boxes].

7. Do you have another example of instruction that you would like to submit? [Y/N]

"Yes" will take the survey respondent to next example.

"No" will take the respondent to demographic information.

Page 8, 9, 10, 11, 12, 13, 14, 15, 16 – Repeat

Page 17

1. Please share any additional information or perspectives regarding your involvement in teaching for undergraduate research programs [long answer text box].

Page 18

1. Name of institution (optional) [text box]

2. Job title of the person filling out the survey (optional) [text box]

3. Are you willing to be contacted for a follow-up interview? [Y/N]

4. If yes, please provide your e-mail address [text box].

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Thank you for taking the time to participate in this survey about library instructional support for formal undergraduate research programs.

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http://crl.acrl.org/content/early/2013/02/06/crl13-458.full.pdf+html.

If you have any questions about this survey and this research, please contact the investigator:

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