Mixin' it Up: Using a Mixed-Methods Approach to Understand Graduate Research Needs

Hilary Bussell, Jessica Hagman, and Christopher S. Guder

Introduction

In Fall 2012, our library decided to settle the workshop question once and for all. Our intermittent, tool-focused workshop offerings had historically been poorly attended. The time and resources spent preparing and promoting the workshops did not serve our users. Before giving them up entirely, however, we knew we needed more data. Personal experience and conversations with our fellow subject librarians told us that some graduate students, in particular, faced challenges throughout the research process and needed support as they developed into independent researchers. Our previous workshops had focused entirely on tools for finding and citing information sources and had not addressed other skills that graduate students need to develop in order to conduct their own research.

Furthermore, our university, like many others, has seen a growing number of online graduate degree programs. Students in eLearning programs often do not have the opportunity to visit the library, meet their subject librarian during orientation sessions, or attend library-based workshops. Lacking information about this new group of students and their experiences learning to conduct research, it was unclear to us what sort of library instruction would best support their development as independent scholars. Given limited—and shrinking—staff numbers, it was vital that we approach the question of whether and how to develop workshops for both on-campus and eLearning students with the data that would maximize our resources and meet the research needs of our target population. Such data would also be useful for subject librarians seeking to develop a more sustainable outreach approach for on-campus and eLearning students alike.

In order to make decisions about any future graduate student programming, we conducted a mixed-methods needs assessment of both our on-campus graduate students and those students enrolled in the growing number of eLearning graduate programs. Using data from focus groups, interviews, and surveys, we sought to answer the following research questions:

1. Do the information needs of Ohio University graduate students suggest that the library should offer workshops or other non-course-integrated instruction on research-related topics, including the use of library-based tools?
2. Do the information needs of on-campus graduate students differ from those of eLearning graduate students?
3. If there is a need for out-of-class instruction opportunities, in what format should they be offered to in order to best reach both on-campus and eLearning graduate students and still efficiently use limited staff time?

Hilary Bussell is eLearning Librarian, Ohio University, e-mail: bussell@ohio.edu; Jessica Hagman is Reference & Instruction Librarian, Ohio University, e-mail: hagman@ohio.edu; Christopher S. Guder is Reference & Instruction Librarian, Ohio University, e-mail: guder@ohio.edu

Literature Review

Previous literature has examined the research needs of graduate students, though this has largely been focused on graduate students' experiences with library services and their strategies during the information collection stages of the research process. Several of these studies indicate that students often do not expect to find research assistance at the library, even in the information seeking stages of the research process. George, Bright, Hurlbert, Linke, St. Clair, and Stein used semi-structured interviews to better understand the information-seeking behavior of graduate students at Carnegie Mellon University. Only 40% of the students reported seeking help from a librarian in their research process, although experiences in this area varied by discipline. Most of the students reported using Google for academic research and employing strategies like citation chaining.[1] Like George et al., Gibbs, Boettcher, Hollingsworth, and Slania found that graduate students were generally not strong users of the library's liaison services, with only half of the participants indicating awareness of their department's library liaison. The students in their focus groups and respondents to their online survey believed that the library should focus on information access over developing student services.[2] Similarly, students in Monroe-Gulick and Peter's study of incoming graduate students indicated that faculty members served as the students' primary source of information about library resources and services and that few of the students considered seeking help from the library or librarians.[3] In this same vein, Fleming-May and Yuro's focus group analysis revealed that some students are reluctant to speak to librarians out of the belief that they should already be able to conduct their research independently or that their own research topics were too specialized for librarian assistance.[4] Interestingly, the participants in this study indicated that the transformation of their identity from undergraduate student to independent scholar influenced how they thought about the research process and approached the use of library resources.[5]

Some library-based studies have demonstrated the challenges that students face beyond the information seeking stages of the research process. Doucette and Fyfe researched the data management practices of graduate students at several different universities in Canada. Overall, the participants reported confidence in their ability to manage their data, though some participants reported losing data that later needed to be recollected.[6] In a study of humanities graduate students at Columbia and Cornell universities, Castro Gessner, Jaggars, Rutner, and Tancheva found that graduate students needed assistance as they sought funding to support their graduate work and research. Beyond funding, students sometimes needed assistance with basic technological tasks like annotating PDFs. Interestingly, the student participants also reported frustrations at navigating institutional requirements, a problem which encouraged them to turn to their communities of fellow students to seek support and learn how to best work through the bureaucratic systems.[7]

Developing and Assessing Workshops

Some research has provided direction on ways that graduate students think about existing or potential library workshop offerings. Roszkowski and Reynolds found that students believed themselves to be too busy to come to an on-campus workshop during the week and expressed a preference for weekend workshops. The students indicated that they preferred instruction specific to their own discipline and that went beyond basic library-skills instruction.[8] In contrast, the students in Rempel, Hussong-Christian, and Mellinger's study said that they wanted additional general orientation offerings as they began their graduate programs as well as better knowledge of the training opportunities already available across campus.[9] While not specifically asked about library workshops, the new graduate students in Monroe-Gulick and Petr's study reported that they had actually received *too much* general library instruction via library tours or introductory sessions in the library before beginning their graduate programs.[10]

Beyond the research on graduate students' perceptions of library instructional offerings, the literature also offers practical advice for developing effective workshop series. Hensley outlined a number of recommendations deriving from the development of a "savvy researcher" workshop series, including: asking students for the type of content they would like to see in the workshops, partnering with the other campus units to develop the workshops, and using a variety of instructional formats.[11] Critz, Axford, Baer, Doty, Lowe, and Renfro also recounted their experiences in developing a series of library workshops and recommended collaboration with the campus Graduate Student Association. They urged librarians to develop clear titles for workshops in order to help students understand exactly what content would be covered in each offering.[12] Finally, Rempel and Davidson, who developed a literature review workshop, encouraged libraries to promote workshops through graduate advisors and to be mindful of workshop timing.[13]

A review of the literature on graduate students' research needs indicates that while they do face challenges throughout the research process, they do not necessarily think of the library as the place where they can find assistance. There does not appear to be a clear answer about the ways in which graduate students think about library workshops or a single preferred workshop format. While this literature helped us to understand some of the challenges that our graduate students might face, it did not provide guidance specific to our population. Nor did it help us to address the questions raised by the growing eLearning graduate student population. Given the limitations of the previous literature, we sought to better understand the specific challenges faced by our on-campus and eLearning students as we decided whether to continue offering workshops and how we might adapt the workshop format if there was indeed a need for this form of library instruction.

Setting and Methodology

Ohio University is a large public university located in Southeast Ohio with a Carnegie Classification of high research activity. In Spring 2014, the total combined enrollment (undergraduate and graduate) in Athens (main) campus and eLearning programs was 27,623. Enrollment in both the Athens campus and eLearning graduate programs has increased in recent years, with Athens campus graduate enrollment increasing by 4.1% from 2008-2014 and eLearning by 180.3% for the same period. Total graduate student enrollment for Spring 2014 was 2,480 on the Athens campus and 1,646 in eLearning graduate programs.[14]

The Ohio University Libraries on the Athens campus consist of Alden Library, the Music and Dance Library, and the Hwa-Wei Lee Library Annex. Alden Library is open 24/5 during the school year (with reduced hours during summers and weekends). A librarian or other staff member is available whenever Alden Library is open to answer questions or refer users to the appropriate subject librarian via in-person reference, IM/Chat, phone, and e-mail. There are seventeen subject librarians on the Athens campus; each is responsible for information literacy instruction, outreach, and research support for the students and faculty in their liaison area(s). The researchers for this study are subject librarians for Political Science, Communication Studies and Media Studies, and Education, respectively, as well as members of the Reference Department.

The graduate student needs assessment consisted of an initial qualitative phase followed by a quantitative phase. We received a grant of $944.50 from the Academic Library Association of Ohio that allowed us to compensate participants and provide refreshments for the focus groups. In June 2013, invitations to participate in the needs assessment were e-mailed to all graduate students enrolled in Athens campus and eLearning programs. The study was also promoted via the library's social media accounts and blog. Focus groups were conducted with Athens campus students ($n = 25$), while eLearning students ($n = 9$) participated in individual in-depth interviews over Adobe Connect. Focus group participants received a $10 gift card for the campus dining facilities and eLearning participants received a $15 credit on their account with the

Bursar's office. The same questions were used in the focus groups and interviews.

We decided to analyze the data using an inductive thematic approach, which allowed us to examine the range of research-related challenges faced by the participants. After transcribing the recordings of the focus groups and interviews, we individually coded each transcript and identified themes relevant to the research questions. We then compared individual analyses and created a master of list of codes which we re-applied to the transcripts using the software program Dedoose. Among the many themes that emerged, several specific question areas were identified to explore further in a survey.

A Qualtrics survey was administered for a one-week period in April 2014. The survey consisted of 18 questions in which participants were asked to rate their confidence with specific skills related to finding information, managing sources of information and data, and writing and disseminating the results of their research. Participants were also asked to indicate their preferred formats for learning new skills related to research, to rate their experiences accessing library resources and services, and to indicate which technology tools and citation software they used or needed to learn how to use. An open-ended question at the end of the survey allowed students to comment on any additional questions or concerns related to their own research process (see Appendix A for the complete survey).

An invitation to complete the survey was e-mailed to all graduate students enrolled at that time on the main campus (N = 2,840) and in eLearning programs (N = 1,646), using an enrollment list provided by the Office of the Registrar. Each e-mail included a unique link, which tied the responses to the students' selected demographic information (college, specific program, and degree sought). A reminder e-mail was sent to students who had not yet taken the survey partway through the week. Participants who completed the survey had the opportunity to include their name and contact information in a separate form that entered them into a drawing for one of 10 $50 Amazon gift cards. The final response rate was 18.8% (n = 842 total); 75% of respondents were on-campus students and 25% eLearning students. On-campus respondents were over-represented in the final sample, as graduate student enrollment during the Spring 2014 semester was 63% on-campus students, compared to 37% enrolled in eLearning programs.

A saturation sample was used to distribute the survey to all registered graduate students, rather than attempting random distribution.[15] However, the respondent group was determined to be representative of the population of graduate students with respect to college. Most of the response rates fell within 1-2% of the population parameters. The major exceptions were Business, which represents 10.3% of the survey respondents but 15.2% of the graduate student population, and Arts and Sciences, which represents 21.5% of the survey respondents but 15.6% of the graduate student population. Nonresponse error is still a concern, as it would be with any survey research, but coverage error was reduced significantly as every potential graduate student was included.

Findings

Findings from Interviews and Focus Groups

Analysis of the focus groups and interviews revealed a number of problem areas for graduate students in using the library and doing research, as well as potential areas for intervention by librarians in helping them cultivate their research abilities. Subjects in both on-campus and eLearning programs identified a wide range of tasks that challenged them throughout the research process, as well as skills they needed to be able to master in order to conduct research effectively. We grouped these skills and challenges into the following categories, which became the basis for the survey conducted in Spring 2014:

- accessing and using previously published research
- writing or sharing research results
- utilizing technology tools for research
- collecting and managing data
- obtaining funding for research

TABLE 1
Highest and Lowest Means for Perceived Confidence in Research Skills (All Students)

	n	Min	Max	Mean
Cite sources in the appropriate style	783	1	5	4.05
Identify previously published research on your topic	782	1	5	3.90
Access the full text of previously published research	781	1	5	3.86
Determine where to publish your research	753	1	5	2.48
Successfully apply for grant funding for your research	685	1	5	2.05
Identify sources of grant funding for your research	705	1	5	2.04
Note: Participants were not required to answer each question, which led to different n-values for each.				

- accessing and using library resources
- navigating the graduate program and relationship with advisers

Interestingly, a number of subjects in on-campus programs spoke about the need to cultivate personal traits or habits that would help them develop as graduate students and future scholars. Examples included the need to be bold or original, to be able to avoid procrastination, and to be able to solve problems without asking for assistance from advisors or faculty. In contrast, eLearning students did not mention these more personality-driven traits; their responses fell within the technical and information-seeking tasks and challenges represented in the categories listed above. While this illustrates the complexity of the graduate student experience and is worth further study, we decided this finding fell outside the scope the current project.

Findings from Survey

The first step in analyzing the results of the survey was to run descriptive statistics to determine which questions about research-related skills produced the highest and lowest means in reported confidence to complete the specified tasks. The questions were asked on a five-point Likert scale with 1 representing the lowest self-perceived ability level in a given skill (labeled "Poor") and 5 representing the highest self-perceived ability level (labeled "Excellent"). Table 1 lists the three highest and three lowest mean scores for the skills questions. The entire list of skills and their means is located in Appendix B.

We also compared the means for on-campus and eLearning students on skills confidence and library experience questions by conducting independent t-tests. Interesting patterns emerged from comparing the skills confidence means of eLearning students with those of on-campus students that we feel warrant additional consideration with respect to instructional and service-based decisions. While the independent t-tests did show some statistically significant ($p < .05$) differences between on-campus students and eLearning students in terms of skill confidence, the effect sizes were so small that they may not warrant actionable consideration at the individual question level.

However, each of the four questions we identified as "library experience" questions showed significant differences between the on-campus and eLearning students, with on-campus students showing a higher

TABLE 2
Significant Differences in Skills Confidence by Campus Group

	Campus Group	n	Mean	Effect Size
Develop a poster for presentation	on-campus eLearning	583 188	3.45 3.80	.19
Access the full text of previously published research	on-campus eLearning	586 195	3.90 3.72	.08
Access books needed for research	on-campus eLearning	575 192	3.72 3.51	.02
Decide when to end the search for previously published research	on-campus eLearning	564 189	3.04 3.30	.10

TABLE 3
Library Experience Questions by Campus Group

	Campus Group	n	Mean	Effect Size
Ohio University Libraries staff are available to answer my questions	on-campus eLearning	580 188	4.10 3.71	.21
Ohio University Libraries staff are able to answer my questions	on-campus eLearning	580 189	4.07 3.92	.08
I have access to the information resources I need through the Ohio University Libraries	on-campus eLearning	579 189	3.68 3.47	.09
I feel well-informed about the resources and services available to me through the Ohio University Libraries	on-campus eLearning	580 189	3.95 3.68	.15

mean scores for all four experience questions than eLearning students. The library experience questions were asked using a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" and dealt primarily with how well the student felt the Libraries were providing services. Table 3 shows the mean score for each group on each library experience question as well as the effect size.

In the section of the survey dealing with learning format preferences, we asked the respondents to rank the following formats in order of preference, with 1 being most preferred and 5 being least preferred:

- a live online workshop
- a video I could watch when needed
- a website with images and text that I could consult as needed
- an in-person workshop
- a presentation in regular classes

We examined the data both in the aggregate and by campus affiliation, which indicated there are some differences in learning format preferences among the two groups of students.

When all participants are considered in the aggregate, it seems that participants were generally not interested in online workshops (see figure 1). However, when campus affiliation is considered, we see that more eLearning students prefer the live online workshop than do on-campus graduate students (see figure 2).

Given our initial interest in deciding whether the library should continue to offer in-person workshops, it was also worth examining the preferences for that learning format. Figure 3 shows the aggregate prefer-

FIGURE 1
Preferences for a Live Online Workshop, All Students

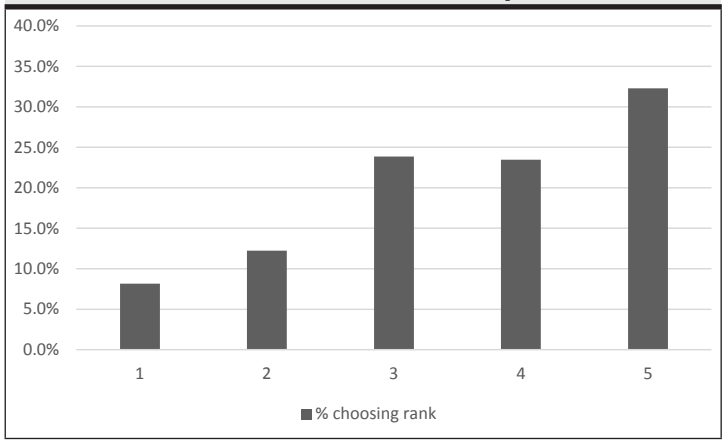


FIGURE 2
Preferences for a Live Online Workshop, by Campus

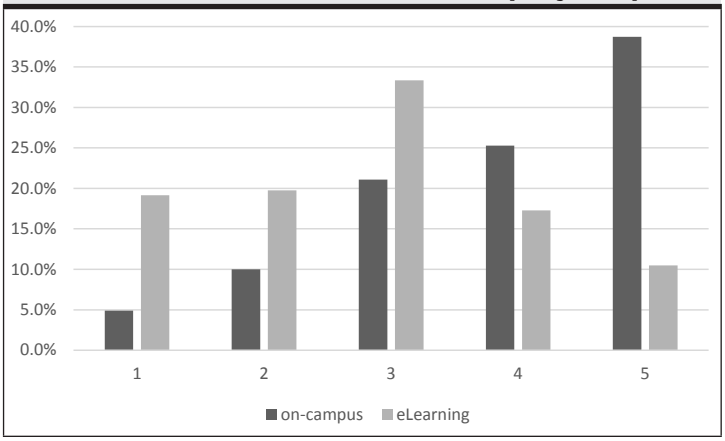


FIGURE 3
Preferences for an In-person Workshop, All Students

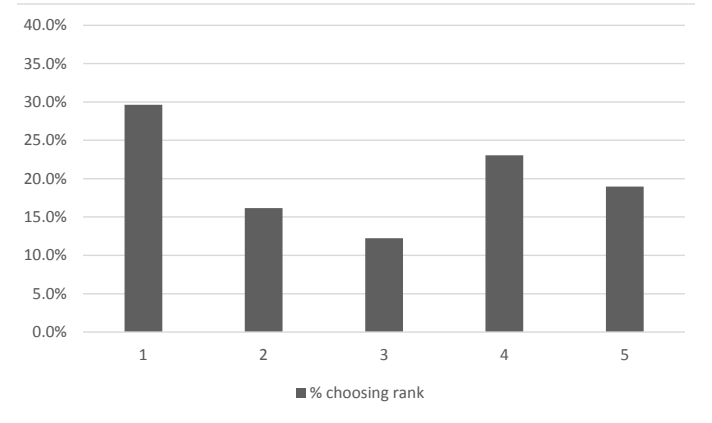
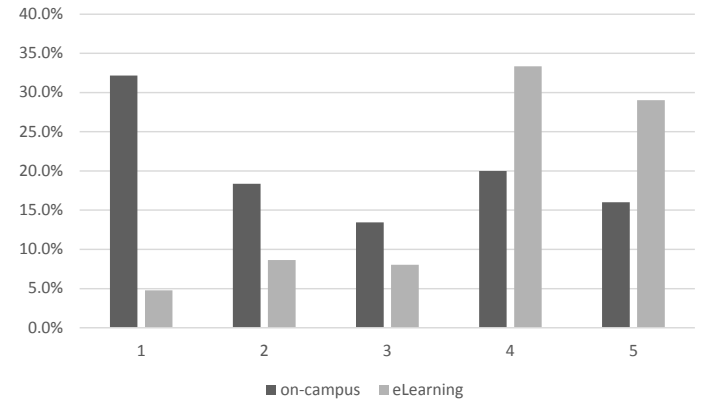


FIGURE 4
Preferences for an in-person Workshop, by Campus



ence for in-person workshops, which indicates that this is still the preferred learning format for many students. Even some of the eLearning students indicated that they preferred an in-person workshop format for learning a new skill, as demonstrated by figure 4.

Our research questions focused on the challenges students face throughout the entire research process. Therefore, we also sought to identify specific types of software that students use or need to learn in order to develop into effective researchers given that software programs had come up during the interviews and focus groups. We asked the participants to indicate whether they currently use a citation management software like Refworks, Zotero, Mendeley, or EndNote. Overall, only 31% of the participants said that they used a citation management program (23% eLearning, 34% on-campus). Of the participants who said they used a citation management program, 237 responded to an open-ended question asking them to list the software they used, with some participants indicating that they used more than one citation software. At the time of the survey, a third of the participants who used a citation software (34%) were still using RefWorks, a few months ahead of the library's cancellation of our RefWorks subscription and changeover to support for Zotero. Other citation software used at the time of the survey included Zotero (22%), EndNote (8%), Microsoft Office tools (2%), PERRLA (2%), Papers (2%) and EasyBib (1%). The rest (29%) of the answers mentioned specific programs fewer than three times, or were unintelligible.

A second open-ended question asked participants to indicate if there was any other software they would need to learn how to use effectively to conduct their own research, the results of which seem to indicate strong interest in qualitative and quantitative analysis tools. Of the 595 programs listed by participants (some participants listed multiple programs) 20% were SPSS. Other frequently mentioned programs included R (8%), MATLAB (5%), Excel (4%), Nvivo (4%) and Atlas.ti (3%). The rest of the programs listed were mentioned fewer than twenty times.

Discussion

In undertaking this study, our goal was not only to better understand the research needs of graduate students at our institution but to be able to make recommendations for supporting them in a more sustainable way (whether this be workshops, online video tutorials, or another type of instructional offering). Overall, the data from the survey showed some differences in skills confidence, library experiences, and learning preferences between on-campus and eLearning students. Taken together, the results provide a data-driven position from which to develop out-of-class instructional opportunities for both groups of students.

It has been important to us to think about how to share insights and implement programs based on our results in ways that bring in campus partners from outside the library and encourage repurposing and sharing of materials by subject librarians, faculty, and others on campus. After an initial presentation on the results of the study to subject librarians at our library, we thought about how to use these results to develop instructional programs and resources for graduate students in a way that would be sustainable and useful to many. We decided to take a two-pronged approach. First, we created a LibGuide to serve as a centralized repository for instructional materials, the content and format of which were developed based on the results of our study. These materials are intended to be used, adapted, and added to by any subject librarian who works with graduate students or used by graduate students seeking DIY research skill development. The LibGuide also houses publications reporting on the results of the study, which give subject librarians and other interested parties a general idea about trends and preferences among graduate student researchers. In cases where subject librarians are interested in the specific challenges faced by graduate students in their disciplines, we have also broken down the results by department or college with the expectation that this information would support more effective outreach.

Second, since our survey results indicated high preference among on-campus graduate students for in-person workshops for learning research skills, we have decided to give workshops another try, with some modifications in content, development, and marketing. We have planned and hosted workshops at the library, which include sessions taught by librarians as well as other experts from across campus, an idea supported by Rempel et al.[16] Using experts from inside the library and across campus will allow us to expand our topics to other areas of the research cycle.

We began this series in Fall 2014 by offering several workshops on using the citation management tool Zotero. Our choice of topic was informed by survey results showing that the majority of graduate students do not currently use a citation management tool. Furthermore, of those who did indicate that they used a citation management tool, the largest number indicated that they used RefWorks, a tool for which the library was set to cancel a few months after the survey. Interest in Zotero was borne out in the high rate of attendance and the number of questions we received both during and after the workshops. One reason for increased attendance could be credited to our changed approach in marketing the workshops. Rather than simply highlighting the chance to learn another tool, our PR materials emphasized the benefits of using Zotero in saving time and managing the burdensome part of research, a strategy recommended by students in the on-campus focus groups.[17] In addition to advertising through the library's blog, social media, and physical signage, we sent e-mails to everyone who had attended a library orientation session for incoming graduate students based on our qualitative findings that graduate students prefer receiving e-mail communications from the library. Two online Zotero workshops were also held via Adobe Connect. The attendance was not as high for these, despite the survey results indicating an interest in the live online workshop format by eLearning students. Future efforts will include more targeted advertising to eLearning students, via subject librarians and eLearning faculty and staff.

The Zotero workshops were followed later in the semester by a "Hack Your Research" workshop focusing on strategies relating to hard-to-find items, productivity, and advanced search techniques (all of which were identified as needed skills in our survey). As of this writing, we are currently planning another round of Zotero workshops as well as a workshop on public speaking about research results, which will be co-taught by PhD students from the university's School of Communication Studies. We are also in the process of seeking out additional campus partners with whom we can offer workshops on software tools and areas of the research process in which we lack in-house expertise, such as obtaining research funding.

We have created online materials to supplement the workshops (including short videos, slides, and handouts), which are shared via our social media out-

lets and are stored on the LibGuide. We are concentrating our efforts in particular on creating short videos, since this was identified as one of most highly preferred formats for learning research skills. It is our hope that creating these materials will facilitate asynchronous instruction on these topics by individual subject librarians, in particular for eLearning graduate students. Our intention in creating both a centralized repository which can be used or added to by any subject librarians, as well as a workshop series, is that these resources will not be "owned" by the three librarians who conducted the study but rather sustained through input and collaboration from librarians and others across campus.

Conclusion

In the end, the workshop question was answered with a resounding "yes." Analysis of the focus group, interview, and survey data indicated that graduate students have challenges that hinder their development into efficient and effective researchers. Using data drawn from our student population has provided us with direction and a means to better reach out to students who attend classes both on campus and online. While some of the skills that the students seek to develop fall outside of the traditional roles of academic libraries, we believe that libraries should seek to support scholars throughout the research process and engage deeply with the campus community. Future workshops, targeted to the needs and learning preferences of our diverse graduate student population will be one way that we conduct outreach to our campus community and show them the ways in which the Ohio University Libraries can support their development into independent scholars.

Appendix A. Survey Questions

Skills Questions Participants rated their confidence to complete the following tasks as poor, fair, good, very good or excellent (on a scale from 1-5)	**Writing & Sharing** • Compile a literature review • Writing up the results of your research • Determine where to publish your research • Write about previous research without plagiarizing • Develop a poster for presentation • Prepare a conference proposal
	Research Sources • Cite sources in the appropriate style • Identify previously published research on your topic • Access the full text of previously published research • Keep track of or organize citations of previously published research • Access books I need for my research • decide when to and the search for previously published research
	Funding • Identify Sources of grant funding for your research • Successfully apply for grant funding for your research
	Data • Analyze qualitative data • Analyze quantitative data • Collect data • Store or manage data

Technology Questions	Is there any software or computer program you will need to learn in order to complete research in your program, such as software for data analysis or visualization? Yes/No/Not Sure If yes: Please list the programs you will need to learn how to use to complete research in your program.
Citation Management Questions	Do you use a citation management tool to keep track of research sources? Examples of these tools include RefWorks, Zotero, Mendeley and EndNote. Yes/No/Not Sure If yes: Which tool(s) do you use?
Learn Format Questions	If you found yourself in a situation where you needed to learn a new skill in order to successfully complete a research project, how would you prefer to learn that skill? Please rank your preferred learning options from 1 to 5 with 1 being preferred in most cases and 5 being preferred least often. • A live online workshop • A video I could watch when needed • A website with images and text that I could consult as needed • An in-person workshop • A presentation in your regular classes
	Are there any preferred methods of learning a new skill that are not on this list? Yes/No If yes: Are there any preferred methods of learning a new skill that are not on this list?
Experience Questions Participants answered these questions on a five-point Likert scale from strongly disagree to strongly agree, with the exception of the question about not using particular resources.	Please indicate whether you agree or disagree with the following statements about your experience using the Ohio University Libraries' resources and services. • Ohio University Libraries staff are available to answer my questions. • Ohio University Libraries staff are able to answer my questions. • I have access to the information resources I need through the Ohio University Libraries • I feel well-informed about the resources and services available to me through the Ohio University Libraries
	Please indicate whether you agree or disagree with the following statements about your experience as a graduate student. • My program and coursework helped me learn the skills I need to become an effective and efficient researcher • My undergraduate program prepared me for graduate-level expectations of student research skills
	Have you ever decided not to use a particular information resource (such as a journal article or dissertation) because you were not able to access the document at the time you needed it? Yes/No
Open-Ended	Is there anything else you would like to let us know about learning research skills?

Appendix B. Means for All Skill-Related Questions, All Participants

Skills Questions	n	Min	Max	Mean
Compile a literature review	788	1	5	3.58
Write up the results of your research	788	1	5	3.54
Determine where to publish your research	753	1	5	2.48
Write about previous research without plagiarizing	794	1	5	3.92
Develop a poster for presentation	771	1	5	3.53
Preparing a conference proposal	746	1	5	3.07
Cite sources in the appropriate style	783	1	5	4.05
Identify previously published research on your topic	782	1	5	3.90
Access the full text of previously published research	781	1	5	3.86
Keep track/organize citations of previously published research	779	1	5	3.63
Access books needed for research	767	1	5	3.66
Decide when to end the search for previously published research	753	1	5	3.11
Identify sources of grant funding for your research	705	1	5	2.04
Successfully apply for grant funding for your research	685	1	5	2.05
Analyze qualitative data	757	1	5	3.22
Analyze quantitative data	760	1	5	3.15
Collect data	766	1	5	3.51
Store or manage data	764	1	5	3.48

Notes

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