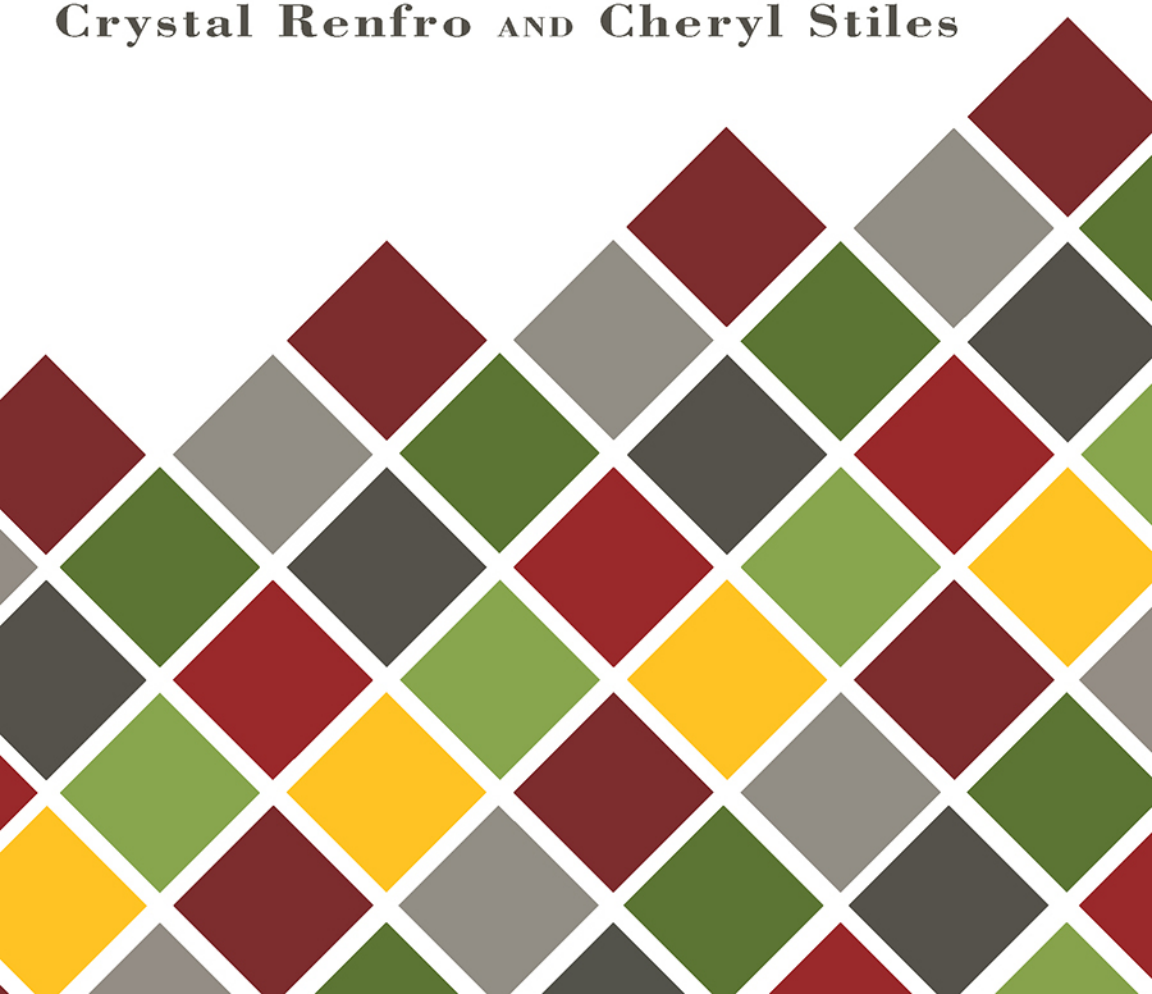
Transforming Libraries to Serve Graduate Students

EDITED BY
Crystal Renfro AND Cheryl Stiles



Transforming Libraries to Serve Graduate Students

Edited by Crystal Renfro and Cheryl Stiles

Association of College and Research Libraries
A division of the American Library Association
Chicago, Illinois 2018

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences–Permanence of Paper for Printed Library Materials, ANSI Z39.48-1992. ∞

Library of Congress Cataloging-in-Publication Data

Printed in the United States of America.

1 2 3 4 5 22 21 20 19 18

Cover design by Aajay Murphy

Chapter 12

Providing Innovative Library Services to STEM Graduate Students

Karen Stanley Grigg, Sarah H. Jeong, and Nina Exner

Introduction

While there is abundant discussion in library literature on the information literacy needs of undergraduates, particularly incoming freshmen, fewer librarians have focused on the needs and skills of graduate students, perhaps due to the simple fact that the undergraduate population is much larger than that of graduate students.

However, several changes in the educational landscape are driving the need for more comprehensive services for graduate students. First, graduate student programs are seeing greater increases in enrollment across the country. According to the National Center for Education Statistics, "Post baccalaureate

enrollment fluctuated during the period from the mid-1970s to the early 1980s, but between 1983 and 2010 it increased from 1.6 to 2.9 million students. Fall enrollment in post-baccalaureate programs is projected to increase through 2021 to 3.5 million students."[1] As enrollment in graduate programs increases, universities will shift more resources and attention to their graduate students. Librarians will need to seek new and expanded services to respond to this increased emphasis on graduate education.

Graduate students in all academic disciplines have different research needs than their undergraduate counterparts. Many are pursuing original research, seeking new knowledge to add to what exists in the literature. Their research tasks require more sophisticated skill sets, they must find more extensive and exhaustive sets of literature, they use very subject-specific resources, and they are doing all these tasks while juggling studies, doing internships or research assistantships, or teaching, and they are often returning to a research environment after a significant gap.

Graduate students in STEM disciplines face all these challenges and, additionally, other discipline-centered challenges. This chapter will cover the academic landscape navigated by STEM graduate students, along with proposing a robust suite of services to graduate students that embed librarians and the library throughout their research life cycle.

Macauley and Green noted that librarians needed to reconceptualize their relationships with doctoral students.[2] Doctoral candidates in the sciences were far less likely to believe that a librarian should be allocated to work with them on information literacy skills than doctoral candidates in other disciplines. The authors concluded that, while there is still a place for librarians to assist with information literacy training, graduate students needed to be approached as autonomous, self-directed learners.

Covert-Vail and Collard, in a 2012 ARL report, suggested that libraries create a suite of services for graduate students that address the graduate student life cycle of teacher, student, scholar, writer, and researcher.[3] They suggested that "existing library initiatives such as the institutional repository, scholarly communications programming, and library instruction, should be reframed or re-characterized, to resonate with the graduate students and their academic lifecycle."[4]

Renfro and Shields discussed a similar graduate life cycle, where services could be developed for the "coursework phase of doctoral programs, assistance with searching and managing citations; in the middle (writing) phase, help with using technology, data management, and communication with different kinds of audiences; and, as they finish, help with publication (publishing, determining impact of one's scholarly work, writing for impact) and job searches."[5]

While the graduate student life cycle applies across graduate disciplines, STEM disciplines tend to additionally share a common research life cycle. Ex-

ner's model of the STEM research life cycle (see figure 12.1) begins with the literature search and continues with the phases for funding, research, publication, and discoverability. In each segment of this life cycle, there are opportunities for librarians to embed services for graduate students, but it requires the library to broaden the conception of what services librarians traditionally provide. This chapter will discuss the suite of services STEM librarians could be offering graduate students throughout their research life cycle.

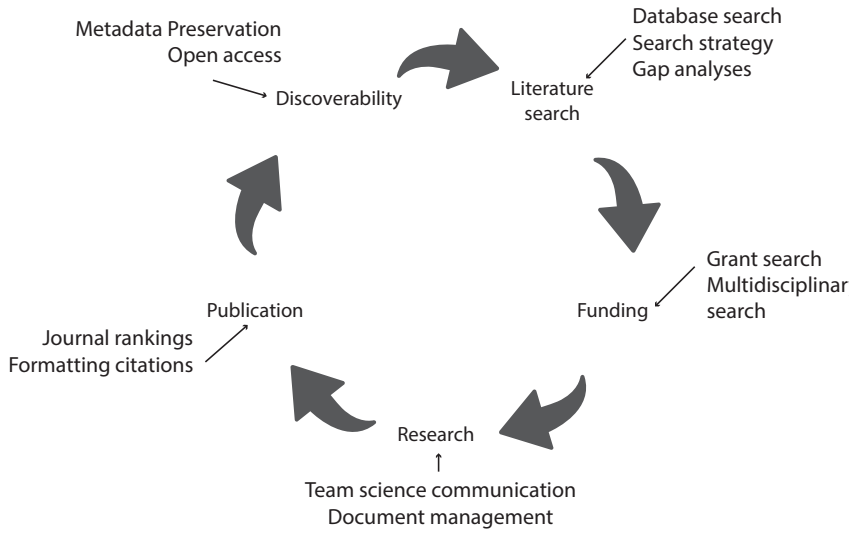


Figure 12.1

Points of librarian support for research. (Source: Nina Exner, "Building Faculty Relationships through Research Support," *Issues in Science and Technology Librarianship*, no. 82 [Fall 2015], https://doi.org/10.5062/F4ZC80W8. Used with permission of author.)

Advanced Searching Skills

One of the most fundamental and obvious areas in which librarians can assist STEM graduate students is to offer targeted, advanced, subject-specific workshops. Librarians at Georgetown University surveyed graduate students to ask about their biggest frustrations in conducting research. Overall, the library fared well in student response, but students reported struggling with "1) difficulty of searching for and accessing journal articles; 2) availability of books and the poor

state of Lauinger Library's stacks; 3) lack of specific resources or types of resources; and 4) difficulty understanding and navigating the website and databases."[6]

At a recent conference, "Transforming Libraries for Graduate Students: Services, Instruction, Spaces Conference" at Kennesaw State University (KSU), attendees discussed the fact that faculty often overestimate the skills of graduate students in doing library research. Librarians might also assume more advanced searching skills than these students have. "Points were raised about the gap between common assumptions about graduate students and their actual skills and experience. For example, faculty may overestimate incoming graduate students' skill at library research. Mid-career students who are accustomed to professional reading and writing may need to readjust their habits for graduate school. Graduate students may not be as grounded in disciplinary or theoretical knowledge as faculty expect."[7]

Workshops on basic journal and database searching skills should focus on the advanced search skills graduate students will need to retrieve comprehensive search results for their theses and dissertations. Advanced features that are particularly valuable to graduate students, such as exporting to citation management systems, locating data, storing searches, and creating alerts, should be covered. A good time to begin teaching these skills is during graduate student orientations. Classes can be identified with research components, and librarians can offer various levels of embeddedness. But, in addition to participating in scheduled classes and orientation, librarians should develop and offer specific workshops. Workshops can also be offered within lab groups, as the groups will all be working on the same topics.

Journal Clubs and Research Groups

Although journal clubs are commonly housed within academic libraries for current awareness of evidence-based trends in the profession, health science librarians and STEM librarians have done outreach to journals clubs housed in academic departments and graduate-level curricula, where graduate students practice presenting papers related to a particular research theme. Fitzgibbons, Kloda, and Miller-Nesbit surveyed twenty librarians from the United States, Canada, Australia, and New Zealand, five of which were participating in journal clubs housed in departments at their institutions. Health science librarians set a precedent regarding participation in departmental clinical journal clubs, which has enhanced librarians' roles regarding credibility with deeper engagement with disciplinary research projects.[8]

Although library internships are typically sought by MLS students, library research instruction internships could be expanded to STEM graduate students.[9]

Librarians could train STEM graduate students to publicize journal table of contents sites such as BrowZine.com among their peers in journal clubs. STEM graduate students are typically unaware of controlled vocabulary searching with Library of Congress Subject Headings (LCSH) and Medical Subject Headings (MeSH) and usage of Boolean operators in creating search strings, which could enhance the efficiency and relevance of their literature search process.

STEM graduate students in the journal club could also benefit from learning about National Center for Biotechnology Information (NCBI) tools such as Gene, Nucleotide, Protein, and Structure using BLAST (Basic Local Alignment Search Tool) from librarians with training from continuing education opportunities in professional associations. Although STEM graduate students may be familiar with the physical library space and collections, journal clubs could raise awareness of the many benefits of library liaison research support available to them, ranging from advanced literature searching in STEM databases such as MEDLINE (PubMed), Web of Science, SciFinder, and Inspec to searching genomic data sets and analyzing research metrics.

Journal clubs can foster an informal, group-learning environment and ongoing dialogue about the research literature between librarians, graduate students, and faculty. Per the request of graduate students enrolled in a journal club for course credit, the Research and Instruction Librarian for Science at Wake Forest University was invited for consecutive multiple semesters to present current trends and issues in the research landscape. The faculty adviser of the journal club subsequently invited the Research and Instruction Librarian for Science to talk about theoretical and applied aspects of research metrics to the Salsbury Research Group, which is a research team comprised of three doctoral students and a postdoctoral scholar that focuses on structural and computational biophysics. Vestfold University College Library in Norway has transformed value-added library research engagement from the Subject Librarian, who can provide discipline-specific information literacy instruction for a broad multidepartmental population of users, to the Research Group Librarian, who acts as a peer and a collaborator with bringing researchers up-to-date with advanced literature search skills, scholarly communication issues, and reference management systems.[10]

Grants

Graduate students in general are moving toward being scholars and researchers. The STEM research cycle often depends on grant funding. While grants are of interest to many researchers, STEM research can be costly in terms of lab or diagnostic equipment. Therefore, STEM researchers depend on grant funding.

Graduate students who intend to go on to research jobs become interested in grants through their faculty advisors, and their graduate studies are often funded by faculty grants. For that reason, a unique scholarly communication interest of STEM graduate students is the role of grants in the research cycle. There are three areas of particular interest: (1) obtaining fellowships and grants for their current graduate studies or future postdoctoral studies; (2) assisting their lab in completing current funding applications; and (3) gaining needed skills for leading a grant application when they become independent researchers.

Fellowships and Graduate Grants

Graduate students have a pressing interest in finding grants to fund their current or upcoming studies. This depends on searching the grants databases. Grants databases work much like library databases, including Boolean and field-specific searching. Some campuses have subscription grant-search databases, while others depend on freely available sites such as Grants.gov.

Grant searching is the same as database searching on a technical level. But the thought process is much different because funding opportunities (i.e., chances to apply for a grant) are usually broad. So a student studying nanoconstruction processes in bioengineering might get a grant for studying science, or engineering, or emerging technologies. Unlike searching for articles, which tends toward narrow terms, grant searching depends on thinking about broader terms. So it is important to help searchers brainstorm broader terms or practical applications that their research might fall within.

Beyond that, faceted searching to limit searches also helps. Limiting results to graduate fellowships or postdoctoral fellowships can help. In addition, searchers can limit a search to grant opportunities for research or research and development and grant opportunities for education. Eligibility limits such as institutions of higher education may also help narrow results. Good partners to work with on graduate fellowship grant searching include the financial aid office, graduate school, and grants office.

Supporting the Lab in Grant Writing

Many STEM graduate students work in a grant-funded lab. The lab funding is often what pays their research assistantship and pays their tuition. Therefore, they have a vested interest in helping their lab lead (principal investigator or PI) to get more funding. Helping them to learn to write and synthesize the literature effectively to support their PI's grants will make them better lab members.

In one sense, searching for literature to support STEM grants is the same as any other graduate-level literature searching. The funding proposal, or grant

application, is like a very advanced version of a student research methods proposal paper or dissertation proposal. In any proposal case, the literature is there to support three ideas: first, that the research is novel yet shows promise to advance the field; second, that the proposed research is well-founded in the literature; and third, that the proposed research methods have a reasonable chance of success.

Funding proposals are different from dissertation proposals in two ways. First, funding proposals must be short. The use of facts and language requires more synthesis to make it very brief and to-the-point. So graduate students must learn to read articles for their essential facts and extract just the most relevant facts to support their PI's proposed research.

The second, and more difficult, difference between grants' use of literature and the dissertation literature review is that grant proposals have no literature review section. The literature must be incorporated throughout the proposal. It is not organized the same way. Therefore, instead of using the traditional "funnel format" logic of a dissertation literature review, graduate students need to consider essential facts that the grant proposal will need to establish. Then, they must search for articles that support these facts in some way. For example, if a grant is proposing to explore a new kind of artificial tissue, they need to consider the facts that support this research's value. One fact to add is the importance of artificial tissue; this can be done by searching for articles on the need for tissue grafts and the past impacts of existing artificial tissue studies. The students also need to establish that this research will extend existing research. This might be done by searching for articles with conclusion sections calling for this research as a promising future area. Or it might be done by finding articles that have shown promise in similar research and then separately finding articles that establish how this technique is better than other techniques in some way.

Working with the writing center or grants department to create workshops can make this aspect of scholarly communication more powerful. The grants department might discuss the persuasive needs of funding proposals. The writing department could then discuss rhetorical devices useful for persuasion. The library could add the searching and strategy elements on how to find articles that establish the facts needed to support those rhetorical devices. And the writing center and library together could discuss analyzing articles and creating the most effective brief paraphrases of those articles. Keep in mind that grant proposals must use very good citing practices, so the library can include training on accurate citation. International students, in particular, may find citation challenging because the United States has different principles of citation than some other countries. Because of the high number of international English-as-a-second-language students in STEM and their unique challenges in creating effective persuasion in English, working with this population may be especially impactful.

Tangentially, lab training on grant writing also leads to training on grant data support. Librarians can help lab researchers document their findings for reproducibility and sharability. This is relevant to grantsmanship because of data management and data sharing requirements (addressed below), but when a lab is involved, there is an opportunity for a librarian to support the whole team learning about good data management. An embedded strategy beyond has evolved where librarians could coauthor sections of electronic lab manuals.[11] As bench research moves away from paper-based to electronic lab notebooks (ELNs), librarians could partner with the information systems department as Bogdan and Flowers have done at Yale University to manage authenticated access to LabArchives ELN.[12] Librarians could play a growing role in supporting the increasingly digital research life cycle from ELNs to grant proposals to researcher profiles.[13]

Learning to Lead Future Grant Writing

As STEM graduate students matriculate through their programs, they are preparing to join the research workforce. This may include leading their own lab in the future. Leading a lab will depend on their ability to get funding for the lab. Gaining these skills in graduate school will help them get jobs and keep their future research vital.

The skill set is similar to those skills addressed immediately above: searching for grants, strategizing effective responses to them, and communicating how proposed research may fit the funding opportunity's goals. It is good to remind graduate students of the importance of staying aware of trends in the field to be ready as new trends in research and grant funding emerge based on new discoveries. Training graduate students in how to use alerting services to keep up-to-date with current events in the literature is one way to prepare them for leading a lab. It is useful to emphasize that if they get in the habit of using alerting services to follow trends now, they will be more familiar with hot topics in the field later. That will make them more able to identify areas that are trending in the field and will appeal to grant reviewers in the future. It takes a few years to get a good feel for trends in the literature, so they will position themselves more effectively for grants and other research if they start the habit of skimming table of contents alerts now. This exposes them to the full range of research so that they can be more strategic in seeking topics and data into the future.

Supporting Researchers in Finding Data Sets

STEM graduate students are moving toward being researchers who make original discoveries. Some of this is based on bench, lab, and field research collecting original data. However, other research depends on the use of existing data sets. This *secondary analysis* kind of research lets researchers find new knowledge from existing—often large governmental—data that has been collected.

Secondary analysis requires finding data sets that can be used with the student's research query. This creates challenges, and data can intimidate librarians. However, searching for data is not much different from searching for journal articles. Librarians can help students find articles even when the research inside the article is too technical for the librarian to read; data sets are the same. Librarians need only a basic understanding of data structures to get started. From there, knowledge of likely websites for data is enough to start. The search options in data set search tools are otherwise similar to advanced search functions in article databases.

Data sets are often like large spreadsheets—they list each individual measurement line by line. Many statistical sources then share analyzed data on the web for the general public. However, the underlying data set with the individual-level data or microdata (that line-by-line view of every sample, sensor, or person examined) is what graduate students are looking for. One example is the US Census survey, which collects each household individually but shares only summaries across all of those people on the internet. In the case of the Census, there are special processes to go to a central data center if a researcher needs access to the full data set.

Librarians are often intimidated by data sets because they are uncomfortable with advanced statistics. However, most of finding data sets depends on knowing government websites and on other common search skills such as citation tracking. It is not generally necessary to understand the underlying statistical principles in order to help with finding data sets. The only statistical concepts to understand are that the researchers usually need the full individual-level data and that any variables (pieces of data that the student wants to analyze) need to be in the same data set unless the student already knows how to connect multiple data sets. Connecting multiple data sets is outside of the scope of many STEM graduate programs, so for most students their variables must all be in a single data set. Understanding this is a key part of deciding whether data found through public searches can be used or not, particularly with data about human behaviors for disciplines like nutrition or industrial engineering. These data sets are often restricted by privacy regulations, so finding out whether there is

a single data set with all of the needed variables in one place can be a challenge. Subscription data set packages are the most common sources of these, but some government-sponsored *microdata* data sets are available for these purposes.

Basic science secondary analyses, such as applied math and *in silico* studies on their own or in preparation for bench science, often have it easier. Data sets in the basic sciences are less likely to be protected by privacy concerns. Many basic sciences have existing data sets hosted by government agencies, such as the National Institutes of Health's (NIH) National Center for Biotechnology Information (NCBI) databases. Many librarians are familiar with PubMed already, which includes data sets and has a facet to limit to data only. But librarians may be less familiar with NCBI's genomics, proteomics, and PubChem data offerings. The search functions in these are similar to those in PubMed (although PubChem is less sophisticated). The key is knowing the data collections are there, and often it is good to look at some webinars on displaying and downloading the data because there may be extra steps with larger data.

Other agencies also have well-established large data collections, ranging from the National Oceanic and Atmospheric Administration's Climate Data Online to the US Geological Survey's Comprehensive Earthquake Catalog. In addition, mandates for public access to data from grant-funded research has led to many smaller, more niche data sets being filed publicly. Sometimes these are hosted on the agency website; in those cases there is a link for data on each agency's website, which can lead to both their large data products and smaller hosted data sets. The key is knowing which agencies do what, in order to predict where certain types of data might be. This is an area where STEM librarians can work with government documents librarians to train graduate students on agency data.

Finally, these same federal mandates can also lead to researchers making their data available through campus or professional society repositories. These are discoverable through web searching with terms like *data* or *data set*, but that can bring many false hits as well. Knowing large repositories such as arXiv and Dryad can be a good starting place, and many repositories are tracked by re3data.org (Registry of Research Data Repositories). Alternately, looking for related articles and then searching for linked data or data citations in those articles can lead to data sets. Especially if the article was funded recently by the NIH or the National Science Foundation (some databases allow users to search in a "funding" field), the data is becoming more and more likely to be available.

Students often need to adjust their ambitions to fit the available data. Data available for one geography or socioeconomic group does not always imply there is similar data for every geography or group. Nevertheless, being aware of data-focused functionality in government tools and public repositories is an important way to help STEM students explore options of data that is already available for their research.

Data Management

In 2012, a survey of science librarians in ARL member institutions asked respondents about participation in data management and data repositories. The survey showed that 8.4 percent of respondents' institutions accepted and stored data, and 10.9 percent indicated that the institution was working on implementing a repository. In addition, 31.9 percent indicated assistance with data management was available, and 24 percent responded that librarians offered data management plan consultations. Of respondents, 44 percent indicated that their job duties included working with institutional/data repositories or data management, with 17 percent indicating that these duties were forthcoming.[14]

When considering the life cycle of research data, particularly during the data storage phase, as well as the archival phase, libraries can provide services advising on best practices in organizing, naming, and storing research data. STEM librarians should take leadership in advising researchers on current standards for metadata and file naming for research data in relevant subject areas. Although libraries might not have the capacity to host data, librarians can guide student researchers to the appropriate repositories for storing their data and should develop familiarity with repositories in their subject areas.

In developing data management services and resources, librarians should first identify and partner with other campus entities that are already providing data management assistance and reach out to these offices and offer to partner. Often, services are already available on campus, and the library does not need to duplicate these services, but librarians can promote these services that already exist.

Citation Management Tools

Graduate students spend countless hours managing lists of references and citations. They juggle with storing and organizing their many PDF files. Much time is spent creating bibliographies and properly formatting their citations. When students discover citation management tools, the discovery is often transformative and saves time for the many other duties these students juggle. Librarians are ideally poised to offer assistance to graduate students with citation management.

There are numerous products often used by STEM authors, and STEM librarians should regularly scan the marketplace to evaluate new products and changes and updates to familiar products and stay up-to-date on products used by STEM researchers to best advise graduate students as to which citation management system would work best for the needs of the individual. Paying special

attention to freely available or low-cost products, such as Zotero and Mendeley, ensures that students from all economic backgrounds have access to citation management systems. Other aspects that may be considered are portability, ease of use, number of styles available, ability to have shared folders, and usefulness with a specific discipline.

Along with maintaining familiarity with these tools, librarians should regularly offer workshops on citation management tools and individual consultations for those who need assistance. Help guides can be created and posted online. The University of Wisconsin at Madison maintains a comprehensive comparison chart of the major citation management tools likely to be used by STEM graduate students, which can be consulted when making a recommendation to students.[15]

Scholarly Communication

In a 2013 Rutgers Library survey of master's and doctoral students' interest in library-facilitated workshops, two of the three most chosen topics of interest to doctoral students were on scholarly publishing: postdissertation publishing, and publishing tips.[16] Given that graduates who enter academia or find employment as research scientists will inevitably need to contribute to the scientific literature, it is important that these students obtain fluency in scholarly communication issues before graduation. Librarians have been active in promoting scholarly publishing literacy among faculty; they must also extend this outreach to graduate students. Some of the topics about which graduate students should be knowledgeable include open access, copyright and fair use, identifying potential publications for submission, institutional repositories, and evaluating scholarly impact via metrics, both standard and altmetrics. These skills can be embedded in standard library sessions. For example, while teaching students how to do advanced database searching, an exercise can have students take an ideal search set and determine the top five journals for one to submit an article on a given topic and to find corresponding metrics for those journals. Liaisons can offer scholarly communication and publishing workshops to entire departments, focusing on discipline-specific practices.

An interesting example of how university libraries can market scholarly communication awareness to students took place at the William F. Ekstrom Library at the University of Louisville in Kentucky, where librarians developed and offered a semester-long, five-workshop Publishing Academy for graduate students that focused on various aspects of scholarly writing and publication.[17] Topics included citation metrics, copyright, open access and license negotiations, working with publishers, strategies for writing for publication, and peer review,

and outcomes and goals were rooted in the ACRL *Framework for Information Literacy*. Though this series of workshops was not discipline-specific, STEM librarians could create a similar series more specifically tied to scientific disciplines.

Another way that libraries can support scholarly communications is to participate in Open Access Week and develop and market activities coinciding with this week that would appeal to graduate students. One such event at UCLA, called "Dissertation to Book: Separating Truth from Fiction," addressed a particular open access topic that is of great concern to graduating doctoral candidates: making dissertations available online and the effects on future publication. The event addressed these topics by focusing on one of the matters of greatest immediate concern to graduating doctoral candidates: Will posting a dissertation online negatively impact my ability to publish a first book?[18]

Conclusion

Traditionally, when providing services to graduate students, librarians have focused mainly on helping during the literature-searching phase, a core service that we should provide. However, as librarians continue to look for gaps in services to students that are compatible with the library's stated mission, new, innovative roles are emerging. Librarians are using the skills learned during their MLS programs and their career history: organization, ability to find and evaluate multiple kinds of information, familiarity with the research process, commitment to the scholarly and research life cycle, and finding ways to embed themselves more fully throughout the graduate school cycle. Services such as data management and data set retrieval, journal clubs, assistance with the grant process, citation management assistance, and help navigating the scholarly communication issues they will encounter are useful to students and help the library demonstrate its value and importance to graduate students, faculty, and administrators.

Acknowledgements

Sarah Jeong would like to thank the Salsbury Research Group, Dr. Partha P. Choudhury, and Dr. A. Daniel Johnson for their work.

Notes

1. Susan Aud et al., *The Condition of Education 2010*, NCES 2010-028 (Washington, DC: *National Center for Education Statistics*, May 2010), v, https://nces.ed.gov/pubs2010/2010028.pdf.

2. Peter Macauley and Rosemary Green. "Can Our Relationships Be Reconceptualized? Librarians, Information Literacy, and Doctoral Learners," *Journal of Education for Library and Information Science* 50, no. 2 (Spring 2009): 74, http://www.jstor.org/stable/40732565.
3. Lucinda Covert-Vail and Scott Collard, *New Roles for New Times: Research Library Services for Graduate Students* (Washington, DC: Association of Research Libraries, 2012), 6, http://www.arl.org/storage/documents/publications/nrnt-grad-roles-20dec12.pdf.
4. Covert-Vail and Collard, *New Roles for New Times*, 6.
5. Crystal Renfro and Elisabeth Shields, "Transforming Libraries to Serve Graduate Students," *College and Research Libraries News* 78, no. 4 (April 2017): 203, https://doi.org/10.5860/crln.78.4.9649.
6. David Gibbs et al., "Assessing the Research Needs of Graduate Students at Georgetown University," *Journal of Academic Librarianship* 38, no. 5 (September 2012): 270, https://doi.org/10.1016/j.acalib.2012.07.002.
7. Renfro and Shields, "Transforming Libraries to Serve Graduate Students," 203.
8. Megan Fitzgibbons, Lorie Kloda, and Andrea Miller-Nesbitt, "Exploring the Value of Academic Librarians' Participation in Journal Clubs," *College and Research Libraries* 78, no. 6 (September 2017): 777, https://doi.org/10.5860/crl.78.6.774.
9. Jennifer Nutefall, "Structuring a Successful Instruction Internship," *College and Undergraduate Libraries* 19, no. 1 (January 2012): 84, https://doi.org/10.1080/10691316.2012.652550.
10. Heidi Kristin Olsen, "Research Group Librarian—A Cooperating Partner in Research?" *Liber Quarterly: The Journal of European Research Libraries* 22, no. 3 (December 2012): 209, https://doi.org/10.18352/lq.8090.
11. A. Daniel Johnson, "Choosing and Citing Sources," in *Technical Communication Guide for Biology Core Labs*, version 17.1 (Winston-Salem, NC: Wake Forest University, 2016), 47–50.
12. Kristin Bogdan and Themba Flowers, "Electronic Lab Notebooks: Supporting Laboratory Data in the Digital Era," *Issues in Science and Technology Librarianship*, no. 76 (Spring 2014), https://doi.org/10.5062/F4V9861X.
13. Alice Meadows, "What Collaboration Means to Me: Working Together to Build a Strong and Sustainable Digital Research Infrastructure," *Collaborative Librarianship* 8, no. 3 (July 2016): 113, https://digitalcommons.du.edu/collaborativelibrarianship/vol8/iss3/2.
14. Karen Antell et al., "Dealing with Data: Science Librarians' Participation in Data Management at Association of Research Libraries Institutions," *College and Research Libraries* 75, no. 4 (July 2014): 562, https://doi.org/10.5860/crl.75.4.557.
15. University of Wisconsin-Madison Libraries, "Comparison Chart," accessed November 22, 2017, https://www.library.wisc.edu/services/citation-managers/comparison-chart/.
16. Bonnie L. Fong et al., "Assessing and Serving the Workshop Needs of Graduate Students." *Journal of Academic Librarianship* 42, no. 5 (September 2016): 571, https://doi.org/10.1016/j.acalib.2016.06.003.
17. Samantha McClellan et al., "Raising the Library's Impact Factor: A Case Study in Scholarly Publishing Literacy for Graduate Students," *portal: Libraries and the Academy* 17, no. 3 (July 2017): 544, https://doi.org/10.1353/pla.2017.0034.
18. Diane Gurman and Marta Brunner, "Dissertation to Book: Successful Open Access Outreach to Graduate Students," *Journal of Library Innovation* 6, no. 1 (January 2015): 40, EBSCO*host*.

Bibliography

Antell, Karen, Jody Bales Foote, Jaymie Turner, and Brian Shults. "Dealing with Data: Science Librarians' Participation in Data Management at Association of Research Libraries Institutions." *College and Research Libraries* 75, no. 4 (July 2014): 557–74. https://doi.org/10.5860/crl.75.4.557.

Aud, Susan, William Hussar, Michael Planty, Thomas Snyder, Kevin Bianco, Mary Ann Fox, Lauren Frohlich, et al. *The Condition of Education 2010*. NCES 2010-028. Washington, DC: *National Center for Education Statistics,* May 2010. https://nces.ed.gov/pubs2010/2010028.pdf.

Bogdan, Kristin, and Themba Flowers. "Electronic Lab Notebooks: Supporting Laboratory Data in the Digital Era." *Issues in Science and Technology Librarianship*, no. 76 (Spring 2014). https://doi.org/10.5062/F4V9861X.

Covert-Vail, Lucinda, and Scott Collard. "New Roles for New Times: Research Library Services for Graduate Students," 2012. Accessed December 7, 2017. http://www.arl.org/storage/documents/publications/nrnt-grad-roles-20dec12.pdf.

Exner, Nina. "Building Faculty Relationships through Research Support." *Issues in Science and Technology Librarianship*, no. 82 (Fall 2015). https://doi.org/10.5062/F4ZC80W8.

Fitzgibbons, Megan, Lorie Kloda, and Andrea Miller-Nesbitt. "Exploring the Value of Academic Librarians' Participation in Journal Clubs." *College and Research Libraries* 78, no. 6 (September 2017): 774–88. https://doi.org/10.5860/crl.78.6.774.

Fong, Bonnie L., Minglu Wang, Krista White, and Roberta Tipton. "Assessing and Serving the Workshop Needs of Graduate Students." *Journal of Academic Librarianship* 42, no. 5 (September 2016): 569–80. https://doi.org/10.1016/j.acalib.2016.06.003.

Gibbs, David, Jennifer Boettcher, Jill Hollingsworth, and Heather Slania. "Assessing the Research Needs of Graduate Students at Georgetown University." *Journal of Academic Librarianship* 38, no. 5 (September 2012): 268–76. https://doi.org/10.1016/j.acalib.2012.07.002.

Gurman, Diane, and Marta Brunner. "Dissertation to Book: Successful Open Access Outreach to Graduate Students." *Journal of Library Innovation* 6, no. 1 (January 2015): 40–59. EBSCO*host*.

Johnson, A. Daniel. "Choosing and Citing Sources." In *Technical Communication Guide for Biology Core Labs*, Version 17.1, 47–56. Winston-Salem, NC: Wake Forest University, 2016.

Macauley, Peter, and Rosemary Green. "Can Our Relationships Be Reconceptualized? Librarians, Information Literacy, and Doctoral Learners." *Journal of Education for Library and Information Science* 50, no. 2 (Spring 2009): 68–78. http://www.jstor.org/stable/40732565.

McClellan, Samantha, Robert Detmering, George Martinez, and Anna Marie Johnson. "Raising the Library's Impact Factor: A Case Study in Scholarly Publishing Literacy for Graduate Students." *portal: Libraries and the Academy* 17, no. 3 (July 2017): 543–68. https://doi.org/10.1353/pla.2017.0034.

Meadows, Alice. "What Collaboration Means to Me: Working Together to Build a Strong and Sustainable Digital Research Infrastructure." *Collaborative Librarianship* 8, no. 3 (July 2016): 112–14. https://digitalcommons.du.edu/collaborativelibrarianship/vol8/iss3/2.

Nutefall, Jennifer. "Structuring a Successful Instruction Internship." *College and Undergraduate Libraries* 19, no. 1 (January 2012): 80–94. https://doi.org/10.1080/10691316.2012.652550.

Olsen, Heidi Kristin. "Research Group Librarian—A Cooperating Partner in Research?" *Liber Quarterly: The Journal of European Research Libraries* 22, no. 3 (December 2012): 190–212. https://doi.org/10.18352/lq.8090.

Renfro, Crystal, and Elisabeth Shields. "Transforming Libraries to Serve Graduate Students." *College and Research Libraries News* 78, no. 4 (April 2017): 202–5. https://doi.org/10.5860/crln.78.4.9649.

University of Wisconsin-Madison Libraries. "Comparison Chart." Accessed November 22, 2017. https://www.library.wisc.edu/services/citation-managers/comparison-chart/.