Developing Data Literacy Programs: Working with Faculty, Graduate Students and Undergraduates

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Research Data Access and Preservation

EDITOR'S SUMMARY

Building data information literacy among faculty, graduate students and undergrads was the focus of a 2015 RDAP Summit panel, with panelists describing programs at different institutions geared to each of these target groups. The Data Information Literacy project identified 12 key competencies for graduate students and how librarians could help build those skills. The Data Management Strategies Self-Assessment encourages junior faculty members to objectively consider their research data management practices and to prioritize issues and tasks. Identifying and addressing the data information literacy competencies of undergraduate students is challenging, with their widely diverse backgrounds and needs. Varied creative approaches, such as embedding lessons within a class, presenting workshops and developing partnerships and research mentorships, have been successful. Data Information Literacy project teams have developed educational programs, compared and integrated their experiences and offer guidelines, available online, for developing digital literacy programs at other institutions.

KEYWORDS

information literacy

data curation

outreach service

educational activities

faculty

graduate students

college students

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Researchers are under increasing pressure from federal agencies, scholarly publishers, disciplinary societies and their peers to administer their data in ways that enable them to be discoverable, understandable and used by others. However, the knowledge and skills required to fulfill these expectations are not often included as a part of higher education, leaving researchers to figure out how to manage, share and preserve their data on their own. This panel at ASIS&T's RDAP15 explored how libraries are supporting the education of graduate students, faculty and undergraduate students with data literacy programs.

Working With Graduate Students

Jake Carlson from the University of Michigan and Lisa Johnston from the University of Minnesota presented the lessons learned from Data Information Literacy (DIL) project.

The Data Information Literacy (DIL) project was launched in 2011 with support from the Institute of Museum and Library Services. The intent of the project was to identify the competencies that graduate students should possess in working with data to be successful in their chosen disciplines and to explore roles for librarians in teaching these competencies. The project included five teams from four institutions, each of which partnered with a faculty member to design and implement an educational program informed by disciplinary cultures of practice and targeted to address specific local needs.

The DIL project methodology had each team interview graduate students and faculty advisors to dive deeply into their educational needs and gaps from the perspective of both graduate students and faculty. An outcome of this project is shown in Figure 1. It is a comparison of how faculty and students rate the importance of each of the 12 DIL competencies used in our study. In our sample we had faculty and students from a variety of scientific

disciplines (agriculture, ecology, civil engineering, computer science and landscape architecture). One disconnect that we found was that faculty tended to highly rank more abstract concepts, such as *metadata* and *description* and *data quality* and *documentation*, whereas students focused more on the type of skill sets that they were already accustomed to using, such as *data management* and *organization*, as well as *data processing* and *data visualization*.

FIGURE 1. Graphical comparison of faculty and student rating of importance of DIL competencies. Scale: 5=essential, 1=not important. Source: *Data Information Literacy: Librarians, Data, and the Education of a New Generation of Researchers* by Jake Carlson and Lisa Johnston [1, p. 53]
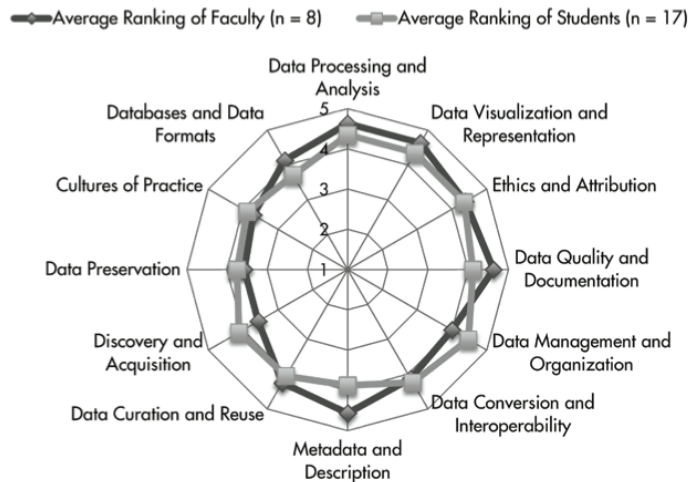
Each of five teams developed an educational program based on what was learned in their interviews and from researching the data cultures of practice of their faculty partner's discipline. For example, the University of Minnesota team created an online asynchronous training course with seven video modules viewable anytime. After two semesters of online only, they flipped the content to a hybrid in-person and online approach to allow more class time for hands-on activities. This change resulted in higher completion rates, even for busy graduate students [2]. Their lesson plans and syllabus

for this hybrid approach is available online for anyone to download and reuse at http://z.umn.edu/TeachDatamgmt.

After teaching their respective programs, each team compared their experiences with each other and developed a guide for academic librarians seeking to develop DIL programs of their own. The following are among our key takeaways:

- Graduate students are key members of the research group and often on the frontline of the research process. They collect, process, analyze and often (solely) manage the research data collected in that research.

- Data management is often a task given to graduate students without a lot of preparation or education. For example, students may be unfamiliar with the techniques for proper data documentation in their own disciplines at this stage in their careers. New students may not have a good understanding of storage options on their campus and may try a DIY approach with backup. They may not have a good understanding of the long-term value of the data or if the data need to be retained after they graduate.

- Take it slow. Don't assume that students have learned even basic data management skills in their undergraduate programs. However, they are very skilled at managing a variety of other types of personal information, such as photos, digital documents and video on many different devices. Use these skills to help them scaffold to digital research data when introducing concepts such as organization, metadata and digital preservation file formats.

- There may be ownership concerns for the students' data that are not well understood. For example, if the data were created as part of a grant or funded by a private organization, those ownership considerations impact how the data are managed and shared.

- Students can and do ask for help. We heard from students that they learned how to manage data by asking their peers, family members and Google or they would try to come up with their own best practices.

- We also found some things that motivate students to participate in DIL educational programs:

- They want DIL skills in order to set themselves apart from their peers when the job market is competitive, and they want to market these skills to future employers.
- They are very busy. Therefore trying a variety of training educational approaches beyond the workshop might be best, such as embedded librarianship or meeting with the research team during their regular meetings or training on demand for graduate students outside of regular library hours.

The complete guide to developing DIL programs is available as a chapter in the Carlson and Johnston edited book [3] or online at the DIL project website: http://www.datainfolit.org/dilguide/.

The DIL project is coming to a close, but these are still early days for librarians in defining educational needs in data management and curation issues. Areas for continued exploration include educating faculty directly and developing programs for undergraduate students.

Working with Faculty Members

Megan Sapp Nelson from Purdue University has developed a self-assessment tool that librarians can use for outreach and program development.

Many newly hired junior faculty are creating expectations for data management within their research labs for the first time. We described an outreach effort targeted to junior faculty members, specifically early career faculty members in their first one to two years holding faculty status positions [4]. In collaboration with a faculty mentor, a more experienced faculty member who convened a junior faculty group, a brownbag/workshop was developed. First, this workshop was intended as a time for junior faculty members to focus on data management issues. Second, it provided background information on data management from both the faculty and graduate student perspectives that had been gathered in the process of the data information literacy grant described above. Third, it provided junior faculty a tool to critique their own data management needs as a way to begin developing a constructive plan for improvement. Fourth, it provided mentoring and conversation on issues of data management with more experienced faculty in their own disciplines.

The tool developed for this outreach, the Data Management Strategies Self Assessment, can be downloaded at http://dx.doi.org/10.5703/1288284315525. This tool is intended to help junior faculty think through research data management in terms of concrete tasks and to invite reflection on practices currently in place in their laboratories and/or research groups. It also provides the faculty members a way to prioritize the most important data management tasks that should be implemented as a starting point for discussion during the workshop. The priorities of the junior faculty then guided the discussion for the workshop. No one individual who participated in the group discussion had solutions for all of the identified priority issues, but the group generally had suggestions and ideas for approaches to addressing identified problems. All identified issues were addressed during the workshop, and all junior faculty members were able to leave the session with ideas for how to begin.

This particular market, early career faculty, present many possibilities for data specialists and data librarians. In particular, finding faculty mentors who work with a number of junior faculty members may be a fruitful avenue for exploration. Additionally, approaching junior faculty members as they set up their research laboratories during their first semesters in their new positions may prove fruitful as well.

Working with Undergraduate Students

Amy Koshoffer from the University of Cincinnati (UC) is actively identifying opportunities for supporting DIL education for undergraduates.

Undergraduates have varied backgrounds in data information literacy at graduation. Those that seek out a research experience potentially learn necessary skills for the specific type of research from the research mentor. Students enrolled in a research-based course, such as biology laboratory courses, may be introduced to concepts of data collection, data analysis and data visualization, but probably not to data management, data backup and preservation. No single approach seems to cover all data information literacy competencies. Librarians involved in providing research data services, such as the three informationists at UC libraries, are looking for creative venues to deliver instruction on these skills. Some approaches include embedding in a class, offering library workshop and forming

strategic partnerships with university faculty, offices and institutes involved with undergraduate education.

At the University of Cincinnati, experiential learning is a cornerstone of the university's approach to undergraduate education [5]. Each year over 5,000 of the 25,000 full-time undergraduates complete a semester of experiential learning, usually in the form of an industry co-op. Experiential learning greatly enhances interpersonal skills such as good communication, confidence and punctuality and professional skills such as critical thinking and collaboration. The Office of Undergraduate Research, Scholarly and Creative Endeavors (URSC) is one of several offices involved in experiential learning support. One goal of URSC is to establish research experiences as viable co-op experiences for students. The office has established a ready-for-research workshop to educate undergraduate students on how to find research opportunities. This introductory workshop focuses on career planning, the resume and basic laboratory safety training. Additionally participants in the workshop can enroll in a mentoring program known as RECON: Research, Education & Creative Opportunities Network.

Students in the RECON program are matched to more senior students already involved in a research experience, usually in the same area of interest. Partnering with this office provides UC libraries with an established and research-focused venue to introduce data information literacy skills and, with student partners in the RECON, mentors to collaborate on teaching these skills.

In collaboration with URSC, informationists in UC libraries plan to offer additional workshops on grant writing, data management, data visualization, presentations and data preservation. Workshops offered will mirror the research process from data collection through data analysis and sharing to data preservation and discoverability. One potential idea is to create a non-credit certification to award to participants who complete all the workshops. Potential research mentors may view this certificate as evidence that certificate holders will have more successful research experiences and be better contributors to the research group's overall goals. The program will give research mentors standards that can be used to evaluate undergraduates seeking research co-op experiences, as participants in these workshops gain enhanced data information literacy skills.

Partnering with URSC may lead to additional collaborations with strategic partners for DIL instruction support, such as individual faculty interested in building data information literacy skills into their courses or other mentoring programs like UC's Preparing Future Faculty (PFF) program for instruction collaborators.

Conclusion

More and more libraries are launching data information literacy initiatives as a component of the data services offered to their constituencies. As we make progress towards defining and delivering data information literacy programs we should also keep in mind the need to develop a community of practice of our own in this area. To this end, we have made the teaching materials generated by the DIL project teams available through the Data Information Literacy Case Study Directory (http://docs.lib.purdue.edu/dilcs/). We hope these materials are of use to others and inspire librarians to get involved in engaging researchers in a growing area of need. ∎

Resources Mentioned in the Article

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