Data Information Literacy

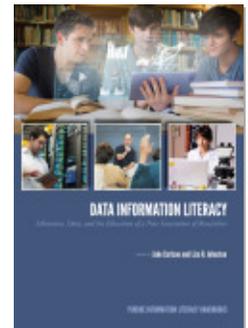Carlson, Jake , Johnston, Lisa

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FUTURE DIRECTIONS FOR DATA INFORMATION LITERACY

Growing Programs and Communities of Practice

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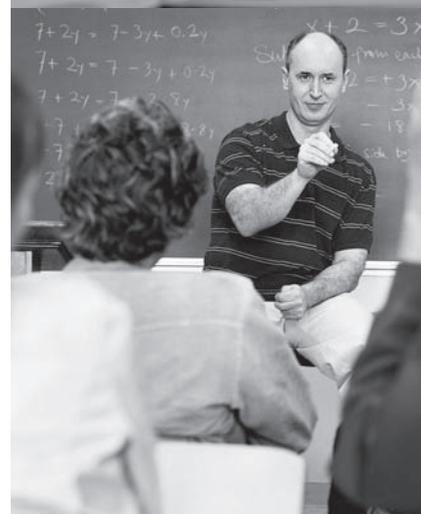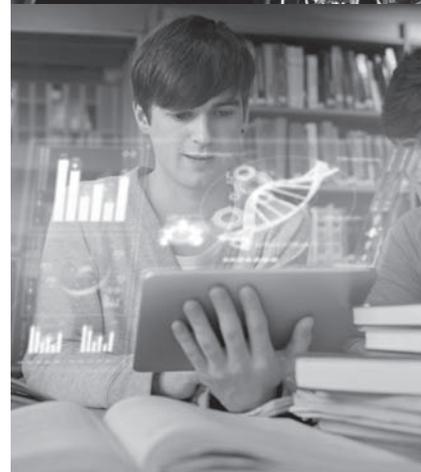
INTRODUCTION

This chapter articulates future directions in advancing the practice of data information literacy (DIL). Beyond further defining the 12 DIL competencies, which is the subject of the previous chapter, I focus on the development of a strong community of practice in this area. Here I examine two sources of information in determining what these next steps could be: the established information literacy community of practice and the emerging community engaged in DIL. Librarians interested in furthering DIL could learn a lot from information literacy, particularly in the questions and challenges that they have addressed over the years. In the first part of this chapter, I examine the recently released draft of the Association of College and Research Libraries' (ACRL's) framework for information literacy and some of the literature produced by information literacy experts for insight. Next, I turn to transcripts from the discussions that took place at the DIL Symposium held in 2013 at Purdue University. The symposium was attended by more than 80 librarians, holding positions mostly in data services or information literacy, to explore roles, responsibilities, and approaches for librarians in teaching data competencies. Many insights for future directions came out of the symposium that could provide an agenda for growth.

EXPLORING DATA INFORMATION LITERACY THROUGH THE LENS OF INFORMATION LITERACY

One of the central strategies of the DIL project was to leverage the investments made by the library community in understanding and responding to information literacy. The DIL case studies illustrated how we informed our work through the lens of information literacy. However, there are many additional avenues for exploring potential linkages between information literacy and DIL.

This is an interesting time to examine how information literacy might inform and propel DIL forward as information literacy itself is undergoing a transition. In the year 2000, the Association of College and Research Libraries (ACRL) released *Information Literacy Competency Standards for Higher Education,* which has largely defined how information literacy has been understood and practiced in academic libraries in the 21st century (Bell, 2013). In 2011 ACRL launched a task force to review the standards to explore whether a revision was needed to better reflect current thinking on information literacy. The changes recommended by the task force included broadening the definition to include other types of literacies and creating a framework to connect these literacies, acknowledging affective and emotion-based learning outcomes rather than focusing exclusively on cognitive outcomes, and recognizing students as content creators and curators (ACRL Information Literacy Competency Standards Review Task Force, 2012). ACRL formed the Information Literacy Competency Standards for Higher Education Taskforce (http://www.ala.org/acrl/aboutacrl/directoryofleadership/taskforces/acr-tfilcshe) and charged them with updating these standards. This taskforce has released multiple drafts over the course of 2014. The new framework for information literacy is still in a period of review as of this writing. The quotes and observations made in this chapter are based on the June 2014 iteration and may not be reflective of the final document (http://acrl.ala.org/ilstandards/wp-content/uploads/2014/02/Framework-for-IL-for-HE-Draft-2.pdf).

A major shift in the "Framework for Information Literacy for Higher Education" document is how it approaches information literacy. Rather than prescribing a set of expected outcomes, the framework focuses on identifying and connecting core concepts as well as encouraging flexible implementations. This new framework for information literacy rests on threshold concepts. The June 2014 iteration of the framework document describes threshold concepts as "those ideas in any discipline that are passageways or portals to enlarged understanding or ways of thinking and practicing within that discipline" (ACRL, 2014, p. 1 of Draft 2). From this perspective, information literacy becomes much more nuanced in implementation rather than teaching broadly defined skills to students through a one-size-fits-all approach.

Using informed learning as its foundation, the ACRL (2014) framework document defines information literacy as

> a repertoire of understandings, practices, and dispositions focused on flexible engagement with the information ecosystem, underpinned by critical self-reflection. The repertoire involves finding, evaluating, interpreting, managing, and using information to answer questions and develop new ones; and creating new knowledge through ethical participation in communities of learning, scholarship, and practice. (p. 2 of Draft 2)

Another approach to information literacy that has gained attention is that of informed learning. Informed learning, as articulated by Bruce (2008), recognizes that "teaching and learning must bring about new ways of experiencing and using information and engage students with information practices that are relevant to their discipline or profession" (pp. viii–ix). A central component of informed

learning is looking at not only what people learn, but also, how they learn it.

Data Information Literacy and Information Ecosystems

There are strong alignments between informed learning, ACRL's proposed framework for information literacy, and the DIL project. The DIL project was predicated on our developing an understanding of the contexts and environments in which the faculty and graduate students worked. This included the environmental scans and literature reviews conducted by each of the five DIL project teams to identify how and to what extent selected fields of study discuss issues relating to the 12 DIL competencies. It included gathering information about the structure and operation of the research lab in which the data were generated, and how the students we intended to teach used data. Through engaging in these activities, we constructed a preliminary understanding of the "information ecosystem" of our students and were able to align our educational programs with disciplinary and local cultures of practice.

However, there are many additional avenues for further exploration in understanding the information ecosystems as they pertain to students' work and experiences with research data. Our interviews revealed that the educational experiences of students on data management and curation were often informal, uneven, and experiential. Therefore, a student's information ecosystem, as it pertained to data, was likely to be ill-defined at best. Our exploration into disciplinary and local information ecosystems of research data was primarily intended to inform the development of our educational programs. More research into information ecosystems as a foundation for generating, processing, analyzing, applying and disseminating research—and

how these ecosystems are understood and practiced from the point of view of students and faculty—would help librarians respond effectively to opportunities and needs.

Data Information Literacy and the Challenge of Context

Some research on information literacy postulates that an individual's approach to information literacy is informed by his or her views of teaching, learning, and information literacy generally, which are adopted implicitly or explicitly in different contexts (Bruce, Edwards, & Lupton, 2006). This finding on the importance of how learning is experienced and the effect of context on the efficacy of information literacy has implications for DIL.

Each of the five DIL teams operated in a different context and, as a result, each crafted different approaches for planning and implementing programs. Two case studies operated in a classroom setting. The Cornell University team created a stand-alone mini-course for credit, and the University of Minnesota team developed a hybrid program with an initial in-person session and then online learning modules. The three other case studies took place "in context," either within the laboratory or in the field. The Carlson and Sapp Nelson team from Purdue University worked on-site as embedded librarians in a lab. The Bracke and Fosmire team from Purdue offered a series of workshops in the lab space of the faculty partner. The team from the University of Oregon offered their program during a regular meeting of the faculty's research team. Each team assessed the impact that their program had on student learning, but larger questions on context remain. For instance, to what extent did the setting for DIL education programs (e.g., classroom, online, lab) have an effect

on student learning? Will DIL programs have a greater impact on student learning if their focus is on data that students are responsible for themselves, as opposed to data sets external from their lab and used in a classroom environment?

There are additional opportunities for research on the contextual aspects of data skills that would aid our collective understanding and action on DIL. First, we need to develop a better understanding of students' relationships to the data that they are generating or working with. How do they perceive their role as a producer of data, especially given that they typically have varying degrees of authority over the data that they are working on? Do they view data as merely a means to an end (a recognized scholarly product such as a journal article or a graduate thesis), or do the data hold value for them as a unique information resource in its own right?

Data Information Literacy in the Presence of Standards and Cultural Norms

Ethical participation in communities of learning and scholarship is a key component of ACRL's draft "Framework for Information Literacy for Higher Education." This represents the importance of cultural connectedness in information literacy, an acknowledgment that an individual's perceptions and actions as a producer and consumer of information is informed by, and in turn informs, the larger cultures of practice. This recognition of larger connections was inherent to the DIL project as well, and we incorporated *cultures of practice* into the DIL competencies so that we could both understand connections and impart them to a larger community.

One of the challenges that we encountered was a lack of widely accepted standards or

norms in the disciplines of our faculty partners for handling, managing, sharing, and curating research data. Many research communities are becoming more aware of the need to consider research data as an asset that has value outside of the lab in which they were generated. This recognition may be due to the mandates of funding agencies and increasing attention to data validity and access by high-impact journals. Even when a community has launched discussions and is taking action to build knowledge and resources around making data accessible, these efforts may not be widely known beyond those few individuals or institutions taking the initiative. For example, DataONE is an initiative to build infrastructure and develop practices around sharing data sets about "life on earth and the environment that sustains it" that has received a great deal of support from the National Science Foundation (DataONE, n.d., "DataONE vision"). However, the University of Oregon team discovered that the ecology faculty partner had only a minimal awareness of DataONE. The Oregon team took this as an opportunity to introduce students and faculty in the lab group to DataONE. They used materials generated by DataONE to discuss considerations and requirements for sharing data outside of the lab.

This absence of widely adopted norms and practices for data management and curation presents both opportunities and challenges to developing and teaching DIL programs. Librarians can play an important role in connecting researchers to the efforts of communities that are addressing these issues. They can help these efforts take root through DIL education both on home campuses and through the professional associations within disciplines. In instances where community efforts have yet to catch on, librarians can act as a catalyst through education of issues and considerations for research data. Ultimately, it is up to the discipline to take ownership and action regarding norms and practices surrounding research data. As DIL initiates change and spurs action, we need a better understanding of how best to foster change within communities and how librarians might be effective agents of change.

Data Information Literacy and Preparing Students for the Workplace

Many in the library community realize that information literacy considerations should extend beyond the classroom, into the workplace. This is acknowledged, in part, within ACRL's new draft "Framework for Information Literacy for Higher Education," which advocates for a more contextualized understanding of the information ecologies in which students are immersed. Embedded within this document are statements on preparing students for professional work through developing their ability to work in teams and the need to better understand the information literacy needs of students enrolled in professional degree programs.

The drafts of the new information literacy framework reflect findings from library science research on how and to what extent information literacy is applied in the workplace. A recent report from Project Information Literacy described its findings on how information literacy skills are put to use by students who have joined the workforce (Head, 2012). Researchers sought perspectives from both employers and employees regarding the information-seeking behaviors of recently hired college graduates. Among their findings was the recognition that employers valued information literacy proficiencies in new hires, but that new hires did not always apply these skills effectively. New hires often defaulted to using information that could be found quickly using a search engine

rather than using other sources of information or demonstrating persistence in seeking information that would address their needs more effectively. In addition, new hires formed adaptive strategies for addressing their information needs, which were typically trial-and-error. Disconnections between information literacy as taught in academic settings and the information literacies applied or needed in the workplace are found in other studies as well. Weiner (2011) noted that the complex, unstructured, and open-ended nature of the workplace contrasts with the more prescribed and directed atmosphere of education. Lloyd and Williamson (2008) took this observation a step further by noting that the generalizations of research done in educational environments do not necessarily reflect the realities of information needs in the workplace. They found that there is a multitude of possible workplaces, each with its own set of contextualized practices, norms, and expectations that make it difficult for information literacy (as typically defined by librarians) to translate effectively outside of a text-based research environment. Instead of viewing information literacy as a set of skills to master, they argued that educators must see it as a holistic practice that considers environmental context as well as the social and physical experiences of the person with information.

Research into information behaviors and needs in the workplace continues to be an important area for informing information literacy theories and programs. Similar explorations are needed to inform the development of DIL, as many students go into jobs outside of academia. As companies become more and more data driven, new employees need to be equipped to work in data-intensive environments and excel as responsible data stewards. We were not able to address this with much depth in the DIL project; however, we recognized the large impact that the environment, expectations, and needs of employers will play in shaping educational programming surrounding data management and curation. For example, the Carlson and Sapp Nelson team from Purdue worked with students developing software code as a component of their participation in the Engineering Projects in Community Service (EPICS) program. The literature review revealed concerns regarding how code was managed and organized within software companies. This team spoke with a few managers at software firms and heard concerns about similar issues that arose in their needs assessment with the faculty and students in the EPICS program: insufficient documentation, difficulties in handing off code to other teams, and quality assurance challenges. Looking forward, we need to be able to move beyond anecdotes to an objective understanding of how to respond to data management and curation needs in the workplace. Just as the information literacy community has begun to investigate the needs of the workplace to inform program development, the DIL community needs to conduct research into the practices and needs of the workplace with regard to working with data.

FURTHER DEVELOPING DATA INFORMATION LITERACY: A COMMUNITY PERSPECTIVE

The DIL project team held a symposium at Purdue University on September 23 and 24, 2013. The intent of the symposium was to foster a community of practice in research libraries centered on developing and implementing sustainable institutional DIL programs. Although the symposium included presentations from

the DIL project teams about the work that they had done, the primary focus was on synthesizing what we learned. This was so that we could provide practical guidance for others to create DIL programs as well as articulate potential roles and responsibilities for librarians in DIL. The symposium included presentations, discussions, exercises, and other activities to engage participants on these topics. The schedule, videos, and materials used at the symposium are openly available at http://docs.lib.purdue .edu/dilsymposium/.

Throughout the symposium, participants were encouraged to consider areas for further development in DIL, both within their own institution and for a broader community of practice. The final session of the symposium was a group discussion on this topic. The themes that emerged from this discussion are presented here.

Raising Awareness

The idea that librarians should provide research data services is taking root in many academic libraries; however, librarians teaching competencies for working with research data is a relatively new development. Teaching DIL skills is a natural fit for librarians as information literacy is a central component of libraries. It is a logical step then to look to what we have learned about how librarians have developed information literacy programs to inform our efforts with data.

It is important to recognize that information literacy was not universally accepted as a role by librarians even after the release of the landmark ACRL's *Presidential Committee on Information Literacy: Final Report* in 1989, which codified the term (ACRL, 1989). Questions arose on the actual meaning of the term *information literacy* and how it was fundamentally different

from other roles such as bibliographic instruction (Snavely & Cooper, 1997). Others pushed back against information literacy, dismissing it as a public relations exercise and a social problem that librarians invented to solve and reclaim relevancy (Foster, 1993). Getting the library community to embrace information literacy required an investment of time and effort on the part of those who saw its potential for libraries and for organizations, such as ACRL, which fostered dialogue at national and international levels. DIL is going through a similar gestation period where definitions, roles, and responsibilities are being discussed and debated in the library community. This will require advocates who can speak passionately and articulate paths toward advancing an awareness of DIL and how librarians could contribute.

Raising awareness of DIL will also require investment and activism at the local level. Our ability to develop DIL programs will depend on our ability to present compelling arguments to colleagues in libraries and on campus. Crafting these arguments will be challenging since time and resources are issues for academic libraries. Librarians may be reluctant to take on this responsibility, especially if it is not an administrative priority for the library.

Most importantly we must raise awareness of DIL among the faculty, students, and administrators at our institutions. We must articulate clear messages that speak to the needs of stakeholders with regard to data. A central tenant of the DIL project was taking the time to know our partners' environments, practices, and challenges in working with data. We believe that this investment enabled us to forge meaningful connections with the faculty and students. Most of the DIL teams are continuing to work with their faculty partners to refine the programs that they developed through this project.

Forming Communities of Practice

As interest and capacity for DIL take root, we need to find ways to come together as practitioners in this emerging field to form a community of practice. Communities of practice facilitate the communication of information, strategies, and experiences, thereby enabling members to learn from each other in ways that foster professional development. They are important for defining common terminologies and concepts, forging standards and best practices, and identifying potential areas of growth.

By design, DIL straddles two existing communities of practice: information literacy and data services. Information literacy communities are well established, having developed multiple communication venues, publications, and other support structures within the library profession and beyond. ACRL's information literacy standards have been widely accepted and adopted. On the other hand, data services is a less established field, though there are some professional conferences and other venues for discussion, such as the International Digital Curation Conference (http://www.dcc.ac.uk/events/international-digital-curation-conference-idcc), IASSIST (http://iassistdata.org/), and the Research Data Access and Preservation Summit (http://www.asis.org/rdap/). We are also seeing an increasing number of publications and initiatives that address data services provided by libraries, such as the *Journal of eScience Librarianship* (http://escholarship.umassmed.edu/jeslib/).

The community of practice for data librarians is different from the community supporting information literacy. Although librarians comprise a sizable block of the membership of professional organizations and attendees at conferences, they are joined by information technologists, research faculty, data scientists, and others whose work centers on managing and curating data. Within the larger data community there is much discussion regarding roles and responsibilities and the knowledge and skill sets needed to assume them. Roles in supporting data work that have been discussed include data creators (researchers), data scientists, data managers, data librarians, data stewards, and data publishers (Lyon, 2013; Pryor & Donnelly, 2009; Swan & Brown, 2008). Although roles and responsibilities are in flux, including multiple perspectives in the discussion encourages the inclusion of a wider range of issues and viewpoints.

A foundational goal for those involved in information literacy is to connect with other communities with complementary interests and aims (ACRL, 1989). An example is the 2013 ACRL report, which explored strategic alignments between information literacy and scholarly communication, noting that they have multiple areas of mutual interest and that opportunities exist for collaboration to address these areas (ACRL, 2013). This report also included data literacy as one of the points of intersection.

Today we are in the process of defining DIL. How communities of practice will form around DIL remains to be seen. Will DIL find a home as a component of a larger established community, such as data services or information literacy, or will it develop its own distinct community? Participants at the DIL Symposium expressed an interest in creating a means of communicating and sharing information about resources and developments in DIL with one another through discussion lists or other channels. We did not want to create an additional silo, but rather to grow and sustain connections with the communities from whom we could model and learn. As DIL becomes more recognized and accepted as a role for librarians, those engaged in DIL activities will have to consider what their needs are as a community

and if satisfying those needs would mandate a distinct community of practice, a presence within larger communities, or some combination of both.

Developing and Sharing Materials

A component of forming and maintaining communities of practice will be developing a means to share approaches, methods, and materials in ways that those within (and outside of) the community can apply them. At the DIL Symposium, attendees referenced the different types of materials they would like to have to support their work. They spoke about the power of sharing real-life "data horror stories" to raise the interest of faculty and students and motivate them to attend educational programming. Several attendees stated that they would like to have illustrations of how good practices in data management and curation resulted in positive changes for researchers, such as an increased impact for researchers who made their data sets openly available, or specific benefits to a lab. Relevant stories have not been easy to find, but this is changing. For example, figshare.com is posting success stories through social media; Dorothea Salo, a faculty associate at the University of Wisconsin–Madison's School of Library and Information Studies, created a listing of "data horror stories" (https://pinboard.in/u:dsalo/t:horrorstories/); and DataONE collects and posts real-world data issues and challenges (https://notebooks.dataone.org/data-stories/).

Participants in the DIL Symposium mentioned their desire for a clearinghouse of educational materials that could be used to generate ideas or repurposed for use in a different program or environment. We are starting to see organizations create educational materials that support librarians and others in teaching data competencies. The University of Massachusetts Medical Center, with support from the National Library of Medicine and others, has invested considerable effort in developing data literacy curricula and learning modules that can be adapted (http://library.umassmed.edu/necdmc/index). DataONE has also developed education modules that can be augmented and reused to meet local needs (http://www.dataone.org/education-modules). What is missing is a centralized repository for collecting materials that address a particular need in the DIL community, along with narratives that would provide the context for how these materials were used and the impact they made. Although locally created materials may be less adaptable than materials created with the specific intent of repurposing, they provide insight into the development process, the approaches taken, and lessons learned. This was a primary goal in creating this book: to share the materials that we developed and our experiences in using them.

Professional Development

In this evolving environment we are seeing interest in DIL grow and opportunities for librarians to take initiative expand. It is important for librarians to educate themselves in these new skills so that they can take on DIL education in effective ways. However, the lack of models and curricula can make it difficult for librarians to prepare or respond to the opportunities on their own. The capacity and capabilities of librarians and others involved in teaching DIL or in developing programs will need to advance. Therefore, we must explore what professional development opportunities librarians need to develop their own competencies in data management and curation theories and practices, as well as how to best teach these competencies to students. One possible approach

comes from the Society of American Archives (SAA). The SAA offers a certification program to educate its professional workforce on curating born-digital archival materials. Their Digital Archives Specialization (DAS) program (http://www2.archivists.org/prof-education /das) requires participants to complete at least 9 continuing education courses and pass a comprehensive 3-hour examination to receive the 5-year renewable certification.

The DIL competencies were developed with an assumption that they would likely extend beyond the knowledge of a typical librarian, faculty member, or information technology (IT) professional. Launching a comprehensive DIL program requires multiple experts from a variety of units within the institution. One of the topics of conversation at the DIL Symposium was the need to be able to connect with the faculty to understand their needs and to convey what the library community has to offer. Since librarians with subject liaison responsibilities connect with the faculty in the departments they serve, they can be paired with data and/or information literacy librarians to develop and implement DIL programs. However, library liaisons may be uncomfortable with or unable to take on additional responsibilities in an unfamiliar area. Other librarians with specialized expertise such as metadata, managing digital repositories, or in intellectual property can participate in the program. A community of practice in the library (and the larger institution) will likely be needed. Developing such a community that spans the library organization would help reduce the barriers to participation in DIL programs and help ensure that community members' knowledge, skills, and connections are applied appropriately.

A critical component of the success of an internal community of practice is the support received from the library's administration. Carlson (2013) identified lack of organizational support as one of the barriers to increased engagement of librarians in working with research data. In addition to securing needed approval and resources, library administrators have contacts within the university administration and with others on campus to which other librarians may not have ready access. They may be able to help raise awareness about the DIL activities underway in our libraries to larger audiences to help extend our reach. An important consideration in developing sustainable DIL initiatives is what professional development in DIL might mean for a library as an organization, in addition to individual librarians.

Scoping Data Information Literacy

A set of questions that arose at the DIL Symposium was about the balance between general best practices in working with data and disciplinary standards. Many disciplines do not have accepted standards surrounding the management, publication, and curation of research data. This makes it difficult to develop DIL programs that align with a student's professional identity. Some of the DIL teams relied on established standards, using them as a foundation and adapting them to local practices. Other teams focused on developing solutions based on best practices relating to the DIL competencies generally and then tying them to existing local practices. Furthermore, some of the teams decided to incorporate several of the DIL competencies into their programs, while others chose to focus on just one or two of them. Other factors, such as specific issues and learning objectives to be addressed in the program, weighed heavily in the team's determination of the scope of their program. However, the driving factor in decisions of scope was the

amount of student time and access available to each of the teams.

It is not yet clear what, if any, the universal competencies for managing, sharing, and curating data are and how they could be taught to an audience from different research fields. A symposium participant suggested that the 12 DIL competencies could serve as a standard in the same way as ACRL's (2000) *Information Literacy Competency Standards for Higher Education* has. There is some appeal to this idea as the DIL competencies are meant to be widely applicable across multiple fields of study. However, as noted in Chapter 10, the DIL competencies have not been fully vetted beyond the DIL project, so it is premature to anoint them as a standard. It is also worth noting that since *Information Literacy Competency Standards for Higher Education* was published in 2000, several discipline-specific information literacy standards have been created, including standards in science and engineering/technology (ALA/ACRL/STS Task Force, n.d.), anthropology and sociology (ALA/ACRL/ANSS Task Force on IL Standards, 2008), and nursing (Health Sciences Interest Group, 2013).

We found that the DIL competencies were a useful framework for gathering information from faculty and students, for informing the DIL programs that we developed, and for facilitating conversation and comparisons between the five case studies. However, we recognize that as more DIL programs take root there will likely be a need for librarians and others to craft specific or targeted variants of the DIL competencies. These variants may be based on disciplinary practices and needs, but they could also be based on a particular research method, data type, or context—for example, a set of competencies primarily focusing on sharing data outside of the lab. There is certainly plenty of opportunity for exploration

beyond the foundational set of DIL competencies that we employed in the DIL project, provided that we keep the focal point of DIL on addressing the real-world needs of researchers through acquiring a solid understanding of their environments.

Audiences for Data Information Literacy Programs

The DIL Symposium participants raised questions about expanding the target audience for DIL beyond graduate students in the science, technology, engineering, and mathematics (STEM) disciplines and expressed interest in developing DIL programs for undergraduate students. One of the recurring themes from the interviews with faculty was the assumption that graduate students had already had some exposure and experience in working with data prior to their coming to work in the lab—an assumption that was not always correct. DIL programs developed for undergraduate students would prepare them for a data-intensive workplace or facilitate their transition to graduate school, where they may be expected to assume responsibilities for developing, managing, and working with data sets. A particular challenge in developing DIL programs for undergraduates will be tailoring these programs to the undergraduate environment. Unlike graduate students, undergraduates do not typically have responsibilities that pertain to the production of data sets outside of a specialized undergraduate research opportunity program (UROP). Therefore it may be difficult to connect them in meaningful ways to the issues that arise when working with data. However, undergraduates are often consumers of data sets, and developing a DIL program from that perspective may serve as a useful introduction. In addition, many colleges and universities

have programs that provide undergraduates with opportunities to engage in research projects, such as Michigan's UROP (http://www.lsa.umich.edu/urop/) or the National Science Foundation's Sponsored Research Experiences for Undergraduates (REU) programs (http://www.nsf.gov/crssprgm/reu/). These programs can serve as potential points of entry for DIL. We expect the interest in undergraduate education on data topics to increase as more attention is given to the value of well-managed data sets and the need for an educated workforce to steward them.

There may be other audiences for DIL programs beyond students. Faculty may benefit from instruction on data management and curation, but that would pose multiple challenges. As busy as graduate students are, faculty are even busier. Faculty are also experts in their fields and may require a much different approach in instruction than students. Furthermore, faculty may have developed familiar routines, even if they acknowledge that these routines are less than ideal. Faculty may be reluctant to commit to changes in working with data if learning curves are deemed too high or the immediate benefit is not clear and does not outweigh the perceived costs of investment. Lab or IT staff who are tasked with administering and stewarding data sets may be motivated to participate in a DIL program.

CONCLUSION

The time is ripe to develop the role of librarians and other information science professionals in delivering DIL programs and to form communities of practice to support these endeavors. The information literacy community can serve as a useful point of reference. In addition, the intersections between data, information literacy, and other communities within the library

field should be recognized and cultivated. Providing DIL programming requires the involvement of individuals with different skill sets and perspectives within (and outside of) libraries.

This chapter identified growth areas for educational programming for graduate students in working with research data. The response that the DIL project has received from faculty, students, administrators, and others at our respective institutions has been phenomenal, and we expect a high level of interest to continue. The DIL project itself ended, but the work that the five DIL teams did at four academic institutions continues to pay dividends as we pursue our individual efforts. This is truly an emerging area of need and one in which librarians can play a significant leadership and teaching role. We look forward to seeing DIL and supporting communities of practice take root in the coming years.

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