

JLSC

ISSN 2162-3309 | JLSC is published by the Pacific University Libraries | <http://jls-public.org>

Volume 3, Issue 2 (2015)

DataDay!: Designing and Assessing a Research Data Workshop for Subject Librarians

Andrew M. Johnson, Megan M. Bresnahan

Johnson, A. M., & Bresnahan, M. M. (2015). DataDay!: Designing and Assessing a Research Data Workshop for Subject Librarians. *Journal of Librarianship and Scholarly Communication*, 3(2), eP1229. <http://dx.doi.org/10.7710/2162-3309.1229>



© 2015 Johnson & Bresnahan. This open access article is distributed under a Creative Commons Attribution 4.0 License (<https://creativecommons.org/licenses/by/4.0/>)

DataDay!: Designing and Assessing a Research Data Workshop for Subject Librarians

Andrew M. Johnson

Research Data Librarian, University of Colorado-Boulder

Megan M. Bresnahan

Sciences Collections Librarian & Scholarly Communications Coordinator, Tufts University

BACKGROUND Many libraries have launched or adapted services to address the research data needs of campus faculty and students. At the University of Colorado Boulder (CU-Boulder), local demand for research data training emerged from a broader assessment of training needs for subject librarians. The findings from this assessment led to the development of a day-long workshop called *DataDay!* that aimed to expand and translate the skills of subject librarians into the context of research data support. **DESCRIPTION OF PROGRAM** The *DataDay!* workshop incorporated hands-on exercises with expert presentations, informal discussions, and print handouts. The workshop allowed participants to gain experience with activities like working with real data sets and developing materials for outreach about research data services. Several instruments were used to assess the workshop learning outcomes, which included changes in knowledge and comfort levels related to engaging in research data support. Assessment activities also measured how well participants applied concepts taught in the workshop to novel situations. **NEXT STEPS** Future research data training efforts for CU-Boulder librarians will be informed by the *DataDay!* workshop assessment results, and this workshop may provide a model for other institutions to use to train subject librarians to adapt to new roles in support of research data. There is also a need for the lessons learned from local training efforts like *DataDay!* to inform the development of resources to support the broader subject librarian community as their institutions launch and grow research data services.

Received: 02/27/2015 Accepted: 05/03/2015

Correspondence: Andrew M. Johnson, University of Colorado at Boulder Libraries, 184 UCB, 1720 Pleasant Street, Boulder, Colorado 80309-0184, andrew.m.johnson@colorado.edu



© 2015 Johnson & Bresnahan. This open access article is distributed under a Creative Commons Attribution 4.0 License (<https://creativecommons.org/licenses/by/4.0/>)

INTRODUCTION

In response to recent funding agency requirements for data management, as well as to increasingly data-driven research practices across disciplines, many libraries have launched or adapted services to address the research data needs of campus faculty and students. As a result, subject librarians may need to fill unfamiliar roles and develop new skills to better support researchers with their data. At the University of Colorado Boulder (CU-Boulder), local demand for research data training emerged from a broader assessment of training needs for subject librarians that involved potential trainees in the identification and design of training opportunities. The results of this assessment revealed that subject librarians reported high levels of anxiety and lack of knowledge associated with research data topics, but they also felt that these topics were becoming very relevant to their work. These participants were also asked to indicate preferences for training formats, and they expressed a strong desire for practical, hands-on training related to research data (Bresnahan & Johnson, 2013). The findings from this training needs assessment led to the development of a day-long workshop called *DataDay!* that aimed to expand and translate the skills of subject librarians into the context of research data support. The workshop was discussion-based and hands-on which allowed participants to gain experience with activities like working with real data sets and developing materials for outreach about research data services. Several instruments were developed to assess learning outcomes, including changes in self-reported knowledge and comfort levels related to engaging in research data support. Assessment activities also aimed to measure how well participants applied concepts taught in the workshop to novel situations.

LITERATURE REVIEW

There is extensive literature on the research data management needs of researchers, the roles that libraries can and already do play in supporting these needs, and the efforts underway to provide training for librarians engaging in this support. The following literature review attempts to situate the *DataDay!* workshop as one model in the broader landscape of training efforts for librarians as they transition into roles supporting research data management in order to meet changing researcher needs.

Changing Researcher Needs

Researchers face a variety of challenges related to the effective management of their data, including (but not limited to) sharing, access, searchability, ethics, and appropriate computing infrastructure, and researchers appear to be unprepared to adequately adapt to these demands despite an increasing number of requirements from funding agencies (ACRL

Research Planning and Review Committee, 2012; National Science Foundation, 2011; The White House, 2013). In this new landscape, researchers will need to adjust their workflows to accommodate new data practices; however, needs for education and training related to research data in the workforce have not yet been recognized or addressed (Carlson, Fosmire, Miller, & Nelson, 2011; National Science Foundation, 2011).

Many researchers have a pronounced need for help and support for the management of their data (Auckland, 2012). One study of agricultural researchers indicated that researchers face a variety of complex challenges related to the storage and sharing of their data (Diekmann, 2012). At the Georgia Institute of Technology, an assessment of campus researchers found that the types of data produced and stored as part of the research process were diverse, yet most researchers had no plan for data management and cited a lack of knowledge as the primary reason for this (Parham, Bodnar, & Fuchs, 2012). In another study at UCLA, researchers in the health sciences reported a need for best practices and support for data privacy, access, and stewardship (Bardyn, Resnick, & Camina, 2012). Graduate students, who are frequently key members of research teams and de facto data managers, are another significant population in need of data management support (Tenopir, Birch, & Allard, 2012). A study of Canadian graduate students revealed that despite high levels of confidence related to data management, students report contradictory behaviors of poor data management practices resulting in occasional data loss and duplication (Doucette & Fyfe, 2013). These examples of the gaps in knowledge around data management skills and practices reveal a clear need for data management training and support, and researchers themselves are receptive to assistance in these areas at the campus level and in some cases via library services (Lage, Losoff, & Maness, 2011; Parham et al., 2012; Steinhart, 2006).

Evolving Library Roles

A number of studies and reports recommend that libraries should play a central role in the development of data management infrastructure and services (ACRL Research Planning and Review Committee, 2012; Auckland, 2012; Gabridge, 2009; Latham & Poe, 2012; Parham et al., 2012; Tenopir et al., 2012). Libraries and librarians are well-positioned to offer guidance on this work based on their traditional expertise, and they can contribute a number of valuable skills to campus data initiatives (Antell, Foote, Turner, & Shults, 2013; Gabridge, 2009; Heidorn, 2011; Ogburn, 2010; Lyon, 2012; Steinhart, 2006). Libraries have long provided storage, preservation, and access for digital information, and subject librarians can leverage their well-established relationships with research faculty and graduate students to promote new services and share the disciplinary knowledge about their liaison departments with campus stakeholders (ACRL Research Planning and Review Committee, 2012; Antell et al., 2013; Bracke, 2011; Gabridge, 2009; Haendel, Vasilevsky, & Wirz, 2012).

Many libraries are already offering or are planning to offer research data services, and there are a variety of models (Lyon, 2012; Raboin, Reznik-Zellen, & Salo, 2013; Tenopir et al., 2012). For example, some libraries may play a role in data storage and dissemination, particularly for small data sets (Akers, 2013; Heidorn, 2011). Libraries offer training, resources, and support for writing data management plans (Johnston, Lafferty, & Petsan, 2012). Other libraries assist researchers with finding data, sharing data, best practices and standards, as well as the ethical use of data (Bardyn et al., 2012; Gabridge, 2009; Lyon, 2012). Libraries also play a key role in data information literacy education for students and faculty (Carlson et al., 2011; Eaker, 2014; Peters & Vaughn, 2015; Wesseling, 2010).

Training for Librarians

To enable the transition toward more robust library support for research data, there is a need for training for librarians in order to increase capacity in this area (Hswe, Furlough, Giarlo, & Martin, 2011; Lyon, 2012; Tenopir, Sandusky, Allard, & Birch, 2013). Surveys of librarians have revealed that they expect research data services to be an important part of their jobs in the future; however, preparedness for delivering research data services impacts how librarians may be able to engage in these services (Auckland, 2012; Corral, Kennan, & Afzal, 2013; Gabridge, 2009; Tenopir et al., 2013). Similarly, a study at the University of Oklahoma showed that while librarians are optimistic about providing new services, there is still uncertainty about the skills and abilities required for success (Antell et al., 2013). A large survey of 140 librarians outside of the United States also showed self-reported gaps in knowledge, skills, and confidence related to data management (Auckland, 2012). A study from the University of Massachusetts Medical School, which sought to establish competencies for health science, science, and technology libraries, concluded that subject librarians need hands-on training related to data curation. This finding was reinforced by another study at Purdue University, which advocates for practical training for reference librarians (Carlson, 2012).

The need for data-related training has led to several new initiatives aimed at re-skilling librarians for participation in research data services. A semester-long course at Harvard University was implemented in the fall of 2013 to provide training for librarians related to data extraction, analysis, and visualization (Erdmann, 2013). The University of North Hampton, in collaboration with the Digital Curation Centre, provided a series of three-hour introductory sessions for librarians to research data management, which was offered in tandem with the online MANTRA training (Digital Curation Centre, 2013). In addition, the New England Regional Medical Library released a full suite of training resources for librarians who wish to develop data management curricula for their students and faculty (Lamar Soutter Library, 2015). The University of Sheffield's Information School, in

collaboration with a local library consortium, created eight half-day learning modules called RDMRose for librarians and library students to develop practical skills for offering research data management consultation (Cox, Verbaan, & Sen, 2014). The *DataDay!* workshop complements all of these efforts by providing a model for practical, data-related training, aimed specifically at subject librarians, that can be delivered at the local level.

DESCRIPTION OF PROGRAM

Workshop Design

The *DataDay!* workshop was designed to provide a hands-on opportunity for librarians to practice skills associated with new roles in research data support. The format of the workshop incorporated hands-on exercises with expert presentations and informal discussions, and participants also received a handout with tips, resources, and tools. All workshop materials are included in a supplementary file accompanying this article as well as via figshare (Johnson & Bresnahan, 2015). A total of 31 participants attended the training, and each participant was given an individual folder in Google Drive that contained the workshop materials. As a result, the workshop was mostly paperless and allowed facilitators to observe and evaluate participant discussion and learning using the online folders. The six objectives of the workshop aimed to equip participants with the skills, knowledge, and confidence needed to begin engaging with and providing services to researchers in order to support their data needs (Figure 1). The authors of this paper were responsible for the design, delivery, and assessment of the workshop.

Objective number	Participants will be able to:
1	Understand the basic stages of the data lifecycle
2	Feel confident discussing the issues associated with new research data services
3	Define the role of the library in research data services
4	Plan for outreach activities to promote new research data services
5	Apply skills from workshop to novel research data situations
6	Engage with researchers effectively when advocating for how the library can support their research data

Figure 1. Workshop learning objectives.

During the workshop, participants were asked to complete four interactive exercises that related to the concepts presented in the workshop. Each of these exercises was mapped to one or more learning objectives for the workshop (Figure 2, following page). Exercise I asked participants to form groups and discuss researcher needs related to each stage of the data lifecycle, including data analysis, documentation, preservation, sharing, and citation. Participants were asked to think about their subject area and to identify library roles in each of these stages of the data lifecycle in order to address learning objectives 1-3. Exercise II asked participants to form groups and discuss a difficult reference question as well as the process through which they answered it. In the second part of Exercise II, participants were given an actual data set along with a brief fictional biography of the researcher who created it. Participants discussed answers to a series of questions about the data set and were asked to think about how they might offer to help the researcher with hypothetical needs they identified. The results of this exercise were informally presented to other groups with the goals of framing the data set discussion in a familiar context and illuminating the similarities between traditional research consultations and support for research data. This exercise addressed learning objectives 1-6. In Exercise III, participants were asked to think about how they would apply the concepts discussed earlier in the workshop to their own subject areas by creating a plan and one tool for research data outreach to campus researchers. Ideas for outreach tools included presentation slides, informational handouts, and research guides. This exercise addressed learning objectives 2, 4, and 6. Lastly, Exercise IV instructed participants to imagine that a researcher walked into their library at the end of the day asking for help writing a data management plan, which was due as part of a grant proposal the next day. Participants were given five minutes to briefly describe both a short-term and long-term plan for helping the researcher with their data management plan and the underlying data management needs. The goal of this activity was for participants to synthesize the concepts covered in the workshop as a whole and to apply those concepts to a novel situation. This final exercise addressed learning objectives 1-6, and it was also used as part of the formal assessment of the workshop.

Assessment Results

Data were gathered through several sources to assess the learning outcomes of the *DataDay!* workshop. Three surveys were distributed to participants immediately before (pre-survey), immediately after (post-survey), and three months following the workshop (follow-up survey). Survey instruments and responses are included in supplementary files accompanying this article. In these surveys, participants were asked to report levels of knowledge and confidence surrounding topics presented during the workshop. Participants were also asked about their roles in research data activities in each survey. While the pre-survey asked what participants hoped to gain from the workshop, the post-survey and follow-up survey

Exercise Title	Format	Description	Mapped to Learning Objective(s)
<i>Exercise I:</i> Library Data Roles	Worksheet, group discussion	In groups, participants were asked to think about the stages of the data lifecycle and answer the following questions for each stage: “What issues do researchers face in your discipline related to this topic?” and “What should (or should not) be the role of the library in supporting these issues?”	1,2,3
<i>Exercise II:</i> Working with Data	Worksheet, group discussion, data set, presentation	In groups, participants were asked to discuss a difficult reference question that they answered recently and talk about the process they went through to answer the question. Next, each group was given a data set, which contained a profile of a researcher and an actual data set. Participants were asked to think about how they would approach supporting this researcher, and how the process compares to answering a more traditional reference question. Each group also presented key points to the entire workshop.	1,2,3,5,6
<i>Exercise III:</i> Research Data Services Outreach Plan	Worksheet, group discussion, outreach tool	Groups were asked to create a plan for outreach around existing or planned research data services. This process and the discussion were structured by the worksheet for this exercise. Participants were then asked to start creating one outreach tool for researchers at their institutions.	2,4,6
<i>Exercise IV:</i> Five-Minute Paper	Short essay	Individuals were asked to imagine that a researcher comes into their library at the end of the day and is frantically seeking help on a data management plan as part of a grant proposal that is due the next day. Participants are asked to think about the data management issues that researchers typically face in their department, and how they might help the person in the immediate future with their data management plan and over the long term with their ongoing data management needs.	1,2,3,5,6

Figure 2. Workshop exercises and associated learning objectives.

asked participants to identify the most important concept learned during the workshop along with any questions that still remained. The follow-up survey also asked participants to describe any recent research data activities or services developed at their institutions and how they have applied skills from the workshop to their jobs. Likert scale responses were tallied to compare how participants' self-reported ratings of their understanding of the research data lifecycle and their confidence in helping researchers changed across all three surveys. Open-ended responses to survey questions were analyzed to identify common themes that emerged. As previously mentioned, participants were also asked to complete an assessment exercise at the end of the workshop called the "five-minute paper" (Exercise IV), which was also analyzed for common themes. All exercise and survey responses were completely anonymous.

Pre-survey results. In the pre-survey, administered immediately prior to the *DataDay!* workshop, participants were asked to rate their level of agreement with the statement, "I understand the basic stages of the research data lifecycle." The Likert scale used for this and other questions was scored on a five point scale, with one indicating strong disagreement and five indicating strong agreement. Six participants reported that they disagreed or strongly disagreed with this statement, six were neutral, and nine participants indicated agreement or strong agreement with this statement. Forty-one percent of respondents reported an understanding of the basic stages of the research data lifecycle prior to their participation in the *DataDay!* workshop.

Participants were also asked to rate the following statement, "I feel confident in my ability to assist researchers with their data," in the pre-survey. For this statement, nine participants disagreed or strongly disagreed, four were neutral, and nine were in agreement or strong agreement. Forty percent of respondents reported feeling confident assisting researchers with their data to some extent.

Another pre-survey question asked participants the question, "What do you imagine your role will be in supporting researchers with their data?" Answers most commonly included statements about roles related to research data sharing or archiving and storage. Less common themes included serving as an informational resource or advocating for adhering to best practices. Several respondents also reported not being sure about their role related to this work. Less typical responses mentioned roles related to making referrals to experts, outreach, database design, metadata, data management plans, data repositories, data citation, expanded liaison duties, and technical infrastructure.

Lastly, participants were asked "What do you hope to learn from this session?" Overwhelmingly, responses expressed a desire to learn more about the research data

lifecycle in general. Other common responses suggested that participants were interested in investigating new library roles, brainstorming promotion and outreach strategies for new services, and developing practical skills. Less typical answers mentioned a desire to discuss changing research environments, technical skills, data repositories, data management plans, and data sharing requirements.

Post-survey results. The questions included in the post-survey mirrored those in the pre-survey for purposes of comparison. When asked again to rate their understanding of the research data lifecycle immediately following the *DataDay!* workshop, none of the participants disagreed with the statement, three were neutral, and 19 participants either agreed or strongly agreed. When asked after the workshop to report their levels of confidence offering research data services, one participant disagreed, two were neutral, and 20 participants agreed or strongly agreed with this statement.

In response to the question, “What do you imagine your role will be in supporting researchers with their data?” in the post-survey, participants reported a large number of ideas for possible roles in research data support at their institutions. The most common theme that appeared in responses was supporting researchers by offering consultative services that would provide information and advice. Other common themes were related to the potential role of librarians related to metadata services, advocacy for data services, finding data, and identifying data repositories. Less common themes related to offering referrals, utilizing liaison relationships, assisting with data management plans, providing infrastructure support, helping researchers share their data, providing full lifecycle support, connecting experts, providing information on data citation, and helping with archiving and storage. Single participants also mentioned identifier assignment for data sets, software support, and data literacy.

Participants were also asked to describe the most important piece of information they took away from the workshop in the post-survey. The most significant theme that emerged in responses was that participants realized that other librarians were facing similar challenges and thus felt less behind in preparing to offer research data services to their researchers. Participants also reported finding value in learning about practical strategies (e.g., hands-on work with data and creating outreach plans) and tools (e.g., existing websites, tutorials, and resources) for research data support. Others stated that they found it helpful to learn about the research data lifecycle, to have opportunities for networking, and to identify questions to ask researchers in consultations related to data and data management plans.

In the post-survey, participants were also asked, “What question do you still have about the material in today’s workshop?” A large majority of participants reported that they had

no remaining questions. To a lesser extent, participants reported that they felt the need for guidance about how to prioritize research data support alongside existing work duties.

Follow-up survey results. Three months after attending the workshop, participants were asked to rate their understanding of the stages of the research data lifecycle again on a five point Likert scale. One participant disagreed with this statement, one individual was neutral, 12 people agreed, and eight strongly agreed.

Participants were again asked to rate their level of confidence in providing research data services at the three month follow-up. Two participants reported that they disagreed with this statement (i.e., did not feel confident), three were neutral, 13 agreed, and four strongly agreed.

In the follow-up survey, participants were asked to provide feedback about the application of the concepts covered in the workshop to their actual work. Participants most commonly reported that they had applied or were planning to apply what they learned toward developing data management plan support, offering consultations and answering questions about research data, working with researchers in a broader research context, and developing new services. Less commonly, participants reported that they had worked to improve outreach and marketing to the campus community. One participant also said that they had created a web resource for their researchers related to research data management.

When asked again in the follow-up survey to identify the most important thing they learned in the workshop, participants most commonly reported an awareness of what others were doing in the area, practical skills that were immediately applicable to their work, and knowledge about what questions to ask a researcher during a research data consultation. Others reported gaining skills that helped them in developing new campus relationships, and some participants remarked that the workshop helped them identify tools, evaluate best practices, and establish a network of others doing similar work. One participant also gained a better understanding of what can be done to support research data initially without additional resources.

Once again, participants were asked “What questions do you still have about the material from the workshop?” Responses largely related to setting priorities and balancing workload related to new research data support activities in light of existing liaison duties. Another common theme expressed by participants related to how to convince researchers of the importance of research data management.

Since the time between the administration of the post-survey and the follow-up survey provided participants with a short period during which they could apply or practice some

of the strategies and skills in the workshop, participants were asked to describe their current approach to providing research data services. Most commonly, participants reported that they were already offering or planning to offer consulting services related to data management. Participants also very frequently reported that they planned to create cross-departmental support teams for research data services to connect experts on campus. Less frequently, but more ambitiously, participants suggested that they planned to provide support services to address researcher needs at every stage of the research data lifecycle. Others remarked that their approach involved training graduate students, developing data information literacy education, working with disciplinary departments, and engaging in outreach activities.

Five-minute paper results. The learning objectives for the five-minute paper exercise focused on identifying whether participants were able to articulate how they would apply skills from the workshop and engage with researchers in both the immediate and long term. Analysis of the five-minute paper essays revealed that participants would approach the immediate situation by consulting a number of sources covered in the training and would seek advice from and make referrals to campus experts as needed. Many participants described how they might offer disciplinary or funder specific guidance based on the content of the grant proposal. In order to support and provide services to meet the long term data management needs of the researcher, many participants described how they would follow up with the researcher after the submission of their grant proposal to encourage them gently to plan further ahead for their next proposal and craft a more robust and effective data management plan. Librarians stated that they would offer to meet again to review some strategies for preparing for this process in the future. Additionally, participants expected to connect the researcher with other campus support services, such as information technology and research computing departments. Librarians also saw the newly established relationship with the researcher as an outreach opportunity, whereby they might connect with the researcher's department to offer support and training for data management as well as to promote other library services such as instruction support.

Discussion of Learning Outcomes

Assessment results indicated that participants found the structure and content of the workshop valuable for work involving research data support services, and analysis revealed a number of outcomes associated with the six learning objectives for the *DataDay!* workshop. The results from each assessment tool contributed to the overall outcomes of each learning objective.

Objective 1: Understand the basic stages of the data lifecycle. The first learning objective for the *DataDay!* workshop aimed to increase participants' understanding of the basic stages of the research data lifecycle. The post-survey and follow-up survey results both revealed

improvements in perceived understanding compared to the pre-survey results. Participants were 35% more likely to report that they understood the basic stages of the research data lifecycle immediately after participating in the *DataDay!* workshop and 31% more likely three months after (Figure 3). The slight decline in understanding three months after the workshop could be attributed to the recency of the workshop content at the time when the post-survey was administered. Overall, it appears that the *DataDay!* workshop was beneficial for participants' levels of understanding of the research data lifecycle.

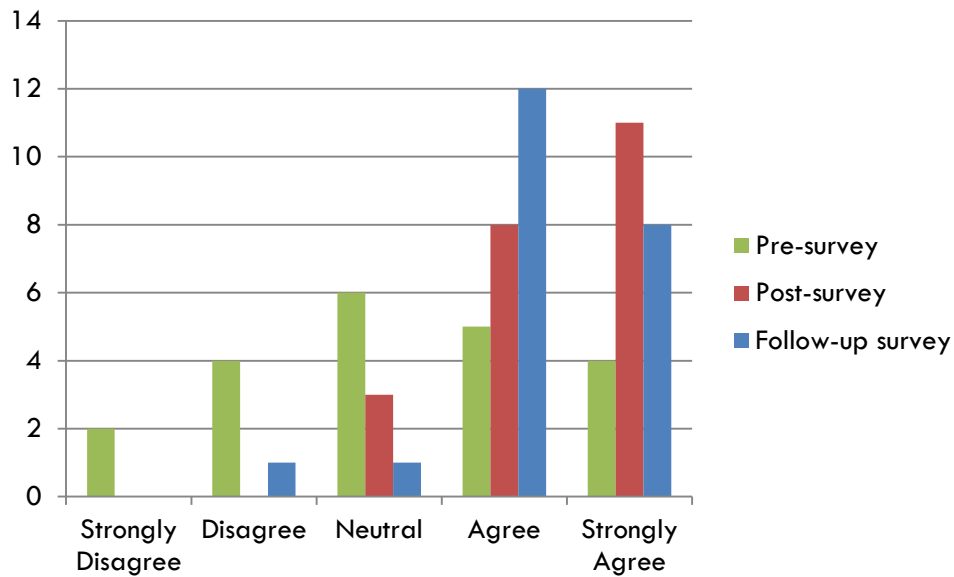


Figure 3. Pre-survey, post-survey, and follow-up survey responses to level of agreement with the statement “I understand the basic stages of the research data lifecycle.”

Objective 2: Feel confident discussing the issues associated with new research data services. Survey feedback showed that participants experienced increased confidence in offering research data services after the workshop. They were 35% more likely to report feeling confident in their ability to assist researchers with their data immediately following the workshop and 30% more likely three months later (Figure 4, following page).

The self-reported ratings about confidence with assisting researchers mirrored the trend seen in the first learning objective relating to levels of knowledge. For the second objective, there was a slight reduction in confidence reported in the follow-up survey compared to the post-

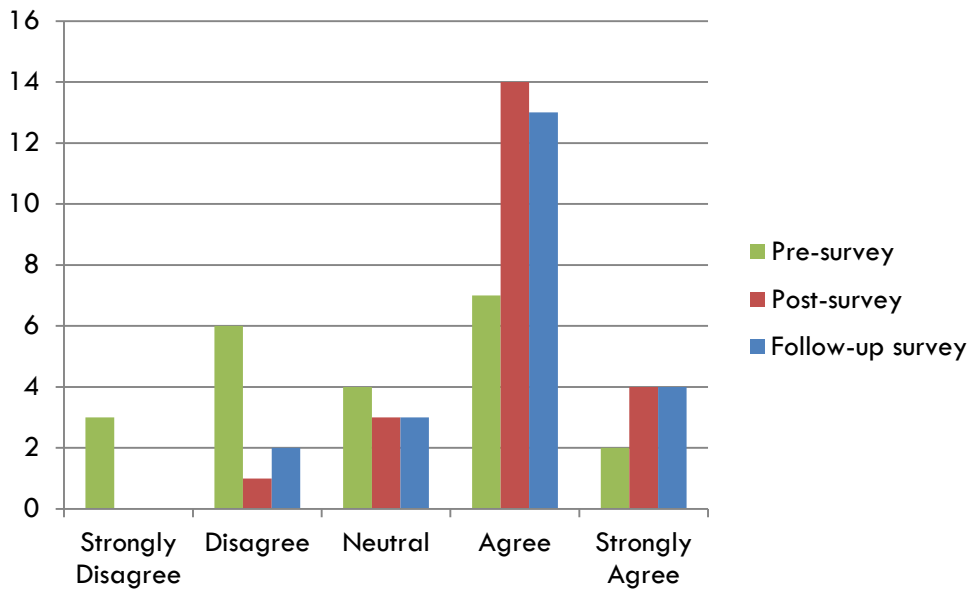


Figure 4. Pre-survey, post-survey, and follow-up survey responses to level of agreement with the statement “I feel confident in my ability to assist researchers with their data.”

survey, but confidence after three months was still higher in comparison to the pre-survey. Again, this reduction might be attributed to the immediacy of the administration of the post-survey after the workshop when the learning experiences of participants were still very recent. Confidence levels tracked slightly lower when compared with perceived knowledge in each of the surveys: however, the variation in confidence levels across surveys was greater, and the increase in comparative confidence levels across time was even more dramatic than that of reported knowledge. While the increase in reported knowledge about the research data lifecycle is a positive outcome for participants, gains in confidence may be even more significant in terms of willingness to adapt to new roles in support of research data.

Objective 3: Define the role of the library in research data services. Participants were asked to describe their potential role as a librarian in providing research data services in the pre-, post-, and follow-up surveys. The most common theme expressed by participants was a consultative role. This finding is somewhat unsurprising since liaison librarians have always played similar roles by connecting researchers with information and campus resources. Thus, participants were able to translate their familiar service role into this new area of work. Other themes also alluded to the translation of traditional liaison roles, such

as helping to find data, advocating for best practices for data management, and identifying resources like data repositories.

Similarly, another outcome articulated by participants was that librarians see themselves as having roles in the archiving, sharing, and stewardship of research data. This perspective also mirrors what libraries have long done in terms of collecting and providing access to information. Once again, librarians tended to view their roles in this area as that of connectors providing referrals to resources and experts but perhaps not managing research data directly.

Comparisons between the pre-survey and post- and follow-up surveys reveal that the responses regarding library roles after participation in the workshop were more diverse, creative, and robust. Participants' responses were longer in the post- and follow-up surveys than in the pre-survey, and they included a wider array of potential roles. The responses in the surveys after the workshop demonstrate a broader and more expansive understanding of how librarians and libraries can contribute to research data activities. Immediately following the workshop, this result could easily be attributed to the freshness of the workshop content in participants' minds, but the follow-up survey revealed a lasting expansion of rhetoric about what roles librarians imagine they will play in research data services.

In some comments, participants seemed somewhat unsure of their roles in offering research data services. This may relate to factors beyond their own skill sets, such as unclear priorities for their library or campus efforts related to this work. Seeking role definition through professional development seemed to be a common desire for participants, and respondents expressed a desire for institutional strategy, structure, and investment in this new work. An unexpected outcome of the workshop was that participants created new networks of colleagues to which they can reach out for support. Many participants reported feeling "less alone" and "less behind" with regard to research data services, resulting in a sense of comradery that may help reduce barriers to participation.

Objective 4: Plan for outreach activities to promote new research data services.

Participants showed a desire to create teams and structures for their work with research data support and proposed outreach that primarily involved connecting researchers with experts and services. Librarians also felt they would play a strong role in research data education efforts through their instruction programs for graduate and undergraduate populations. This interest in data information literacy as an extension of information literacy is further evidence of the pattern of translating existing work and expertise into the research data environment. The desire to form teams also reinforced the outcome that having a support network and feeling "less alone" in initiating these services could make it easier to promote and provide outreach to researchers about them as well.

Objective 5: Apply skills from workshop to novel research data situations. In the five-minute paper exercise, participants articulated a number of strategies for supporting the immediate and long-term data needs of researchers. Participants described the process of how they would walk a researcher through data management requirements for a specific discipline or funding agency and help researchers identify support and resources for their data. Content analysis of the five-minute papers revealed areas of research data support where participants were able to describe how they would apply concepts from the workshop. Several participants mentioned resources and tools that were demonstrated and discussed in the workshop as helpful for addressing researcher needs. On a practical level, participants described investigating the stages of the data lifecycle in the researchers' data management plans in order to identify campus experts who could be involved at each stage as well as how they would facilitate that referral process. A number of participants also described how they were able to translate their experiences conducting complex reference interviews to the research data support environment, which is an important outcome as this translation will make the new work feel more accessible and familiar. Participants also stated that they would work with individual researchers to support the broader grant proposal process instead of isolating research support services to the data management plan, which offers an opportunity for holistic outreach.

Objective 6: Engage with researchers effectively when advocating for how the library can support their research data. The five-minute paper assignment also asked workshop participants to explain how they would plan to offer research data services and support over the long-term (the next semester) as a follow up to addressing the immediate need of creating a data management plan. Several themes from these papers demonstrated how participants imagine they will engage with researchers in their respective disciplines on an ongoing basis. Many participants wrote about plans for outreach activities to the departments with which they liaise. Participants identified long-term relationships with researchers as an opportunity to promote awareness around the value of sharing data, and they viewed themselves as responsible for making researchers aware of available services and technology infrastructure across campus. Participants also indicated that they expected their work with researchers to manifest itself as an iterative conversations which would provide an opportunity to conduct broader outreach. For example, outreach could extend to the researcher's home department where there may be opportunities to discuss other research data issues such as data information literacy in the curriculum.

NEXT STEPS

As previously mentioned, the *DataDay!* workshop resulted from a larger effort to provide training for librarians in a number of areas of need identified at CU-Boulder. After all of

these initial activities were completed, a second survey was distributed to identify what areas required additional training. The results of this survey are still being analyzed, but future research data related training efforts for CU-Boulder librarians will be informed by those results as well as the findings from the *DataDay!* workshop assessment measures. With the research data landscape (e.g., funding agency requirements, tools, resources) rapidly changing, in addition to high rates of staff turnover, it is essential that the *DataDay!* workshop is just the first stage in an iterative training program that provides regular opportunities for practical professional development in this area of librarianship. There is also a need to apply the lessons learned from local training efforts to the development of resources to support the broader subject librarian community as their institutions launch and grow research data services. Finally, the concern that some participants expressed about how to fit research data support into existing workloads has already led to discussions about how this work should be prioritized at CU-Boulder; however, there is still a need for more formal efforts aimed at garnering administrative support for subject librarians engaging with research data.

CONCLUSION

As is likely the case at many academic libraries, subject librarians at CU-Boulder were faced with adapting to meet the research data needs of the faculty and students they support. Feedback from these librarians made it apparent that there was a need for hands-on experience and practice working with researchers and their data, particularly as a means for improving confidence working in this context. The *DataDay!* workshop and exercises were thus designed to provide this type of experience in order to allow librarians to leverage their existing skills and expertise to become more comfortable interacting with researchers and their data. Much of the feedback from the workshop indicated that this focus was beneficial as participants worked to directly apply new knowledge and skills to their work in tangible and scalable ways. Analysis of the outcomes of the workshop also indicated that librarians who participated in the workshop felt both better equipped with the skills necessary to consult with researchers about research data management and more confident in the value of their expertise. The workshop also appeared to help librarians explore their roles related to offering research data services. Unexpectedly, librarians who attended the workshop frequently reported a new sense of shared community in knowing that they face barriers and resource limitations that are common among others, and they felt reassured that it was not too late to start experimenting with new and creative services related to research data, even in the absence of robust technical infrastructure. This workshop and the lessons learned from the assessment results may provide one model for training librarians to adapt to new roles in support of research data. While additional training and skill development may be required if subject librarians become more deeply involved with research data services, this model can serve as an important first step in breaking down the barriers to librarians integrating support for research data into their liaison duties.

REFERENCES

- ACRL Research Planning and Review Committee (2012). 2012 top ten trends in academic libraries: A review of the trends and issues affecting academic libraries in higher education. *College & Research Libraries News*, 73(6), 311–320.
- Akers, K. G. (2013). Looking out for the little guy: Small data curation. *Bulletin of the American Society for Information Science and Technology*, 39(3), 58–59. <http://dx.doi.org/10.1002/bult.2013.1720390317>
- Antell, K., Foote, J. B., Turner, J., & Shults, B. (2013). Dealing with data: Science librarians' participation in data management at Association of Research Libraries institutions. *College & Research Libraries*. Retrieved from <http://crl.acrl.org/content/early/2013/04/05/crl13-464>
- Auckland, M. (2012). *Re-skilling for research*. Research Libraries UK. Retrieved from <http://www.rluk.ac.uk/content/re-skilling-research>
- Bardyn, T. P., Resnick, T., & Camina, S. K. (2012). Translational researchers' perceptions of data management practices and data curation needs: Findings from a focus group in an academic health sciences library. *Journal of Web Librarianship*, 6(4), 274–287. <http://dx.doi.org/10.1080/19322909.2012.730375>
- Bracke, M. S. (2011). Emerging data curation roles for librarians: A case study of agricultural data. *Journal of Agricultural & Food Information*, 12(1), 65–74. <http://dx.doi.org/10.1080/10496505.2011.539158>
- Bresnahan, M. M., & Johnson, A. M. (2013). Assessing scholarly communication and research data training needs. *Reference Services Review*, 41(3), 413–433. <http://dx.doi.org/10.1108/RSR-01-2013-0003>
- Carlson, J. (2012). Demystifying the data interview: Developing a foundation for reference librarians to talk with researchers about their data. *Reference Services Review*, 40(1), 7–23. <http://dx.doi.org/10.1108/00907321211203603>
- Carlson, J., Fosmire, M., Miller, C. C., & Nelson, M. S. (2011). Determining data information literacy needs: A study of Students and Research Faculty. *portal: Libraries and the Academy*, 11(2), 629–657. <http://dx.doi.org/10.1353/pla.2011.0022>
- Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and research data management services: Emerging trends in library support for research. *Library Trends*, 61(3), 636–674. <http://dx.doi.org/10.1353/lib.2013.0005>
- Cox, A., Verbaan, E., & Sen, B. (2014). A spider, an octopus, or an animal just coming into existence?: Designing a curriculum for librarians to support research data management. *Journal of eScience Librarianship*, 3(1). <http://dx.doi.org/10.7191/jeslib.2014.1055>
- Diekmann, F. (2012). Data practices of agricultural scientists: Results from an exploratory study. *Journal of Agricultural & Food Information*, 13(1), 14–34. <http://dx.doi.org/10.1080/10496505.2012.636005>
- Digital Curation Centre. (2013). *RDM for librarians*. Retrieved April 18, 2013, from <http://www.dcc.ac.uk/training/rdm-librarians>

- Doucette, L., & Fyfe, B. (2013). Drowning in research data: Addressing data management literacy of graduate students. In *ACRL 2013 Proceedings*. Retrieved from http://www.ala.org/acrl/sites/ala.org/acrl/files/content/conferences/confsandpreconfs/2013/papers/DoucetteFyfe_Drowning.pdf
- Eaker, C. (2014). Planning data management education initiatives: Process, feedback, and future directions. *Journal of eScience Librarianship*, 3(1). <http://dx.doi.org/10.7191/jeslib.2014.1054>
- Erdmann, C. (2013). *Data scientist training for librarians*. Retrieved July 18, 2013, from <http://altbibl.io/dst4l/>
- Gabridge, T. (2009). The last mile: Liaison roles in curating science and engineering research data. *Research Library Issues: A Bimonthly Report from ARL, CNI and SPARC*, (265), 15–21.
- Haendel, M. A., Vasilevsky, N. A., & Wirz, J. A. (2012). Dealing with data: A case study on information and data management literacy. *PLoS Biology*, 10(5), e1001339. <http://dx.doi.org/10.1371/journal.pbio.1001339>
- Heidorn, P. B. (2011). The emerging role of libraries in data curation and e-science. *Journal of Library Administration*, 51(7-8), 662–672. <http://dx.doi.org/10.1080/01930826.2011.601269>
- Hswe, P., Furlough, M. J., Giarlo, M. J., & Martin, M. (2011). Responding to the call to curate: Digital curation in practice at Penn State University Libraries. *International Journal of Digital Curation*, 6(2), 195–208. <http://dx.doi.org/10.2218/ijdc.v6i2.196>
- Johnson, A. & Bresnahan, M. (2015). DataDay!: Toolkit for a research data services workshop for librarians. *figshare*. <http://dx.doi.org/10.6084/m9.figshare.1316636>
- Johnston, L., Lafferty, M., & Petsan, B. (2012). Training researchers on data management: A scalable, cross-disciplinary approach. *Journal of eScience Librarianship*, 1(2). <http://dx.doi.org/10.7191/jeslib.2012.1012>
- Lage, K., Losoff, B., & Maness, J. (2011). Receptivity to library involvement in scientific data curation: a case study at the University of Colorado Boulder. *portal: Libraries and the Academy*, 11(4), 915–937. <http://dx.doi.org/10.1353/pla.2011.0049>
- Lamar Soutter Library. (2015). *New England Collaborative Data Management Curriculum*. Retrieved April 17, 2014, from <http://library.umassmed.edu/necdmc/index>
- Latham, B., & Poe, J. W. (2012). The library as partner in university data curation: A case study in collaboration. *Journal of Web Librarianship*, 6(4), 288–304. <http://dx.doi.org/10.1080/19322909.2012.729429>
- Lyon, L. (2012). The informatics transform: Re-engineering libraries for the data decade. *International Journal of Digital Curation*, 7(1), 126–138. <http://dx.doi.org/10.2218/ijdc.v7i1.220>
- National Science Foundation. (2011). *Dissemination and sharing of research results*. Retrieved February 1, 2015, from <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>

Ogburn, J. L. (2010). The imperative for data curation. *portal: Libraries and the Academy*, 10(2), 241–246. <http://dx.doi.org/10.1353/pla.0.0100>

Parham, S. W., Bodnar, J., & Fuchs, S. (2012). Supporting tomorrow's research: Assessing faculty data curation needs at Georgia Tech. *College & Research Libraries News*, 73(1), 10–13.

Peters, C., & Vaughn, P. (2015). Initiating data management instruction to graduate students at the University of Houston using the New England Collaborative Data Management Curriculum. *Journal of eScience Librarianship*, 3(1). <http://dx.doi.org/10.7191/jeslib.2014.1064>

Raboin, R., Reznik-Zellen, R., & Salo, D. (2013). Forging new service paths: Institutional approaches to providing research data management services. *Journal of eScience Librarianship*, 1(3). <http://dx.doi.org/10.7191/jeslib.2012.1021>

Steinhart, G. (2006). *Libraries as distributors of geospatial data: Data management policies as tools for managing partnerships*. Retrieved from <http://hdl.handle.net/1813/3562>

Tenopir, C., Birch, B., & Allard, S. (2012). *Academic libraries and research data services*. Retrieved from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/Tenopir_Birch_Allard.pdf

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2013). Academic librarians and research data services: Preparation and attitudes. *IFLA Journal*, 39(1), 70–78. <http://dx.doi.org/10.1177/0340035212473089>

The White House. (2013). *Increasing public access to the results of scientific research*. Retrieved February 1, 2015 from <https://petitions.whitehouse.gov/response/increasing-public-access-results-scientific-research>

Wesseling, M. (2010). Students and scientists are badly “data illiterate.” *Informatie Professional*, (9), 10–11.