# Learning by Teaching about RDM: An Active Learning Model for Internal Library Education

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## Abstract

This paper reports on the design, delivery and assessment of a model for internal library education around research data management (RDM). Conducted at the University of Pittsburgh Library System (ULS), the exercise and resultant instructional session employed an active learning approach, in which a group of librarians and archivists explored data issues and conventions in a discipline of their own selection and presented their findings to an audience of library colleagues. In this paper, we put forth an adaptable active learning model for internal RDM education and offer guidance for its implementation by peer libraries that are similarly building internal capacity for the design and delivery of RDM services that are responsive to disciplinary needs.

# Introduction

In August 2015, the University Library System (ULS) at the University of Pittsburgh formed a research data management (RDM) service team, composed of seven librarians and archivists, two of whom act as co-leaders. Among the aims of this group is to deliver RDM training for faculty, students and for internal library staff. In the early phase of the group's work, the membership focused on upskilling, deepening and extending their understanding of data practices and how best to support data needs at the University of Pittsburgh.

An identified competency area for the ULS RDM Service Team members is the understanding of disciplinary data conventions and practices. This competency is intended to inform the development and delivery of tailored RDM services for the academic communities at the University of Pittsburgh. This paper introduces an active learning approach to internal RDM education that fosters the development of this competency, which we term 'disciplinary deep dives.' The approach involved the team members' investigation of a discipline of their own choosing and a presentation of their findings to library colleagues.

This learning model was designed with two sets of learning outcomes in mind: the first for members of the team and the second for attendees of the presentations. We envisioned that through this exercise, ULS RDM Service Team members would be able to articulate issues in the disciplines that they and their colleagues studied. We viewed the exercise as an opportunity to facilitate peer learning, with the participants modelling their domain discovery process to one another, sharing resources, and brainstorming strategies. Moreover, the members would be able to draw upon their experiences to devise search strategies that would help them to later provide consultative support for researchers in disciplines outside of those examined in the exercise. For attendees of the team members' disciplinary deep dives presentations, we aimed to provide them with an opportunity to gain insight into RDM practices, standards, and resources across a spectrum of domains.

Following the presentations of the disciplinary deep dives, we assessed the efficacy of the training model through two data collection means: a focus group discussion with the team members who completed the disciplinary deep dives and a survey of library colleagues who attended the session. In this paper, we describe the design of the disciplinary deep dives approach and incorporate the feedback from both groups of learners (the team members who conducted the investigations and the library colleagues who attended their presentations) to provide a model that other organizations may implement for their internal library training on RDM.

# Background

### Service Delivery Model for RDM at the ULS

In January 2015, the ULS instituted a working group around RDM to develop a portfolio of RDM services at the University Pittsburgh and an organizational model for the ULS's delivery of these services. The working group put forth a tiered model for service delivery (Figure 1), which was approved by library administration and is now

implemented at the ULS.[1] The model outlines three service roles within the library (Mattern and Brenner, 2015). The service role that is the central focus of this paper is located at Level 2 of the tier: Advanced RDM Service Providers.
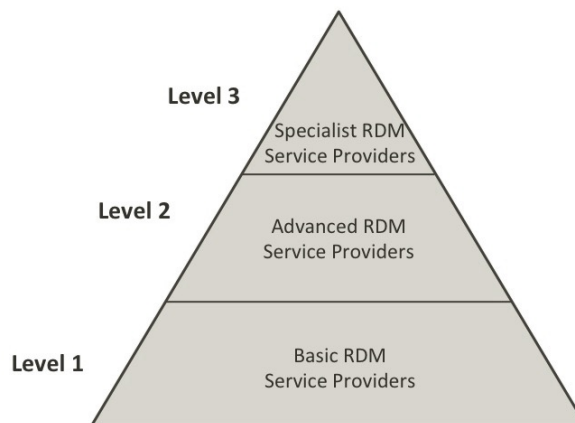


**Figure 1.** A visualization of the ULS at the University of Pittsburgh RDM Service Delivery Model.

Following the development of this service delivery model, the ULS established a RDM Service Team, which is charged with delivering the services initiated by the working group (which concluded its work in the fall of 2015). The team is composed of seven librarians and archivists who voluntarily joined and is co-led by authors Brenner and Mattern. The members of the RDM Service Team fulfill the role of 'Advanced RDM Service Providers,' articulated in the service delivery model.

The service delivery model includes the following description and expectations for the Advanced RDM Service Providers:

> **Level 2 – Advanced RDM Service Providers:** Includes library colleagues who are part of the RDM track and select staff. Advanced RDM Service Providers will be equipped to respond to anticipated RDM-related reference requests that patrons bring to the ULS. Staff at this level will possess tailored disciplinary knowledge related to RDM and be able to provide guidance about these disciplinary considerations to the patrons they serve.

> Advanced RDM Service Providers will develop and possess the following competencies:

> • Understanding of research workflows in disciplines served;

> • Awareness, in disciplines served, of funders' research data management requirements;

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1  This model draws upon the University of Queensland's bibliometrics service delivery approach. See Thomas (2014).

- Familiarity with relevant disciplinary data repositories;

- Familiarity with good practice around file formats, file naming conventions, data storage, and data documentation (Mattern and Brenner, 2015).

Embedded within the competencies is the recognition that there are similarities and differences at the disciplinary level in RDM mandates, cultures, and resources. The disciplinary deep dives described in this paper were designed to grow the RDM Service Team's knowledge of disciplinary practices and issues.

While not the primary focus of this paper, the role of 'Basic Service Providers' deserves brief mention. This service role is composed of all public-facing ULS staff and is characterized by an awareness of key issues and drivers around RDM and an understanding of ULS RDM services. The ULS attendees of the 'disciplinary deep dives' presentations were largely public-facing librarians who consequently are located at Level 1 of the service delivery model. We envisioned that the session would support building this awareness.

## Disciplinary Differences and Library RDM Services

A variety of studies have shown significant differences across disciplinary RDM practices (e.g. Marcus et al., 2007; Lyon et al., 2010; Akers and Doty, 2013; Tam et al., 2014) and tools have been designed to document and collect information about these disciplinary difference, such as the Data Curation Profiles (Witt et al., 2009). In a 2012 survey conducted at Emory University, Akers and Doty discovered notable differences among researchers' data management practices in arts and humanities, social sciences, medical sciences, and basic science domains. This, they argue, has implications for the design of a successful library RDM service. They conclude that "a serious consideration of both the similarities and dissimilarities among disciplines will help guide academic librarians in developing a range of data management-related services that can be tailored to the unique needs of different researchers, thereby resulting in more effective and comprehensive approaches to research data curation" (Akers and Doty, 2013). In identifying research data management roles for librarians, Cox, Verbaan and Sen (2012) highlight the provision of training and consultative support among them. Like Akers and Doty, they see the value of possessing an "understanding of RDM best practices as they apply to relevant disciplines" for librarians' fulfillment of this role. Lyon and Brenner (2015) maintain that the 'domain disconnect' is a challenge for information professionals and suggest, as part of their 'capability ramp' model, immersion sessions as a mitigating strategy.

The importance given to disciplinary understandings by these researchers is in line with a conclusion of the Committee on Future Career Opportunities and Educational Requirements for Digital Curation in their recent National Research Council report. The Committee argues: "Digital curation specialists will need some knowledge of the disciplines and domains in which the digital information they curate will be used" (2015). The Council on Library and Information Resources (CLIR) has instituted a postdoctoral fellowship program in data curation that is premised on this perceived value of embedding researchers with disciplinary expertise academic libraries "in order

to help advance data curation practices and services at their host institutions"[2] (see Kouper, Akers, and Lavin, 2013).

The CLIR model of embedded domain experts in academic libraries is one approach to building institutional capacity for the delivery of tailored RDM services that are responsive to disciplinary needs. Another, more lightweight approach is internal training, designed to build knowledge and abilities among existing library staff without the full commitment required by embedding. For example, data librarians at the University of Edinburgh customized their institution's modular RDM course (MANTRA) to produce the Do-It-Yourself Research Data Management Training Kit for Librarians. The kit is composed of materials for five learning modules: data management planning; organizing and documenting data; data storage and security; ethics and copyright; and data sharing.[3] The training focuses on building a breadth of understanding around key activities in effective management of research data, with limited emphasis on disciplinary-specific aspects of these activities.

### Active Learning

The design of this model was guided by writing on active learning strategies. In their heavily cited publication 'Active Learning: Creating Excitement in the Classroom,' Bonwell and Eison characterize active learning as involving engagement with "such higher-order thinking tasks as analysis, synthesis, and evaluation. Within this context, it is proposed that strategies promoting active learning be defined as instructional activities involving students in doing things and thinking about what they are doing" (1991). The library literature points to some efforts in academic libraries to incorporate active learning techniques in library instruction with, in particular, student groups (e.g. Dabbour, 1997).

Additional strands in educational research informed the active learning exercise presented in this paper: namely, the influence of motivation on learning and the value of peer engagement during the learning process. The National Research Council's Committee on Developments in the Science of Learning highlighted the role of motivation in the learning process in a 2000 report, stating: "learners of all ages are more motivated when they can see the usefulness of what they are learning and when they can use that information to do something that has an impact on others" (2000). For professional training in libraries, motivation may be determined by relevancy to one's work and or the potential contribution the new knowledge would have in engaging with their users. The robust body of literature on peer learning, collaborative and informal in nature, speaks to the educational benefits of both providing support to and receiving help from others (Topping, 2005). At the ULS, the team-based organizational structure for supporting this library service inherently fosters peer learning; the learning model, however, serves to specifically encourage collective engagement with disciplinary differences around data.

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[2]  CLIR, Fellowships in Data Curation for the Sciences and Social Sciences: https://www.clir.org/fellowships/postdoc/info/fellowships-in-data-curation-for-the-sciences-and-social-sciences

[3]  DIY Research Data MANTRA Training Kit for Librarians: http://datalib.edina.ac.uk/mantra/libtraining.html#kit

# Design of the Internal Training Model

This active learning model for internal training in the ULS was based on an assignment designed by Dr. Liz Lyon, Visiting Professor in the School of Information Sciences at University of Pittsburgh, for her graduate-level course Research Data Management. Influenced by her own 'deep-dive' exploration of data practices in the field of crystallography, Lyon asks her students to select an academic discipline of interest to them and investigate data practices, issues, and resources within it.[4] The co-leads of the ULS RDM Service Team (Brenner and Mattern) audited Lyon's course and, having completed this assignment, saw value in adapting it as a self-directed exercise for team members to build knowledge of RDM and disciplinary practices and issues. Guided by research on the role of motivation in learning, the co-leads asked team members to choose a discipline of interest to relevance to them for this activity. The co-leads were full participants in this exercise, believing that it was important for team development.

With the service model competencies in mind, team members were asked to research the following in their selected discipline:

- Common sources of data,

- Common data formats,

- Metadata schemas and ontologies,

- Major funders with data related requirements,

- Data archives that can serve as homes for research data.

As a starting point, the team co-leads pointed the team members to the resources and information included in the ULS RDM LibGuide[5], which was a deliverable of team's predecessor, the ULS RDM Working Group. The co-leads encouraged the team members to view them as resource for brainstorming and discussing concerns and ideas. One member of the team initiated an email thread following the meeting in which the exercise was introduced, suggesting that each member identify the discipline that they would focus the investigation. The following domains were selected, forming the basis of the research and presentations: Astronomy; Chemistry; Computer Science; Economics; Environmental Sciences; Molecular Biology and Cell Biology; and Psychology. The team members shared with one another that they initiated their research process by exploring LibGuides by the ULS and other academic libraries and through Google queries.

Following their investigations, the team members became the teachers, presenting what they learned to an audience of library colleagues from the University of Pittsburgh and Carnegie Mellon University at an event titled 'Disciplinary Deep Dives: A Look at RDM Issues Across Selected Subjects.' The team members decided to each give ten-minute presentations on their research at this event. While most team members indicated that they would create PowerPoint presentations, one librarian determined that she would use a LibGuide as the mode for capturing and sharing her discoveries. One of the co-leads provided an example PowerPoint on her disciplinary deep dive, which team members could refer to as a potential model for their own presentations.

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4   See The Infrastructure for Integration in Structural Sciences (I2S2) project site, which includes deliverables from Lyon and her team's examination of the domain of crystallography. This JISC-funded study ran from October 2009 to March 2011: http://www.ukoln.ac.uk/projects/I2S2/index.html.

5   ULS Research Data Management @ Pitt: http://pitt.libguides.com/managedata

The initial discussion about the disciplinary deep dives occurred in late August 2015 and the presentation to library colleagues was held on October 5, 2015. The group came back together in late September in preparation for the October event, with this meeting envisioned as an opportunity to run-through the presentations. It ultimately served as a check-in, with team members sharing their in-progress work. During this time, the team members shared resources that they located and their strategies for the research. The culminating event for colleagues from the ULS and Carnegie Mellon University Libraries was an hour and a half, with each team member giving ten minute presentations before questions and discussion from the roughly 40 attendees who participated onsite and remotely.

# Assessment of the Active Learning Model

We assessed the efficacy of the educational model from the perspective of our two groups of learners through two means. First, we conducted an informal focus group with team members two days following the event. Through the focus group, the co-leads asked the team members, who were the active learners in this exercise, to reflect on their experiences, share what worked well, and recommend modifications. With our second group of learners – the audience of library colleagues – we solicited their feedback on the approach through a Qualtrics survey link shared at the session and sent out via email following the event. Both data sources pointed to areas in which the learning model could be improved, both for those engaged in the active learning exercise (the team members) and those participating as attendees (library colleagues). This feedback informed modifications to the adaptable active learning model that we present for peer libraries that are similarly building internal understandings of disciplinary-specific data practices.

### Team Members' Assessment

The team members expressed the overall usefulness of the experience for their development of the competencies outlined in the service delivery model (Figure 1). One team member emphasized that completing the exercise within the framework of the group was beneficial, as it provided an opportunity to learn about one another's process for investigating a discipline as well as about the disciplines themselves. This feedback supports the value of peer learning, which guided the design of this model. The team members said that the scheduled check-in meeting prior to their presentations was an important piece to their process as it facilitated this peer learning component.

The team member who communicated with the local astronomer emphasized the value of the researcher as a resource to him both implicitly through references during his presentation and explicitly during the informal focus group. This direct contact with the researcher in astronomy, he said, provided useful context to his investigation. He suggested that interviews or another mode of direct communication be included as part of the exercise if conducted by other libraries. This approach can be conceptualized as a lead-in to an immersion-based learning process that Lyon and Brenner (2015) describe.

A key piece of this learning model was the coupling of research with teaching. In the event with library colleagues, the team members became the educators, helping to build internal awareness and knowledge around their selected disciplines and RDM

issues broadly. The act of packaging the research into a ten-minute presentation for colleagues was itself an active learning exercise. One team member said:

> "The process of having to present helped with the learning phase of internalizing information. Although the presentations may have lost some punch as day went on, the personal experience helped."

The group as a whole expressed concern about the presentations' diminishing 'punch,' noting areas in which the individual presentations were repetitive. For example, when addressing data archives in their selected disciplines, a number of the team members referenced re3data[6], a searchable 'global registry of research data repositories.' To mitigate this issue of redundancy, the team members proposed a presentation approach different from the one that we took. Should this exercise or something similar be conducted at either the ULS or another library in the future, they suggested that the presenters draw common themes out from their individual disciplinary investigations rather than present each discipline on its own.

## Attendees' Assessment

Participation in the brief Qualtrics survey was low, with only eight respondents out of the roughly 40 attendees of the session. The results revealed an uneven degree of satisfaction with the event, though the low response rate limits our ability to responsibly present the results as representative of the audience's perceptions (see Nulty, 2008).

Of the six questions, one included a set of statements about the effectiveness of the educational approach and asked respondents to indicate their level of agreement (ranging from strongly disagree to strongly agree). One statement read: 'This is an effective approach for the development and delivery of an instructional session on RDM.' Four respondents reported that they neither agreed nor disagreed with the statement and three others noted that they agreed (one respondent did not complete this question). The respondents were particularly apathetic when asked to respond to the following prompts: 'I would attend another session that uses this instructional approach' and 'I would recommend others to attend a future session that uses this instructional approach.' For both statements, two attendees indicated disagreement. They offered suggestions for improvements, notably around the organizational structure of the session. Questions were held until the end of the presentations to ensure that there was enough time for each team member, but this was identified as unfavourable for those in attendance.

When designing this exercise, the co-leads were principally focused on supporting the team members, or 'Advanced Service Deliverers,' as they developed the competencies outlined in the service delivery model. The team members' preparation of the presentations and role as session instructors were components of this competency development. The feedback from the survey suggests that the learning experience was not as valuable to the session attendees as it was to the team members. This, from the vantage point of the team co-leads, is unsurprising. The design of this exercise was premised on the benefits of active learning. While the team members identified an adjustment to the presentation component that could improve the attendees' experience, the participants who research and teach about the disciplinary RDM issues remain the active learners. Attendees to the presentation session would continue to have a more

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6  re3data: http://service.re3data.org/about

passive learning experience. There is an opportunity, however, for organizations to design an active learning component that attendees would complete during the session; we invite others to contribute to the improvement of this model by designing and sharing this enhancement.

# Discussion

From the authors' perspective, an advantage of this approach is that it is lightweight and can be quickly implemented by an academic library without many dependencies. For the recently established ULS RDM Service Team, this first exercise was a unifying one, a shared learning experience that supported the collective knowledge and skills needed for the members to fulfill their new role.

The co-leads conducted an additional assessment of the pilot exercise, using the service delivery model as a rubric for evaluating the team members' presentations and assessing their readiness for delivering RDM services. We agreed that the team members demonstrated 'tailored disciplinary knowledge related to RDM' in the presentations that they crafted and during the informal group discussions about their research. Based on our observations and the feedback, we feel confident that this exercise has fostered the competencies outlined in the service delivery model and that the team members are equipped to locate resources that would allow them to assist researchers in disciplines outside of the one they studied.

We used the feedback from the two learner groups to inform modifications to the model, articulated here:

### Engagement with Researchers

In her graduate level RDM courses at the University of Pittsburgh's School of Information Sciences, Lyon includes an immersive unit in which her students go into a research lab to interview researchers about their data and data management. Lyon also encourages the students to share resources and information that may be useful to the researchers. Both the students and researchers find this bilateral sharing of information to be beneficial to them (Lyon and Brenner, 2015; Lyon, forthcoming). Based on the success of the immersive sessions in Lyon's courses and the feedback from the team member who interviewed an astronomer for his disciplinary deep dive, we recommend further incorporation of engagement with disciplinary researchers into the model.

### Timing

Organizations should take into account a few factors when determining the length of time between the introduction of the exercise and the presentations. First, the time that those completing the disciplinary deep dives can commit to the exercise is an important consideration. At the ULS, the members of the RDM Service Team are expected to allocate 20% of their hours to the team's activities and delivery of services. With this in mind, we determined that the amount of time we designated (a month and a half) was appropriate. Had the exercise been an elective professional opportunity for staff who did not have a designated time commitment for RDM service delivery, the time scheduled would have been extended.

One of the recommended modifications to the exercise introduces an additional time-related factor to consider. Interaction with researchers as part of the investigative process is, from the perspective of both the team members and the co-leads, advantageous for providing context to issues in the studied disciplines. If another organization adapts this model and asks learners to conduct in-person interviews or to communicate with researchers via email, phone, or video call, the timing should account for this. Faculty may be unavailable between semesters, have heavy conference travel at certain points during the academic year, or be focused on grading during finals. The organizers of the learning exercise should schedule accordingly.

**Enhancement of Peer Learning Component**

We recommend that the exercise include more opportunities for peer learning. The team members emphasized that the meeting scheduled one week in advance of the presentations was an important component for them. While we had envisioned this meeting as a time for team members to share their final presentations with one another, it was evident that the team members needed to use it as an opportunity to learn about one another's research process and get feedback on challenges or areas of uncertainty. We recommend building regular progress sessions for the group and perhaps building these meetings around the prompts that guided the exercise. For example, a first progress meeting may serve as an opportunity for participants to discuss what they have learned about common sources of data and the resources that informed their findings. Moreover, this modification would help the participants to plan presentations organized around themes rather than disciplines; this rethinking of the presentation would help to address the repetition raised in the assessment of the pilot.

# Conclusion

For libraries that aim to develop RDM services that are responsive to disciplinary-specific needs and practices, we view this active learning model as a promising step toward building internal capacity to do so. The team members who completed the disciplinary deep dives indicated the personal value of the learning experience for them and offered several directions for improvements. The pilot experience at the University of Pittsburgh Library System has highlighted a number of advantages to this model, namely the low threshold required for its implementation and the role it can play in commencing more substantial immersions.

# Acknowledgements

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