CHAPTER 5

The Data Librarian in the Liberal Arts College

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FOR DECADES, RESEARCH universities and libraries have been developing services and support for working with administrative, research, and government data. These services have grown in response to the massive amounts of data researchers in these institutions work with. Typically, the support includes data management planning, data analysis consultation, software instruction and support, and data discovery and acquisition. More recently, smaller liberal arts colleges have begun to develop their own data services and support. These programs are often modeled on the programs in larger research-intensive institutions, a common pattern from past developments in library services. This model has served liberal arts libraries well, allowing them to take advantage of advances from the universities, where larger budgets and staff sizes tend to make innovation easier. In developing these data services, though, the liberal arts data librarian needs to not only look to the large research university for inspiration, but also needs to focus on what makes the liberal arts experience unique, and how this affects the development of data services.

Liberal arts college faculty may not generate data of the same size as faculty at larger institutions, but they are still generating and using a lot of data. Between 1997 and 2006, over half of the top fifty baccalaureate-granting institutions graduating eventual science and engineering doctorate recipients, proportionate to size, were liberal arts institutions.[1] Often the "liberal arts" are thought to be non-technical disciplines. It is clear, however, that liberal arts colleges are graduating science and engineering students, who both collect data and work with secondary data. Liberal arts programs in the social sciences and humanities are also recognizing the importance of data to their work.

This chapter will first briefly look at what makes the liberal arts college in the United States unique, not only in mission but also in typical organization and

structure. With the wide variety of programs in the liberal arts, it is difficult to develop a definition of "the liberal arts"; instead of a strict delineation, I will base this discussion on the outline Hugh Hawkins offers: "A four-year institution of higher education, focusing its attention on candidates for the B.A. degree … an institution resistant to highly specific vocational preparation and insisting on a considerable breadth of studies … [that hopes to develop] interests and capabilities that will enrich both the individual learner and future communities."[2] With this foundation, I will then turn to several areas of interest for those developing data services for the liberal arts college library: how to structure and staff data services, collection development for data collections, and data management and curation. Each of these areas can be of greater or lesser importance, depending on the particular institution. There is a considerable amount of heterogeneity amongst liberal arts institutions, and unique campus concerns must always be taken into consideration when building new services. This heterogeneity, along with the great breadth of topics that fall under the umbrella of data services, means this chapter cannot be exhaustive. However, it can hopefully serve to highlight the need for data services, and unique approaches to these services, on the liberal arts campus.

The Structure and Organization of the Liberal Arts College

A number of different types of institutions could fall under the "liberal arts college" heading above. What makes these organizations unique? First and foremost, as seen in both Hawkins's definition and Robert Birnbaum's discussion of "the collegial institution" in *How Colleges Work: The Cybernetics of Academic Organization and Leadership*, the liberal arts institution is one that values a breadth of curriculum as opposed to a number of highly specialized fields of study (or vocational training).[3] Students that pursue a degree even in a highly technical field such as biochemistry, or econometrics, are commonly expected to meet diverse distribution requirements. As an example, at Reed College in Portland, Oregon, students must fulfill distribution requirements across all academic divisions of the college, including physical education, and even have a "breadth requirement" that requires further coursework outside a student's home division in addition to the other distribution requirements.[4] Curricular breadth, as well as curricular depth within a student's chosen major, is a hallmark of the liberal arts institution.

Liberal arts institutions may have library and information technology departments that have been merged to some degree, or they may be completely separate departments on campus. Typically the liberal arts institution will not have more than one information technology department, though, unlike many research in-

stitutions. In addition, liberal arts institutions may have some sort of student services department, offering writing help and other tutoring, outside of the other supporting departments. No matter the degree to which these departments have been merged, the typical liberal arts institution is small in both size and number of support departments, allowing for greater communication both inter- and intra-departmentally. This communication is perhaps the most important cultural marker of the liberal arts institution—students, faculty, and staff tend to migrate to such institutions because of the opportunity for communication and relationship building, which sets these schools apart from similarly sized comprehensive universities or small research universities.

Unlike at large research libraries, library work at the liberal arts college tends to be almost exclusively focused on the institution's curriculum. Most activities, from collection development to library instruction, are tied to this curriculum. This often means the faculty has a greater say in the activities of the liberal arts library than at a larger research institution. For this reason, it is of the utmost importance that librarians at liberal arts institutions develop and maintain particularly strong relationships with faculty from across the institution.

While the primary focus for faculty in a liberal arts college is typically on advising and teaching students, faculty do conduct research. They are typically both consumers and producers of data, though in many cases these datasets are smaller than those being produced and consumed in larger research labs. There are, of course, examples of big data being used in smaller liberal arts environments, as well as smaller data being used at larger research universities. On average, though, the data produced and used a liberal arts institution tend to be more manageable (at least in terms of size), but also quite diverse.†

Finally, these institutions normally have a very low student-to-faculty ratio, with median of 1:13,[5] allowing faculty to be heavily involved in working with undergraduate students not only in the classroom, but also in the field and in the lab. Science and social science labs in liberal arts colleges tend to employ undergraduate students in many of the same roles that typically go to graduate students or post-doctoral researchers in larger institutions. Students in these positions are often given the opportunity to not only work on faculty data, but also to produce original data of their own. This type of close relationship between faculty, particularly those conducting research, and students, who are learning to conduct their own research, creates a unique opportunity to teach undergraduates about working with data at a high level.

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† Throughout this chapter, the terms "big data" and "small data" will be used in a quite general sense. As a general rule of thumb, "big data" can be taken to refer to anything in the multi-terabyte and larger range, usually highly unstructured, while "small data" can be anything from several megabytes to many gigabytes of data, usually structured.

Structure and Staffing of Data Services in the Liberal Arts College

Structure and staffing of data services programs at any institution are an important consideration. The breadth of expertise that can fall under the purview of "data services" makes it unlikely that any one person could cover all practices for all disciplines. This is especially true at small liberal arts institutions, where librarians often have to strike a special balance between the generalist and specialist sides of their positions. In addition to working with data, a data librarian at a liberal arts college may also have duties including liaison work, shifts at the reference or circulation desk, general information literacy instruction, and other digital scholarship tasks. Unlike those at other small institutions, where librarians also maintain such diverse job functions, these functions are all extremely high-touch at the liberal arts institution, where students, faculty, and staff all come with the expectation of close relationships. Considering the various demands these relationships make on a liberal arts librarian's time, it makes sense to pursue a *distributed model* for data services staffing.

In this distributed model, no one staff member is responsible for all aspects of data services or all disciplines that may use data in their research. Each staff member has an area(s) of expertise, and a place in the data. Faculty and student researchers interact with different team members throughout a research project, but behind the scenes, the team coordinates efforts and communicates internally about hand-offs from one stage to the next. Below in Table 5.1 is an example of the staffing at a hypothetical college:

Table 5.1. Hypothetical Staffing Model with Related Services

Staff Member	**Services**
Science Librarian	Data Discovery
Data Services Librarian	Data Management
Student Support Tutor	Fundamental Statistics Help
Instructional Technologist I	Data Analysis Software Consultation
Instructional Technologist II	Web-based Data Visualization Help
Science Librarian	Data Citation Assistance

Each team member has a stage in the process at which they provide the primary support. In addition to allowing the team members to accomplish their other job duties and best use their particular expertise, this makes the model highly flexible. In the case above, perhaps the researcher was a biology student. When an economics faculty member asks for assistance, the team can easily be reconfig-

ured. For instance, by switching out the Science Librarian for the Social Science Librarian (and hopefully dropping the need for fundamental statistics help), the team has easily been reconfigured to best meet the needs of another user.

Another advantage of the distributed model is that it works equally well whether or not the IT and library departments are merged in a particular institution. As long as the data services team performs outreach and presents themselves *as a team* to faculty and students, users needing assistance can come to see them as such, irrespective of their various departmental affiliations.

This need to present the data services team as a unified team in outreach brings up the main disadvantage of the distributed model: it requires a great deal of coordination, communication, and trust amongst the various members. When a researcher comes to the data services team for assistance, they should feel as though they are being escorted through the research process, so that each handoff from team member to team member makes sense.† Not only does the process need to be properly communicated to the researcher, but team members also need to be communicating behind the scenes about what has already been tried or accomplished—the researcher should not need to repeat requests unnecessarily. To this end, all members of the team need to trust in each other's expertise, as well as fully understand what that expertise means. Ideally, each team member should also have some degree of training in conducting a reference interview, so that no matter which team member is contacted first, this person can appropriately assess the researcher's data needs and provide an effective referral for the researcher.

These disadvantages may be magnified somewhat on campuses where IT and the library are not merged. Due to the cultural, political, and sometimes even spatial differences between different departments in some non-merged organizations, it can require a great deal of work to get a data services team to work together in *a unified fashion*, rather than as a collection of disparate staff. However, in the long run, these efforts will be rewarded by satisfied researchers who recommend the data services team to their students and colleagues.

Data Collection Development for the Liberal Arts

Although data and statistical information have been collected by libraries for a long time, just like any other form of recorded information, this collection has often been done in the absence of clearly defined policies.[6] Many aspects of collecting data can fall easily in line with a wider institutional collection development policy. However, there are enough differences in the collection of data that any institutional policy should have, at the very least, a separate section on data address-

† Again, remember the importance of high-touch relationships at the liberal arts institution.

ing these issues.[7] Some of these issues include restricted access data, single-user licenses, third-party aggregation of publically accessible data, and data preservation and storage. The effect of each of these issues on collecting data will be discussed in this section. While many of these points may also apply to the non-liberal-arts institution, the typically loose nature of policy documentation at many liberal arts schools makes this an important discussion.

Many liberal arts library collections are driven, at least in part, through faculty input. These collections are tightly tied into both the institution's curriculum and researchers' specific interests. This collaboration between liaison librarians and faculty can work quite well in purchasing monographs, serials, and subscriptions to library databases, but it falls apart somewhat when it comes to purchasing and/or licensing datasets. Again, this dynamic reinforces the need for a well-articulated policy for data collection development at the liberal arts institution.

Restricted Access Data†

Some human subjects data, because of their highly confidential nature, are restricted in their accessibility. Often, a public-use version of the data will be created, with the confidential information recoded or removed. However, the original version of the data are often of great interest to researchers because of the greater ability to perform innovative investigations. In these cases, researchers must agree to certain conditions and procedures in order to gain access to these data.

At a small liberal arts college, while it is possible to assist researchers in meeting the conditions and procedures for access, it is often not possible to collect and store such restricted data for the long term, even when it has been generated by local researchers. Instead of trying to manage these data in a local repository, it is advisable to maintain memberships in data repositories, such as the Inter-university Consortium for Political and Social Research (ICPSR), which have the ability curate, store, and provide safe and confidential access to these restricted data for researchers who request it.

Single-User Licenses

Many highly specialized datasets, which may be of interest for a particular class or research project, can also be extremely restrictive in their licensing agreements. As an example, the *Corpus of Global Web-Based English*, which is a valuable dataset for computational linguists, restricts institutions that purchase a multi-user academic license to only providing access to those faculty and graduate students affiliated with a particular campus (i.e., users at another campus in a multi-campus institution can-

† For more information about restricted data, see the chapter in this volume by Jennifer Darragh called "Restricted Data Access and Libraries."

not use the data).[8] There are also a number of specific restrictions on the use of the data that each user must be made aware of before using the data. This requires oversight from the data services librarian, coordination with Collection Services, and infrastructure for ensuring compliance with the restrictions. While liberal arts institutions usually need not worry about single-campus restrictions, they need to plan for negotiating undergraduate access when adding such items to their collection.

Still more restrictive data licenses exist where only an individual researcher is to be given access to the data. Unlike a single-user e-book license, this means that *only that specific researcher* can *ever* access the data. This is most likely outside the collection development practices of most liberal arts libraries, but it is a case that should be addressed, if possible, in a collection development policy for data. Researchers should be made aware that they will need to seek funds from their home department, or include such funding in grant proposals, if they need access to these datasets.

Third-Party Aggregation of Public Data

As interest in data collection has grown in libraries, so too has vendor interest in providing value-added access to publically available data. Many products now exist that aggregate public data sources (such as data from the United States government) and provide improved browsing and searching interfaces for such data. Some third-party aggregators will also provide access to the data in various formats, or allow specialized subsetting of large datasets.

In developing a data collection development policy, it is important to balance the convenience of such services with the goal of teaching students to find, obtain, and evaluate data. If in certain cases (such as a class on statistical methodology) it would be beneficial to have a certain type of data centralized with an easy-to-use interface, purchasing access to such third-party products can make sense for the library.‡ However, in other cases a user may request that the library pay for access to one of these products when she simply does not want to do the searching (or do not want to pay a research assistant to do it). In these cases, it is helpful to have a clear policy in place, as well as having a data librarian who can help train research assistants to search for data. These sustainable research data skills will serve the research assistant, the researcher, and the library better in the long term, as well as advancing the teaching mission of the college.

Data Preservation and Storage

Today, many of the sources of data and statistics that a library collects are stored and preserved by third parties, both public repositories and vendors. However, in some cases, libraries will need to purchase a dataset in the form of a digital file that

‡ Examples of such products include ProQuest International Datasets, CQ Press Voting & Elections Collection, and Social Explorer.

they will need to host and preserve themselves. If the institution has a data repository, and can restrict access to individual files in this repository, then storing and preserving these files is much easier. In the case that the institution does not have a data repository, though, this becomes a more complicated question.

Most of the best practices and guidelines related to data storage and preservation are applicable across all types of institutions. There is little in this area that is unique to liberal arts institutions; I recommend that those interested look to the widely available literature on this topic. To get started, the "Best Practices" section of the DataONE website, as well as the "Preservation" section of the ICPSR's website, are both highly recommended.[9,10]

Data Management and Curation

The National Institutes of Health (NIH) were the first federal agency to require data management and data sharing plans from their grant applications, starting in 2003.[11] This policy did not affect many liberal arts institutions, however, as most of them do not have health sciences programs; even for those that do, the NIH only required these plans from applicants seeking more than $500,000 in costs per year, a large amount even for some health-sciences-exclusive institutions. When the National Science Foundation (NSF) issued their own data management planning and sharing requirements to take effect January 2011,[12] liberal arts colleges (and institutions of all types that rely on grant funding) began to take more notice. When the White House Office of Science and Technology Policy issued a 2013 memorandum requiring the heads of *all* federal funding agencies to develop policies for requiring data management and sharing plans,[13] it became clear that data management planning and sharing were here to stay. Researchers and the libraries and IT departments that support them needed to tackle this issue, no matter how large or small the institution, if they wanted to continue to receive grant funding.

While some liberal arts colleges had data services programs prior to these increased demands for accountability from funding agencies, they rarely covered areas such as data management and curation. These areas were the purview of large research institutions, whose researchers were gathering datasets so large that managing them and describing them became difficult to do through traditional means. It did not seem imperative for liberal arts colleges, with relatively smaller data collections and a focus on teaching undergraduates, to fully engage with the world of data management and curation. Data discovery, manipulation, interpretation, and analysis—these topics were seen as more important for undergraduates to learn. Even as data management instruction for undergraduates has grown, it is often still offered at research universities rather than liberal arts colleges.[14] While data management and curation have become important components of data services at any institution that relies on grant funding, it has also started to become

clear that, from a sustainability point of view, these topics need to become part of an instructional program that trains future researchers in these skills themselves.

While it has not yet become a common data service in liberal arts colleges, training in data management and curation *should* become an important component of these programs. Not only do undergraduates in liberal arts colleges often work with faculty on research and assist in grant-funded projects requiring data management planning and compliance, but many of these undergraduates will go on to pursue graduate degrees, often requiring them to take on more significant responsibility for data management, both within a lab in which they work and in their own research. Of the top fifteen baccalaureate-origin institutions for recipients of science and engineering doctorates from 2002–2011, when considered by institution-yield ratio, eight are small liberal arts colleges.[15] As the training ground for a number of our future researchers and scholars, liberal arts schools would be doing them a disservice to make them wait until they get to a graduate institution to learn about data management and curation. These rich and complex topics deserve to be integrated into *all* levels of higher education.

What do liberal arts undergraduates need to know about data management and curation, and how should we deliver this instruction to them? If we take the broad view that data management and curation encompass all of the practices surrounding the collecting, organizing, documenting, sharing, and preserving data, we can see several opportunities for integrating these topics into the liberal arts curriculum, particularly in the sciences and social sciences, but even in the humanities as well.

Collecting and Organizing

Often in classes where students are taught data analysis or statistical methodologies, their instructors give them pre-scrubbed and organized datasets in the interest of saving them time and allowing students to concentrate on learning analytic techniques. This makes sense, to some degree, but also puts the students at a disadvantage. When they start doing their own research, such as for a final paper or an undergraduate thesis, they may need to collect and organize the data themselves. When students are first tasked with organizing their own data, whether collected themselves or not, they often approach the task with a variety of non-standard solutions, sometimes following inscrutable logic.[16] Several types of exercises could help with this issue, such as giving students detailed directions for collecting and organizing the data, instead of giving them a premade dataset. Another exercise that can teach students about the large differences in data organization is to give them an unorganized dataset (cutting out the collection step), as though they had just been handed it by another researcher, and then have them devise their own organizational scheme before proceeding to the analysis, visualization, and presentation steps.[17] Sharing their process can highlight the need for standardization

and communication in labs and other collaborative environments. Learning how to logically organize files (and document that organization) is a skill that all undergraduates can easily learn, and one that will serve them well in their work beyond data, too.

Documenting

Librarians sometimes struggle with talking to non-librarians about metadata, particularly in avoiding the use of jargon. Anecdotal evidence suggests that some librarians would rather scholars not create final, study-level metadata for their own scholarly products. However, the reality is that with the increase in public data repositories allowing self-deposit, as well as the increase in collaborative research, many researchers are *already* creating their own metadata, for better or worse. Some faculty may think that metadata is a topic that students do not need to know about, or that they already know what it is and how it works.† It is important in pushing back against these claims to use learning outcomes, which are more meaningful for non-librarians, and to avoid the use of jargon. Example learning outcomes include "using disciplinary metadata standards," and "explaining why metadata is important."[18] Instead of talking about "metadata," particularly when talking to undergraduates, librarians can use the phrase "contextual details needed to make the dataset meaningful to others."[19]

Card-sorting exercises can be particularly helpful for teaching about the importance of standardized metadata and also can serve to open up conversations about why metadata standards are so important for increasing understanding.[20] For example, the instructor can give students cards with a number of items that are familiar to their discipline, or are generally familiar (e.g., fruits and vegetables), and have them sort them into categories of their own devising. Students can then discuss how they sorted their items and try to figure out how other groups performed their sort. This can then lead into a discussion of metadata standards and controlled vocabularies, and their importance for long-term searchability and access.

Sharing and Preservation

This final topic under the umbrella of data management and curation is often seen as too complex for undergraduate students. To be sure, data sharing is a complex subject, encompassing the above practices of organization and documentation, as well as intellectual property issues, ethical considerations (especially with human subjects data), and disciplinary cultural practices. Data preservation is also a

† The author has heard both of these claims: the former, in reference to an attempt to talk about evaluating a repository's quality based on metadata quality, and the latter accompanied by the claim that "they know all about that after the NSA thing."

complex topic, involving the practices of the broader world of digital preservation, as well as the tricky prospect of appraising the future value of research data. Preservation, in particular, is one of the areas where faculty themselves have difficulty both evaluating the importance of the practices, as well as knowing how to teach students about these topics—both the faculty and students interviewed as part of the Data Information Literacy Project rated "data preservation" as the least important topic to teach students.[21] Despite this complexity, liberal arts institutions are some of the most promising venues for teaching undergraduates about data sharing and preservation.

As discussed above, a high proportion of students graduating from liberal arts institutions go on to advanced study after earning their baccalaureate. This fact, when coupled with the high involvement of liberal arts undergraduates in faculty research (as well as their own original research) means that there is not only ample *reason* for teaching liberal arts undergraduates about data sharing and preservation, but ample *opportunity* to do just that. While it is true that graduate study is where students are taught how to become members of their disciplinary culture, this enculturation also takes place at a significant level at the undergraduate level in a liberal arts environment. Despite, or perhaps because of, the lack of vocational training at liberal arts institutions, students are often being trained in the "vocation" of becoming a scholar. Working closely with faculty in the classroom, the lab, or the studio, as well as learning how this work of scholarship can affect the larger world for better or worse—these are some of the hallmarks of a liberal arts education. Learning about using data as a scholarly product, with real value beyond its original purpose, can help students working with data to learn other ways to place themselves into the scholarly conversation. Learning about the preservation of data can help students to learn that materials beyond the journal article and the monograph can have real value and need to be preserved as part of the cultural record (even if they are never the ones who have to preserve it in practice). Thinking about data being preserved and shared for the long term can also help students to do better data management work in the longer term, similar to what Char Booth and Char Miller have argued about other undergraduate work and open access publishing.[22] When you are thinking that another scholar, or another student, may read or use your work, it makes the whole scholarly enterprise much more real in a way that few frameworks can.

Conclusion

The development of data services programs for liberal arts colleges is a project still in its infancy, and there are many questions for liberal arts data librarians to answer. In such environments, innovation is very important, but sometimes carries more risk than in a large research institution. Being able to fail and recover from failure is a privilege for those institutions with the resources (e.g. staff, time,

money) to do so. As they do in many other areas, liberal arts libraries look to these larger institutions for ideas and infrastructure, but they must do so with a careful eye to their unique communities and circumstances. Just because something works in a larger institution does not mean it can scale down to your particular institution. On the flip side of this, just because something does not work in a larger institution does not mean it cannot work in a liberal arts college. Collaboration, whether with students, with faculty, or with other colleges, can allow a culture of data information literacy to flourish in the liberal arts environment in special ways that may be constrained in larger organizations. One of the long-standing goals of the liberal arts program is the holistic development of a better-informed and more critical citizenry. Providing data services and data information literacy instruction is an essential part of continuing this mission in the twenty-first century.

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