



# Research on the Hierarchical Training Model of Data Service Ability for University Librarians

Shaojun Hu

Northeast Petroleum University Library, Daqing, China

Email: Hushaojun2004@126.com

**How to cite this paper:** Hu, S.J. (2017) Research on the Hierarchical Training Model of Data Service Ability for University Librarians. *Open Access Library Journal*, 4: e3979.

<https://doi.org/10.4236/oalib.1103979>

**Received:** September 26, 2017

**Accepted:** October 23, 2017

**Published:** October 26, 2017

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## Abstract

On the basis of elaborating the job responsibilities of the data librarians and the data service ability that should be possessed, put forward that the university library should adopt the data skill hierarchical training and progressive development mode, the general education training mode, the special training mode and the development mode, and introduced the corresponding safeguards.

## Subject Areas

Information Science, Library, Intelligence and Philology

## Keywords

University Library, Data Service, Hierarchical Training

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## 1. Data Librarian and Data Service Ability

### 1.1. The Functions of the Data Librarian

Data Librarian refers to a librarian who has been systematically trained in data management, storage and storage to manage all kinds of data scientifically using the appropriate technology (mainly computer technology) and related disciplines. Data librarians are mainly located in research institutes in developed countries in Europe and the United States [1]. Their job responsibilities relate to resource management, data services, technology platforms and analytical tools, legal and ethical aspects. Librarians work on management of data sources, the development of data management policies; data selection, preservation, storage and maintenance, metadata creation and conversion, to carry out the corresponding data services: such as data management Planning consulting, data analysis, data access services, data reference, data sharing and so on. University li-

brarians engaged in data management and service librarians should have the corresponding data literacy, with the ability to guide users to enhance data awareness, build data using skills and basic skills [2]. Therefore, the training of librarians with data processing, operation and transformation ability as the core of the data skills becomes the main task of librarian data literacy education.

University libraries abroad attach great importance to data service practitioners data awareness and ability, have been carried out data literacy education related courses, lectures and learning plans, most of the foreign university libraries have developed a special training program and regularly on the database Staff to carry out all-round, multi-level job training.

There are many ways to train foreign librarians, including library internal, library association, data supervisor and so on. The training method is flexible, the training method is not only limited to the course training, but also the discussion of the meeting, online learning, field teaching and so on, and short-term training mainly for the data librarian to use free time to learn. Training content design focuses on the combination of theory and practice [3]. The horizontal point of view is generally around the life cycle of scientific research, involving data collection, organization, management, preservation, utilization and reuse activities, and related data policy, data management plan, data sharing and other content, focusing on data analysis tools, data management plan writing, data reference, data ethics and other knowledge and skills training; from a vertical perspective, scientific data management resources, data literacy, general education, subject data literacy education constitute a shallow and deep continuous whole, have a hierarchical progressive nature.

## 1.2. Data Librarians Should Have the Data Service Ability

The data literacy embodies the perception and understanding of the data. The data literacy of university librarians mainly includes four parts: data consciousness, data knowledge, data skills and data ethics [4]. The data skill is the core part of data literacy, the ability to use, display and evaluate the data to show the librarian's ability to process the data and innovate on the basis of the original data, which directly affects the quality of the librarian's data service and determines the librarian's level (Table 1).

**Table 1.** The composition of librarians' data service ability.

	Data Service Phase	Service Ability Requirements
University Librarian Data Service Ability	Data Acquisition Phase	Data Demand Analysis Ability Data Acquisition Ability Data Assessment Ability
	Data Management and Analysis Phase	Data Processing and Development Ability Data Visualization Analysis Ability
	Data Storage and Security Phase	Data Retention Ability Data Display Ability

The data acquisition phase is the pre-preparation phase of data management and service. Good data collection is the basis of smooth data lifecycle. The data collection of the library is differentiated by the different objects of the service. It is divided into two categories: application and scientific research. The application is mainly based on the personalized service. The research is mainly to predict the trend of the discipline and explore the research direction of the subject. At this stage, the technical requirements of the librarians are as follows: 1) Data demand analysis ability, which can analyze the problems raised by the users, understand the user requirements and the ultimate purpose, and tap the potential demand [5]. 2) Data acquisition ability, from the massive data source to obtain the required content to match the data. Data according to the different sources can be divided into two kinds: a) First-hand data. Directly from the investigation and scientific experiments; b) Second-hand data. From others' surveys and experiments.

The data management and analysis phase are the focus of data management and service work. This stage is an important link between the function of the database librarian and the other functions of the library, which means that the library is further changed from the knowledge service to the intelligent service. The data librarians of the skills required higher and stronger. These stages of the technical requirements of the librarians are: 1) Data assessment ability. In the service early to the huge data information can be evaluated, to the pseudo-true, to coarse and fine, to identify valuable data and core data; in the latter part of the service, should be combined with user feedback and use of data resources to assess, and as a standard timely Adjust the service content and service path. 2) Data processing and development ability. This skill is the necessary skills for the data librarian, including: a) Data description ability, in order to ensure that data objects can be found and long-term preservation, and to improve the interoperability of resources, data librarians must develop the corresponding metadata data standards And the relevant specifications to describe and express, to facilitate data preservation, re-use, including: MARC, Dublin core metadata, OAI, DDI, etc; b) Data organization and management ability, mainly refers to the data resources for relatively simple processing. c) Data analysis ability, data can be analyzed quickly, accurately and effectively data analysis tools (SPSS, SQL and SAS etc.). For unstructured data, can use other more high-end data analysis tools, such as the widely used large data processing platform Hadoop and development of data analysis tools based on Hadoop by the major manufacturers, that not only reduce the cost of unstructured data analysis, but also provide a convenient, accurate and efficient platform for unstructured data. In addition, the data librarians should have data visualization analysis ability, can systematize the data, comprehensive analysis, extraction, comparison, induction, summary, inference and so on.

The data storage and security phase is the guarantee stage of the data management and service of the data librarian. At this stage, the technical requirements of the librarians are as follows: 1) Data retention ability, including: a) Da-

ta storage capacity, including data preparation before storage and Storage of disaster prevention planning and implementation; to ensure that the number of copies; data content, format and other error checking; data ownership maintenance; storage level management; replacement media. b) Long-term preservation of data, mainly refers to the definition of long-term preservation of data; data format migration, migration process to ensure data integrity and authenticity; long-term preservation strategy; for long-term preservation of metadata format construction. Especially with the knowledge of the construction of the knowledge base, familiar with DSpace, Fedora and other open source software, to the data storage and storage; with digital resources to save the standard knowledge and experience. 2) Data display ability, mainly refers to the librarian on the data for a series of processing, summary and other operations, the use of what form of data presented to the user. Data display in a variety of forms (such as charts, maps, matrix, network, hierarchy, etc.), data display to be effective, accurate, clear and easy to understand.

Data librarians are comprehensive high-quality talent, they not only have the professional knowledge of books and information, but also with resource construction and discipline services, etc., in addition to good teamwork, communication skills, data librarians Job responsibilities are focused on data management policies and advocacy, data services and data resource management, data management and organization, data policies, data services, data retention, etc., both in data acquisition, data management, analysis, or data Storage and data security stage, the data librarian on the professional ability, subject background and overall quality requirements are very high, job responsibilities also run through the data lifecycle management of the entire process and data regulation policy and promotion, data law ethics and so on. Especially in the computer technology and data management technology requires higher professional skills, it is necessary for the database librarian training and upgrading of education in order to enhance its service skills and literacy.

## **2. University Librarians Who Can Given Priority to Enhance the Ability of Data Service**

The professional education and continuing education of data quality and literacy in domestic university libraries have not yet started or are in the initial stage, and there is no separate ability to set up data technology professional or educational projects. The data literacy education of data service librarians is very different from that of foreign countries. The specific performance is: First, the lack of data technology and literacy training awareness and attention, the lack of appropriate policy support and service design; second, has not yet formed a clear data literacy training model, cultivate curriculum content design lack of integrity and system. Some of the libraries' training only involves data literacy aspects of a content, or only introduce the distribution and acquisition of data resources, or only for the use of data analysis software training methods [6]. Third, the cultivation mode is relatively simple, simple, that is,

the lack of universal access to general education and the lack of intensive professional education.

We can learn from foreign experience related to the curriculum into the library and information science, in the library and information science professional degree corresponding to the same time to give data skills certification. Or in the existing relevant disciplines on the basis of professional education, to carry out practice-oriented, with the characteristics of library and information professional multi-level interdisciplinary comprehensive data skills to continue education, can continue to educate the preparatory data librarians are:

### **2.1. Librarian of Professional Knowledge of Library Science**

Data librarians also need to have a certain background knowledge background. On the one hand, it is based on the data format of the map domain, and the storage of unstructured information. On the other hand, based on the background of the knowledge and knowledge, combined with the data analysis tools and application experience, we will update and innovate the existing service mode of the library. At present, China's university libraries have a group of both library knowledge, but also owning the background of the knowledge of high-quality, working ability, business proficient subject librarians, from the librarians can choose the quality High, capable of the staff, for him (her) them related training, to achieve the subject librarians to the conversion and upgrading of data librarians.

### **2.2. Librarians for Computer and Related Backgrounds**

As the university library has not set up specialized in the data management of the librarians (including data librarians and data services in the subject librarian), the best way is to select a group of computer and related background librarians, through training and Practice exercise, make it a qualified data librarian. These librarians have the knowledge of computer-related background, familiar with metadata configuration, data storage, data reuse and other professional knowledge, have the ability to develop data management software, familiar with the standard format and life cycle of the data, the knowledge base is familiar with the familiar Science and technology management policies, such as NSF requirements for data management programs funded by research projects, also have a certain copyright knowledge, is a potential candidate for data librarians.

Domestic university libraries should encourage and support these preparatory data librarians through professional education and continuing education, systematically learn data management knowledge, and organize internal communication, explore, promote the sharing of data management knowledge [7]. In addition, the data librarians should also participate in a variety of data management training courses and seminars organized by the library industry to enhance operational capacity and broaden their horizons.

### 3. Hierarchical Training of Data Service Ability for University Librarians

According to the requirements of training, data training can be divided into basic training and characteristic training. The basic requirements are suitable for the development of data skills. It is universal and suitable for all data librarians. The characteristics are suitable for carrying out data Special skills to cultivate and expand the training. The characteristics of the requirements refers to the requirements of the data librarians are different, the university library should be based on their size, type and characteristics, according to their own development status, future planning and other requirements, step by step, in the overall situation, Schools, the characteristics of the museum to cultivate the model to cultivate and improve the service capacity of data librarians.

#### 3.1. General Data Skills Training Mode

The goal of general knowledge training is that the librarians can provide general service items. The contents of the training are mainly based on the data life cycle and the research life cycle as the main line. The basic theories and methods of data management, data management and analysis the specific operation and use of tools, data management policies and ethics, mainly to provide an overview of data management and services, so that learners from the overall ability to grasp the basic skills of data management [8]. The diversity of teaching forms in general education, in addition to the most common forms of elective courses, symposiums, online courses, etc., there are some commonly used data skills General education form:

- 1) Use of content management and knowledge sharing platform-LibGuides to establish scientific data management resources to provide data services. This method is the basic form of data literacy education, which mainly provides the network resource catalog and navigation of data management resources, helps learners to establish the initial concept of data management, understand the common methods, tools and available resources of data management.

- 2) Relying on data management platform to promote data skills and literacy education. Domestic libraries have unique advantages in resource collection, organization and service. Librarians should play the functions of data management, provide professional services for scientific research and teaching in colleges and universities, and gradually form their own characteristics and services. Such as the university library can establish scientific data resources for the researchers to provide data storage, management and sharing system, the establishment of interactive platform between users and librarians. And rely on their own data management resources and data management platform to carry out data skills and literacy education, while training in the library's data management system, publicity data services.

#### 3.2. Special Data Skills Training Model

The special data skills training model is aimed at cultivators with certain data li-

teracy, but in some skills there is a lack of librarians. The model can be based on specific disciplines or practical positions to carry out data skills training, compared with the general model, more targeted, more systematic and in-depth, suitable for providing personalized service project librarians.

The training requirements of special data skills are mainly divided into three aspects. First, it requires a certain theoretical knowledge and practical skills for data lifecycle management, including the ability of data resources organization, the capacity of institutional building (familiar with Dspace and other library building software). The development of software resources in the network environment, to master more than one computer language; the second is to require data services and data analysis ability, familiar with and can use SPSS, Stata, the use of data, SAS and other statistical analysis software, master data visualization analysis software, to provide researchers with data empirical research, data monitoring programs and consulting; third is a project management and process management ability, to the library resources and services for strategic planning, understanding data regulation related policies, to master certain data legal knowledge.

University library can be based on two focuses on the choice of nurturing content, first, according to the subject selection of special data skills content, the second is based on the actual job needs to set up training content.

1) Subject selection of data skills to cultivate content. Discipline data Skill training is mainly for the needs of specific disciplines and set up, at present, foreign subject matter data literacy education university library is not a lot, and the domestic development of the university library to carry on even less. The University of Virginia University's data literacy education curriculum has formed a more complete system, according to the data life cycle design, in different disciplines horizontal development, for specific researchers to provide professional training [9]. These model and method are worthy of domestic reference and learning.

Different disciplines in the field of data skills training needs are not the same, the data librarians should be different with the subject of the characteristics of students choose to cultivate content. For example, the data literacy of science and engineering emphasizes the use of data analysis tools, focusing on the use of data mining and analysis methods in large data environment. Therefore, the special data skill training of science and engineering focuses on the improvement of data consciousness and data processing ability. The training of special data skills in the field of social sciences needs to focus on the training of data consciousness, data acquisition and expressive ability.

2) The actual job requirements set to cultivate content. Within the university library in the development of data librarians to cultivate the skills, according to the museum's job needs and the actual situation to set up training content. The position of the data librarian is different, the service object is different, the content of the skill training should be focused, should highlight the service focus, clear distinction and contact. If the post requires the service of the researcher, the data librarian will need to follow up the research process to provide the data

management for the researchers throughout the data lifecycle, which requires the data librarian to have strong data acquisition, analysis and storage ability. Researchers write research data management plans to accommodate data management and sharing requirements; should be integrated into a comprehensive data librarian. If the post needs to serve the general users, the focus is on the need for the data librarian to have strong and effective data acquisition and analysis ability, to provide users with pre-advisory services to meet the potential needs of users to help users complete data collection, analysis and processing research data utilization and management. Therefore, the university library should be based on the actual situation to set up the contents of the training of librarians in order to better carry out the data services.

In addition, regardless of the choice of general education mode, or special data skills training mode, in addition to the importance of data collection, data analysis, data standards and other related “hard skills” training, cannot ignore the communication skills, management skills and teamwork. And other “soft skills” of the training requirements. In the course set up also set up team cooperation courses, training librarians and users of teamwork and communication skills.

### **3.3. To Expand the Data Skills to Cultivate the Model**

As the data service industry is an interdisciplinary industry, the need for different disciplines background, different knowledge structure, different levels of education professionals to develop together. Data Skills Education is also an immature educational field that requires organizations from different countries, different disciplines, different levels, and different training models to further expand the data skills that have been mastered [10].

Foreign university library to carry out data skills and literacy education often take the form of cooperation, by the library of academic librarians, technical experts, scientific research departments, faculties and other forms of team collaboration, according to their expertise, survey data management needs, Co-design to cultivate content. The conditional university library can cooperate with domestic and foreign institutions to participate in relevant international forums and seminars, share teaching experience and information, visit foreign universities and libraries for educational experience, and further expand and enhance the skills of data librarians.

In the domestic, development of data librarians to the vocational skills of education need to strengthen the cooperation of university libraries and scientific research institutions and data center, with scientific research institutions and data center data advantages, and actively carry out practice, with the professional characteristics of library and information, multi-level comprehensive comprehensive data technology education, in the provision of theoretical teaching and academic research platform at the same time, give the information librarians practice the opportunity to practice, the librarians and professional users or researchers to establish a bridge of communication, through the tripartite cooperation, to achieve “theoretical study”, “academic research”, “practical ap-

plication” all-round common development.

1) To provide certain funds for outstanding librarians to study abroad. Although the current university library funding is limited, but the foreign university library in the scientific data librarian system construction has a relatively mature experience, there are many worthy of our reference and learning place, so within the scope of funding to support more librarians Go out and learn from foreign advanced ideas and techniques, and apply it to our university library.

2) Participate in short-term training courses organized by relevant domestic institutions. Organizers invited in the field have a certain research and experienced scholars to give lectures, the university library scientific data librarians to discuss the exchange, mutual progress. The training organization may be CALIS, the university library and related institutions. In March this year, the first Chinese data librarian training course was organized by the Chinese Academy of Sciences. The training contents included data policy, management, processing, analysis, publication and storage. And so on, the training by the library community’s praise. China Library Institute High School Library Branch The “Research Data Management and Intelligent Analysis Tool Usage” held in December 2016 will help librarians master the practical tools for data management, processing, analysis and visualization. Have data thinking ability, to carry out relevant research work for needs; to enhance and develop future data science and technology personnel.

In short, the domestic library to carry out data skills and literacy education should pay attention to subject librarians, library technicians, scientific research management departments, data management agencies between the mutual cooperation, based on the existing information literacy education experience to enhance the data librarians Professional skills, timely expansion of service functions, step by step, to explore suitable for the school, the museum’s data skills training model.

## **4. Related Safeguards**

University library for promoting librarians data ability to foster the effect of grading, can take the following safeguards:

### **4.1. Self-Assessment before Breeding**

In order to carry out self-assessment on the digital skills and literacy of the librarians, the university library should carry out the “targeted, sub-disciplinary and focused” digital skills according to the different abilities and levels. Literacy training activities, at the same time, the use of digital resources can be cultivated mode and content innovation, the librarian’s digital skills and literacy level included in the individual performance appraisal.

### **4.2. Certificate Issued after Incubation**

The library professional qualification system is a scientific and effective check

for the practitioners of the library. Although China has started to study the library professional qualification system from the beginning of the 21st century, up to now, China has not established and implemented the vocational qualification certification system. Library should be used as a data management professional qualification institutions, responsible for vocational qualification assessment and certification and other related matters, the university library in the data librarians during the incubation period, the implementation of university library data librarian professional qualification system, data on the one hand, the quality of the data librarian team can be ensured from the source to ensure the professional level of the data service of the university library. On the other hand, the librarian can raise the initiative of the librarian to improve their own data. To make data management learning and training more targeted and effective, to enhance the overall level of librarian data services. Data librarians in the acceptance of the system, standardized professional skills after grading training, through the authority of the assessment, certification, can be issued by the corresponding primary, intermediate, senior qualification certificate.

### **4.3. With the Supervision to Cultivate the Effect**

Assessment is the basic way to test the service quality of data librarians and supervise the work of librarians. It is an indispensable content for the construction and training of data librarians. The contents of the assessment mainly include the service quality of the librarian, the ability to work, the comprehensive quality and so on. After the grading of the data librarians, the university library can adopt the combination of regular assessment and occasional sampling, take the librarian self-evaluation, the museum mutual evaluation, user evaluation and organization evaluation [11], such as the University of Michigan Library annual assessment of its librarians, including the librarian's expertise, skills and performance level; leadership and teamwork ability; interpersonal communication skills; innovative service ability; management capacity and other five aspects.

### **4.4. Practice Test Results**

After training, the librarians should be able to practice in the training of university libraries or other relevant institutions for some time, can master the theoretical knowledge of training into practical skills, is the effective test of training and enhance the effect. In addition, the participating librarians to sum up each training to form a report, and "pass, help, with" in the form of sharing to other librarians, for the library into new ideas.

## **5. Conclusion**

The research on the service ability of university librarians is a long-term process. On the basis of elaborating the job responsibilities of the data librarians and the data service ability, it is put forward that the university library should adopt the data skill hierarchical cultivation and progressive development mode. That is,

general education mode, special training mode and the expanded cultivation mode, and introduced the corresponding safeguard measures. In the large data environment, the university library has carried out data skill and accomplishment activities in different stages, and actively explores the contents and modes of data skills and accomplishment training, improves the management level and service ability of data librarians, and satisfies the users to a certain extent and the data management needs of scientific research personnel is one of the effective ways to expand and deepen the service function of university library, and it is also the strategic choice of university library to actively integrate into academic exchange and large data environment.

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