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Research Article

LIS Program Representatives' Perspectives on Preparing Students for Careers in Research Data Management and Data-Related Librarianship

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Abstract

Objective – This study aims to contribute a qualitative analysis of the perspectives of LIS program representatives on providing research data management (RDM) and data librarianship training opportunities to their students. The primary objectives of the study are to determine which programs currently provide training opportunities for students in RDM and related areas, as well as whether programs have provided such opportunities in the past and/or intend to do so in the future.

Methods – This study incorporates in-depth qualitative empirical evidence in the form of five semi-structured interviews of representatives of Canadian LIS programs to investigate first-hand

perspectives on the RDM and data-related opportunities they can provide to their students.

Results – The interviews identified five major themes related to LIS programs' RDM and data-related training offerings, including the range of formal and informal opportunities currently available in the programs; the ways in which the representatives would mentor and advise students interested in RDM or related career paths; the challenges posed by both the lack of instructors for RDM and data-related courses, and the lack of students who are interested in, or ready to pursue, data-related careers; the need for programs to develop a curriculum that meets the requirements of many stakeholders; and the effects of the rapidly changing library landscape on LIS curriculum development.

Conclusion – This qualitative study sheds light on both the support that Canadian LIS programs can provide to students who are interested in RDM and data-related careers in academic libraries, and the challenges those programs face in providing that support.

Introduction

The need for academic librarians to develop skills and competencies in research data management (RDM) and data services has been recognized for well over a decade (Andrikopoulou et al., 2022; Corrall, 2012; Corrall et al., 2013; Koltay, 2016; Perrier et al., 2018; Pinfield et al., 2014; Tenopir et al., 2015). This need is set to grow with the implementation of data management, deposit, and/or sharing policies such as the Tri-Agency RDM Policy in Canada (Government of Canada, 2021) and the NIH Data Management and Sharing Policy in the United States (National Institutes of Health, 2020), which will further increase both researchers' obligations related to properly managing their research data and the support they require to do so (Khair et al., 2020; Steeleworthy, 2014). However, it has also been observed that many practicing librarians—primarily those who are not already supporting research data services as part of their job, but even some who are—often do not feel that they have either the skills or the access to training needed to adequately support researchers with this work (Tang & Hu, 2019; Tenopir et al., 2013, 2014). Academic libraries have also reported difficulties in finding new staff with the appropriate mix of skills to support RDM (Cox et al., 2017).

In 2019, Cox et al. suggested that future research into how academic libraries support RDM "will help us understand the new data-oriented skills, knowledge and attitudes professionals will increasingly need and how LIS [library and information studies] curricula can be transformed to provide them" (p. 1454). However, there has been little research as to what LIS programs are currently offering their students in the way of RDM and data librarianship-related training, which makes it difficult both to know what their graduates could bring to RDM and data-related positions, and to understand how their curricula could or should be updated to meet academic libraries' needs. This qualitative study seeks to fill that gap by contributing novel insights from interviews with representatives of LIS programs across Canada.

Aims

This study aims to contribute a qualitative analysis of the perspectives of LIS program representatives on providing RDM and data librarianship training opportunities to their students, beyond the information which is available on their public-facing websites. It is organized around the following research question:

RQ: Are Canadian universities that offer Master-level library and information studies programs providing their students with training in areas relating to RDM, and if so, in what ways?

The primary objectives of the study are to determine which programs currently provide training opportunities for students in RDM and related areas, as well as whether programs have provided such opportunities in the past or intend to do so in the future. In addition, we hoped to gain insights into the factors affecting whether and how the programs offered this type of training.

Literature Review

To date, most of the literature on RDM and data-related training for librarians has focused on continuing professional development/education for practicing librarians. These efforts are primarily in-person workshops, ranging from one hour to several days in length (Conrad et al., 2017; Cox et al., 2014; Johnson & Bresnahan, 2015; O'Malley, 2014; Southall & Scutt, 2017); online modules (Read et al., 2019; Shipman & Tang, 2019) and hands-on "training grounds" (Davis & Cross, 2015) have also been used. Some opportunities take a "train-the-trainer" model, where librarians learn the material and/or useful instructional techniques so they can teach others (Conrad et al., 2017; Read et al., 2019; Tayler & Jafary, 2021). Other approaches are focused on community of practice-style programs, where librarians can develop shared expertise and build confidence in a collegial learning environment (Atwood et al., 2017; Wittenberg et al., 2018). Training is often focused on the subject/liaison librarians who work most closely with researchers and students (Davis & Cross, 2015; Southall & Scutt, 2017; Wittenberg et al., 2018). Other lines of research indicate that librarians are also participating in academic library RDM training aimed at researchers and students (Xu, 2022; Xu et al., 2022). However, none of the training discussed above involves LIS students.

There has been limited discussion of how LIS programs prepare their students to become RDM or data-focused librarians, or whether this type of training is fundamentally in scope for LIS programs. On the one hand is research enumerating how many LIS programs offer data-related courses, programs or certificates (Harris-Pierce & Quan Liu, 2012; Keralis, 2012; Wang & Lin, 2019) or describing particular instances of such courses in LIS programs (Lyon, 2016). On the other hand, there are a handful of studies which focus in part on how practicing RDM and data-focused librarians view their LIS training in relation to their current roles or demands for data services (Fuhr, 2019, 2022; Thomas and Urban, 2018). For example, the majority of the Canadian RDM and data librarians interviewed by Rod (2023) felt that having an MLIS helped prepare them for their current positions, while also acknowledging that there were not enough data-specific courses or formal training opportunities in their programs to give them advanced proficiency in pertinent data-related skills. In addition, a key finding of Rod (2023) is that RDM and data librarians in Canada view experience conducting a research project from beginning to end—including applying for ethics approvals, securing funding, and publishing research outputs—as critical expertise for their positions. The interview participants of Rod's (2023) study generally argued that their MLIS programs did not offer enough opportunities for conducting relevant research projects. This aligns with Thielen and Neeser's (2020) study on data professional job advertisements, which found that more than half of job advertisements related to research data services positions between 2013 to 2018 sought candidates with a second graduate degree in addition to an MLIS. Indeed, MLIS programs are typically geared toward professional training rather than academic research (Bright and Colón-Aguirre, 2022). Another study by Thomas and Urban (2018), which relied on a survey of 105 data librarians, found that the majority of respondents who held an MLIS responded neutrally or negatively when asked how well their program had prepared them for their current work, with some respondents saying that their education was "outdated" or "too theoretical".

Another stream in the literature focuses on the debate regarding whether LIS programs, broadly, should adapt and incorporate training related to major "trends" in librarianship such as scholarly communications, RDM, data services, etc. (Kassim et al., 2022; Lyon and Brenner, 2015; Raju, 2019). Lyon and Brenner (2015) argue that LIS programs are shifting toward information studies broadly as a reflection of the evolution of the field of librarianship and information professions, rather than narrowly focusing solely on conventional training for librarians, and that this shift necessitates updating the core curriculum of LIS programs to include robust data-focused courses. Similarly, Fuhr (2022) implemented a survey of academic librarians and identified a clear gap in skills related to data services. Fuhr (2022) concludes that LIS programs should be concerned with this gap and review their current data course offerings or offer other formal opportunities such as internship placements with data librarians. Alternatively, Eden (2018), a former member of the American Library Association's (ALA) committee on accreditation, argues that soft skills and the core values of librarianship as a profession are foundational components of training for MLIS programs. Missing from these discussions has been the perspective of LIS programs, beyond what is available on websites or publicly available syllabi.

Methods

This qualitative study relies on a semi-structured interview methodology with five representatives of the seven anglophone Canadian institutions offering ALA-accredited Master's-level LIS programs (representatives from all seven institutions were invited to participate, with five accepting). The operationalization of an LIS program representative includes an individual employed or appointed to respond to requests from prospective students or who would have knowledge and the authority to comment on the program's curriculum. This includes individuals publicly listed, on the program or institution's directory or website, as the primary LIS master's degree program coordinator. If the primary point of contact for these programs was unavailable or declined to participate, we invited another representative of that institution's program (for example, a member of the program's curriculum committee or the department chair). The research described in this article was approved by the University of Calgary Research Ethics Board (File # REB23-1180) and received external recognitions from each of the Research Ethics Boards at each institution where a program representative was contacted to participate in this study (Dalhousie University, McGill University, University of Alberta, University of British Columbia, University of Ottawa, University of Toronto, and Western University).

The 30-minute interviews were booked via Microsoft Bookings and took place virtually via Zoom between November 21, 2023, and March 18, 2024. The interview questions focused on RDM or data-related training opportunities in the program's curriculum, including dedicated courses if they were offered; activities or examples of how RDM training is incorporated throughout the curriculum both formally and informally; and participants' perspectives on the alignment between their program's curriculum and the skills and knowledge needed for data-related or RDM librarians. We neither offered a definition nor an operationalization for RDM or data-related "training", since there remains disagreement within the literature regarding the sufficient or necessary training, including content, domain knowledge, and modalities, for data-related or RDM librarian careers. Thus, we opted to design questions that addressed different avenues for training that have been previously identified in the literature (e.g., curriculum/formal courses; for-credit research projects; "on the job" training; self-guided training such as webinars or modules; mentorship models including practicums or internships; other degrees or educational experience in research, computer programming, or data-focused disciplines; "train-the-trainer" professional development models; etc.). For a full list of interview questions and the corresponding codebook, see the deposited dataset (Abel and Rod, 2024).

The interviews were automatically transcribed using the transcription functionality in Zoom. The text document transcripts were checked against the audio recordings of the interviews and were corrected as necessary; identifying information (i.e., names of individuals and institutions) was also removed at this stage. The interview transcripts were then coded and analyzed by both authors independently using Taguette (Rampin & Rampin, 2021), an open-source desktop application. Coding qualitative or unstructured data is an approach for performing content analysis, where independent coders iteratively review and categorize information and compare agreement (Creswell, 1994; Krippendorff, 2018). An initial iteration of coding at the interview level resulted in the development of a codebook of high-level categories and themes.

After one round of coding using the codebook, the inter-rater agreement between both coders was below the threshold for reliability, e.g., percent agreement > 90% or $\kappa > .70$ (Krippendorff, 2004; Kurasaki, 2000; Lombard, Snyder-Duch, & Bracken, 2002, p. 596). At this stage, the codebook was reviewed and definitions for codes were refined. Subsequent rounds of coding used the response —i.e., the content between one question from the interviewer and the next—as the basic unit of analysis. In the case of courses, students who had pursued research projects or independent studies, and faculty supervisors, each discrete course and individual was coded so that accurate lists or counts could be obtained.

After a second round of coding, the inter-rater agreement for two of the five interviews reached an appropriate level of reliability with the other three interviews approaching that level. After the third round of coding, the inter-rater agreement, calculated using SPSS, reached a robust reliability threshold with Cohen's Kappa > .70 for each transcript (see Table 1). At this point, the coders reviewed and resolved all remaining disagreements, and a final set of reconciled codes are used as the basis for data analysis. To ensure confidentiality of participants' identities, pseudonyms are used in describing results.

Table 1
Inter-rater Reliability Analysis Results Following Three Rounds of Independent Coding

Interview	**Percent Agreement**	**Cohen's Kappa (κ)**
Participant 1 (Jordan)	90.32%	0.85
Participant 2 (Emma)	83.87%	0.76
Participant 3 (Sophia)	96.77%	0.94
Participant 4 (Blake)	83.87%	0.76
Participant 5 (Noah)	93.55%	0.90

Results

Overall, all the LIS program representatives affirmed that either formal or informal avenues of training opportunities in RDM and data-related skills are available for students interested in these careers or topics. In general, five major themes emerged from the interviews, including:

- The range of RDM and data-related courses and training opportunities currently available in the programs;

- The need for programs to develop a curriculum that meets the requirements of many stakeholders;
- The challenges posed by the limited pools of both available instructors and interested students;
- Mentorship and advising strategies for students interested in RDM or related career paths; and
- The effects on curriculum development of a rapidly changing library landscape.

Courses

First, we asked the LIS program representatives to discuss RDM-related courses, courses containing RDM-related topics, and other data-related courses that may be available to students. Three of the representatives indicated that there is a full course on RDM available within their program's curriculum; at Blake's school, this course is called 'data curation', but the content is essentially RDM. Across the programs, RDM courses are typically offered as an elective or special topic, although Jordan mentioned that as part of their "current curriculum review", their institution has "recommended that it become a permanent course". The representatives also indicated that there is demand among students for the RDM course, as emphasized by Jordan who remarked that there is "substantial" enrollment because the course "isn't offered that often". Relatedly, in terms of scheduling the RDM course, three program representatives mentioned that the course is meant to be offered every two years, but this has varied recently due to instructor availability at one institution, the lingering scheduling effects of the pandemic at another institution, and the redesign of the course around a newly released Canadian-focused RDM open educational resource (Thompson et al., 2023) at the third institution. A final interesting finding regarding the RDM courses across LIS programs in Canada is that two of the programs rely on their institutions' RDM librarians to serve as the course instructors. As Emma explained, "we've had to bring in someone not from [our] faculty to teach".

When asked about other data-related courses, three program representatives listed courses that they believed could build the competencies and data skills needed to be competitive as a data librarian. The courses mentioned explicitly by the representatives include data visualization, database design, data analytics, Python programming, data science, and a course on a specific type of open data.

Although two program representatives acknowledged that their programs do not offer any RDM or data-related courses, all five representatives discussed other related courses in which students have opportunities to engage with the more general skills related to RDM and data librarianship. A few examples of courses listed by the representatives that could provide the necessary "learning objectives", as described by Blake, include digital curation and/or preservation, metadata, GIS, information management or organization, and bibliometrics. All the representatives argued that students can gain relevant skills and knowledge from courses that are not necessarily focused on RDM or data per se. Jordan gave the example of "archival courses" such as "digital preservation", which are "not exactly on the area, but many of the same concepts would be introduced in those courses". Many of the program representatives also emphasized that instructors "talk" about data in a variety of courses or that a one-off lecture on RDM is offered, albeit inconsistently, in some related courses such as research methods.

The last topic that emerged related to courses in LIS programs is the option for students to use an independent study course to pursue RDM or data-related topics. All five program representatives affirmed that it would be possible for students to use an independent study course to tailor their training toward data or RDM librarianship. For example, Jordan described "a student who really wanted to go down a path of data librarianship, so did an independent study with me and we kind of did this thing where the student took all of the modules from an online RDM course."

Current Curricula and Curriculum Development

Another focus of the interview questions included prompts to elicit information about the pathways for developing skills and knowledge in data topics within the curriculum of each LIS program, including options beyond the courses discussed above. This resulted in two broad sub-themes: how the current curriculum could support RDM and data-related learning opportunities, and how curriculum development is shaped by competing demands and capacity-related constraints.

In terms of their current curricula, when asked if there is any formal or informal focus on data or RDM, three program representatives mentioned that there is a formal focus or emphasis within their programs, though these pathways focus less on RDM for academic contexts and more on data science or interdisciplinary industry-focused data professions. However, almost all the representatives discussed informal ways that students could focus on data or RDM including independent study courses. For example, Blake mentioned that they offer an independent study course "where you would actually have the opportunity to pursue a research project on maybe data curation or what have you." Noah offered a similar perspective, stating that "I think you could cobble together with our courses that we offer something that would give you some insights".

In addition to independent study courses, all program representatives mentioned that an independent research project would also be a feasible pathway for training or gaining competencies and knowledge about a topic related to RDM or data. Three program representatives explained that their programs incorporate a thesis or thesis-style project that could be used to focus on RDM or data. To gauge the interest in project-based options for RDM skills development, we asked program representatives how many students have pursued RDM or data-related research projects in the past few years. Two of the program representatives could name or discuss two students each, while a third representative searched through a directory of thesis-style projects to identify four students. The other two program representatives could not recall whether any student had conducted an RDM or data-related research project.

In terms of the influences affecting curriculum development, an overarching theme that emerged from this discussion is the importance of ALA accreditation (see Committee on Accreditation, 2024) and its related curricular review on the availability or unavailability of data or RDM-related courses or training. Most of the program representatives discussed recently completed, current, or impending preparations for seeking reaccreditation, including reviewing their curricula. However, the consequences of the curricular reviews on RDM and data-related offerings vary across programs. For example, Jordan stated that because of their review, they have "recommended that [the RDM course] become a permanent course". On the other hand, Blake described a meeting with their program's advisory board where they asked what these employers were looking for in program graduates:

We came to them with, among other things, the sort of update of where we are with accreditation, like program review, and curriculum review and so on. And one of the things we asked them was, so you know, what do you need from our students? … And one of the things they said was, we're not looking for specialists. Because our employees have to be versatile. And what we hire them for, if they're very good at it that's great, but their job is going to change. So, you know, don't produce highly specialized students who are not versatile in their employment characteristics. Number 2 was…we need people with people skills. With soft skills. Like in libraries, what they were noticing, the [City 1] Public Libraries, that they're dealing with people problems all the time, you know, mental health, addiction, violence…the problems in society. But what I found kind of interesting and surprising, apropos RDM, was that because

RDM is increasingly important in - from the point of view of funding agencies, SSHRC and NSERC [two Canadian funding agencies] and so on, then it became - like it stood out to me that RDM was a skill that is sort of up and coming.

RDM is thus only one of many priorities Blake's program must consider when developing its curriculum.

Overall, program representatives offered mixed perspectives on whether an RDM course should be offered formally within LIS curricula. As summarized by Noah, "if we feel like there's an argument to be made for offering [an RDM course], then that's definitely something we would listen to, and we could recommend to the department". At least half of the program representatives expressed some skepticism that RDM is a topic general enough for information professionals as to warrant inclusion in the core or permanent curriculum either as a course or as a focus.

Limited Pools of Instructors and Interested Students

The program representatives' responses suggested that the lack of two key levers affects their RDM and data-related course offerings: instructor availability, and students' interest in and readiness for those courses and/or careers.

All the program representatives described problems finding or retaining instructors to teach RDM and data-related courses. A reliance on adjunct instructors, as is the case at two of the LIS programs, can affect how often the course is offered. For example, Jordan explained that their program's main challenge with the course "is being able to offer it on a regular basis because [Adjunct Instructor] has not always been available to teach it every year". They noted as well that it is generally difficult to find instructors working in the RDM field who are available to teach the course.

A general lack of permanent faculty members who were available to teach RDM or other data-related courses was mentioned by four of the five program representatives. Several reasons for this were provided by the representatives. Some schools simply do not have enough faculty members, and some are experiencing budget limitations which have affected the hiring of new faculty. Other schools have more faculty members, but not necessarily any with RDM or data-librarianship related expertise which could be useful in these courses. Jordan described a new hire who is a computer scientist but does not have an LIS degree, acknowledging that "this will probably expand our offerings related to data, but not…necessarily in the professional context of data librarianship." Permanent faculty may also be unavailable to teach these types of courses due to sabbaticals, leaves, and secondments.

Two of the representatives from programs with RDM courses raised the issue of whether students are either interested in or ready for—or consider themselves ready for—RDM and/or data-related career paths. Jordan, who has taught a course on public domain data sources, described their experience with students' data literacy in the most recent offering of the course:

> When I've taught [the course], sometimes we've kind of almost like jumped over the basic data literacy and started doing projects and, you know, like here's the data set, play with it…. Of the 18 students in that class at the beginning of the class, I said, okay, rate yourself on data novice, data newbie, you know, up to data expert and everybody was on the lower end of that scale, everybody in the class. I mean, that's a self-assessment. Some of them, I think, have more knowledge than they realize they have. But, and then, when we did some of these projects, you

> see that there are students who…are lacking some of the fundamentals. So, part of our challenge, I think, is the extent to which students are equipped.

Similarly, Emma's program has a data management class (not RDM) as one of its required courses, which they say is not necessarily welcomed by the students:

> Some students always kind of push back but our view is even when we talk to people that are more interested in sort of the librarian side of things, data is still an incredibly important part of everybody's job…. We've kind of taken the position that, you know, data literacy is critical to almost everybody in society now. So, you know, this is something definitely all our students should have.

They also mentioned re-considering this requirement, but eventually deciding to keep it due to working librarians' views on data literacy:

> We have a lot of core [courses] and we are trying to streamline them and it was interesting because some students really argued for, like, this isn't core, but then when we had conversations with professionals we were hearing just as much from you know public librarians, academic librarians that data skills are essential so we just decided to stick with it.

Both Jordan and Emma also estimated that the number of students who would be interested in RDM or data-related librarianship is limited. They suggested that while one-third to one-half of their students would be interested in academic librarianship generally, a much smaller percentage would be interested in these types of careers. As Emma said, "it is a really exciting area and we always try and get our students interested in it but…unless they kind of get a sense of what they can do with it, it's harder."

Career Advice

Despite the challenges they face in offering a formal RDM or data-related curriculum, all the representatives were able to think of career advice they would offer to students looking at careers in this area. Most emphasized that they would advise students to be strategic in their selection of courses and to rely on their program's curriculum for developing the relevant knowledge and skills. Sophia stated they would advise students to focus on tailoring their assignments, explaining:

> This is what I tell most students, like tailor your assignments because when you go to your interview you want to be able to connect what you've learned and what you did, that this was conscious decision-making. Like, I wanted to learn about data management, so I did this for this assignment.

Program representatives also discussed the importance of networking or building relationships within the RDM community, external resources, and internships or practicums. Three representatives discussed the importance of involvement in the broader community of practice of RDM librarians in Canada. For example, two representatives specifically mentioned the Canadian community listserv for data and RDM librarians (CANLIB-DATA), with Jordan explaining that "the first thing I would advise and have [them do] is to join the listserv. I can't remember what it's called, but I'm on that list. I'm just a lurker there but there's always, you know, good topics there and that's a good opportunity to stay in tune with what's going on". Other advice related to participating in the RDM community included attending relevant

conferences to network and connecting students with alumni in academic RDM librarianship positions. As emphasized by Jordan:

> One of the features of this community, I think, is the cooperative, collaborative professional development. So there are resources online, you know, there are meetings they can go to where they're going to meet and learn from other people. And so, I would say tap into that network.

Relatedly, two program representatives argued that external resources, such as open online courses or webinars, can fill in gaps in the formal LIS curriculum. Sophia also named their institution's libraries' workshops as a potential resource for gaining further training, stating that "we're fortunate enough that at [our] libraries our students actually get - you know, we have the open data week… So, there are opportunities for our students to attend these sessions and get exposure at least".

Other categories of advice for pursuing a career in RDM librarianship included seeking internship or practicum opportunities, conducting an independent research project, and seeking opportunities for mentorship by faculty members. Interestingly, one program representative mentioned that they would advise students to do a research project or thesis as a way to gain experience in going through the process of managing data over the lifecycle of a project as opposed to focusing on an RDM or data topic to gain knowledge about these fields of librarianship. As Noah explained, "I do think they would want to understand the research process a little bit more. So I don't know if that would entail actually doing research - that might be a bit much. But understanding the inner workings of scientific research".

Finally, one program representative suggested that LIS programs are not necessarily the best fit for students aiming to pursue the more technical data skills that may be needed for data or RDM librarianship. As noted by Emma:

> You know, we also try and be really thoughtful and sort of say to a student, if you are good at using tools and doing all those things, but if you are someone who really wants to go more, sort of, the programming route, then, you know, we think another program is better for you. So we try and kind of be clear about that.

The Changing Library Landscape

All the program representatives mentioned that as the role and importance of RDM is evolving in the research landscape, their programs must find appropriate ways to respond to the changes. Some suggested that RDM needs have not become pervasive as quickly as they might have anticipated, and that other concerns may be taking their place. Sophia said:

> I'm really thinking that research data management was like - it was a big thing. Like a few years ago. But now I'm thinking that the big thing is AI…. So this conversation is just getting me thinking about…how do we keep the momentum going, or the visibility of data librarianship…or research data management, and how do we keep that visible within the program?

Sophia added that a criticism they hear about LIS programs is "we're a bit of trend chasers…so then how do we build in the sustainability?" The tension between responding to the growth of RDM and that of other emerging areas was also observed by Noah:

> [RDM is] getting bigger now with the open science movement. And, you know, we'll be exposed to it more and more. So we'll also need to support it more and more, it'll become probably a bigger element of academic librarianship. So in that case, we want to cater to it, but at the same time, you know, there are a lot of other things also developing really rapidly.

Noah referenced the situation at their own institution's library as an example of how difficult it is to determine how many RDM librarians will be needed in the future:

> [Here it's] one person that's kind of handling all this [RDM] stuff. And if that gives the impression that it's kind of a peripheral thing, then as a school we would need to better understand how important that position is. Not just theoretically, but actually like on the floor. We have dozens of librarians and only one of them [does RDM].

As well, it takes time and effort to ensure that RDM and data-related skills are taught appropriately. Jordan stated that because the landscape is shifting so quickly, their program's RDM course needed to be redesigned almost every time it was offered, which has taken time and led to delays in offering it regularly. Blake described the process of responding to these shifts as like sailing "a long heavy boat, you know – it's like a tanker or something. It takes a long time to steer it."

Despite the uncertainty and challenges that the changing RDM landscape might present for their programs, two of the representatives from programs with RDM courses suggested that these developments present excellent opportunities for students. As emphasized by Emma:

> If all researchers now have to have research data management plans and really almost plan their research with the idea that…ideally their data should be reused, that's a whole new thing, so that we think that this is an area that we actually need to spend more time and attention on, and a great opportunity for students.

Jordan also observed that having RDM or data-related training is "a great way to set yourself apart, like in terms of a skill set, in a job application", but admitted that getting students interested in this area is not always easy, saying "part of my battle is like this is where the new jobs are – like, you need to realize this."

Discussion

This qualitative study aimed to address whether Canadian universities that offer Master-level LIS programs are providing their students with training related to RDM librarianship and, if they are offering such training, to determine what that training consists of or includes. A key finding of this study is that LIS program representatives at Canadian institutions are very willing to support students in their programs who express interest in RDM or data-related librarianship, whether through an existing formalized focus area in the curriculum or an informal pathway combining coursework, self-guided trainings, practicums or internships, tailored research projects, and/or mentorships. Interestingly, although we did not define what we meant by 'training' in the context of data or RDM librarianship, none of the program representatives asked us for such a definition, and none explained their own understanding of what such training would entail. This may explain some of the variation across their responses.

The multiple mentions of non-course-based learning opportunities supports recent research by Torres et al. (2022) advocating for mandatory practicums/internships in LIS programs. Torres et al. (2022) argue that without internship experience, "students do not gain opportunities for becoming meaningfully connected with the realities of the library workforce skills that are articulated in job advertisements" (p. 3). In RDM and data-related librarianship, this learning pathway may be particularly salient. However, a couple of the program representatives suggested that students would need to approach a program representative or advisor and request help in curating a pathway, be it formal or informal, toward RDM or data librarianship. In this way, in most LIS programs in Canada, the onus remains on students to actively seek guidance for RDM or data-related career pathways. Thus, a major gap in the literature that future research could address is to elicit student perspectives on whether LIS programs prepare them or offer them opportunities to prepare for careers as RDM or data-related librarians, in addition to their level of awareness of and interest in these types of careers.

The program representatives also suggested that there is a tension for programs between developing information professionals with a general and broad base of knowledge and training specialists in more niche areas. Although the representatives mentioned various current trends in librarianship that their programs might be expected to respond to—e.g., AI, data literacy, open science, and similar "21st-century competencies that meet the needs of the current job market" (Kassim et al., 2022, p. 407)—they appear somewhat hesitant to significantly redevelop existing curricula or add courses that may be difficult to maintain, particularly in light of the number of other demands on their curricula. Indeed, a second key novel finding of this study is how heavily ALA accreditation weighs on considerations on the types of courses and content to offer or emphasize within the programs. For example, as mentioned by Sophia and Noah, there is an impression among professors involved in curriculum development committees in LIS programs that most jobs are generalist in nature at public libraries, industry, or liaison roles at academic libraries. The salience of ALA accreditation and the actual or perceived requirements involved with that process is an aspect of LIS program curriculum development that has not been discussed or identified in previous studies on RDM or data librarianship skills development, which have focused more on the individual attitudes of data and RDM librarians (e.g., Rod, 2023; Thomas and Urban, 2018).

Some representatives also argued that it would be inefficient for a program to focus on specialized training when they perceive there to be a lack of interest or awareness among incoming students and very few specialized jobs in RDM or data librarianship. The program representatives generally agreed that there is a need to be somewhat responsive to major trends, but also expressed uncertainty about where to direct their efforts regarding developing courses or seeking out instructors with expertise in data-related fields or topics. The participants generally agreed that they find it difficult to predict which trends will become ubiquitous requirements for or expectations of librarians, and at what point it makes sense to invest in overhauling existing curricular content, especially regarding core course requirements.

All program representatives discussed the challenges in meeting the demands of many stakeholders and requirements, such as ALA accreditation and employer demands, but none of them discussed actively working with their own institution's academic library to align with employment needs. Notably, only one representative mentioned that they actively sought advice from their institution's practicing librarians, particularly in relation to a core course on data management rather than an elective RDM course. Another program representative mentioned that they would be open to their academic library making the case, as an employer, that RDM or data-related competencies will be required of academic librarians more generally, and that this would thus necessitate the offering of relevant courses within the LIS programs. This finding is consistent with Freeberg and Vera's (2021) recent study, which found that practicing librarians also perceive a disconnect between LIS programs and employer expectations of practitioners.

Participants in this study also highlighted the need for LIS programs to engage more robustly with practitioners when planning courses and developing curriculum. Overall, the key implication of this finding is that communication and engagement between academic libraries and their LIS program counterparts should be improved or formalized in curriculum development. In addition, LIS programs should engage broadly with academic library employers, including smaller institutions that may not have their own LIS programs, but where liaison librarians may be more likely to "wear many hats" and support services such as RDM as part of their role (e.g., Rod, 2023). This would provide a more holistic perspective of the demand for RDM or data-related skills in academic librarianship as compared to measuring demand in terms of full-time equivalent (FTE) dedicated roles.

Another consistent topic discussed by most program representatives included the challenges of offering data or RDM-focused courses when the landscape of RDM best practices and work is constantly evolving. In this way, this study contributes a direct response from LIS programs reinforcing consistent findings across several recent studies that have demonstrated or identified a gap between LIS program curricula in different countries and the employability or professional readiness of graduates in both generalist and specialist roles (Kassim et al., 2022; Raju, 2019; Torres et al., 2022). For example, Raju (2019) compared 196 job descriptions for scholarly communications librarians, which was operationalized in the study as including RDM and data librarianship, to LIS course descriptions in South African programs, concluding that "LIS school curricula in South Africa need to do more to respond to new and emerging scholarly communication competencies required in the professional workplace. This appears to be part of a global trend" (p. 22). One way to address this gap could be for LIS programs to reevaluate the formal curricular tracks related to academic librarianship. This perspective is supported by Colón-Aguirre and Bright's (2024) study that found, via interviews with liaison librarians, that there is a set of several courses (e.g., reference, instruction, collection development) that could be combined as a track for students aiming to pursue academic librarianship. Similarly, functional areas of academic librarianship, including RDM and data services, could be packaged as part of required courses for students interested in these areas.

One limitation of this study is that it is focused on anglophone Canadian LIS programs, of which there are only seven, and thus may not reflect the curricula or state of LIS programs across other countries. We did not include the single francophone LIS program in Canada (at the Université de Montréal) as neither author of this study could conduct the interview fluently in French. In addition, only five representatives responded to requests for interviews. For the two additional institutions, we reached out to all potential representatives we could identify from their public-facing websites who met the inclusion criteria for this study and did not receive any response. Although five interviews could be considered a small sample, this represents a majority of the LIS programs in Canada, and programs in five different provinces are represented in the sample. In addition, this study is qualitative by design, which is not inherently intended to maximize representativeness, but rather to surface insights that would not be easily uncovered using other methodological approaches. Future research could replicate this methodological approach and conduct qualitative interviews with LIS program representatives across a variety of countries and linguistic contexts.

Conclusion

This qualitative study sheds light on both the support that Canadian LIS programs can provide to students who are interested in RDM and data-related careers in academic libraries, and the challenges those programs face in providing that support. In general, LIS program representatives expressed enthusiasm for helping students carve career pathways in RDM or data-related librarianship.

Overall, five major themes emerged from the interviews, including the range of RDM and data-related courses and training opportunities currently available in the programs; the ways in which the representatives would mentor and advise students interested in RDM or related career paths; the challenges posed by both the lack of instructors for RDM and data-related courses, and the lack of students who are interested in, or ready to pursue, data-related careers; the need for programs to develop a curriculum that meets the requirements of many stakeholders; and the effects of the rapidly changing library landscape on LIS curriculum development. The balancing act the programs face was encapsulated in one representative's statement: "we cannot cover everything, essentially". Despite these challenges, LIS programs continue to try to meet the needs of their diverse student population, in addition to the needs of a wide range of employers and the requirements of the ALA accreditation process, although they cannot always keep up with the rapid changes and evolving trends that are the hallmark of modern librarianship.

The views of LIS program representatives have not previously surfaced in the discussion around the training of RDM and data librarians, which has largely been focused on practicing librarians and their academic library employers. This study thus provides not only a novel contribution to the literature but also practical insights that may lead to improved training and development of the next generation of RDM and data librarians. A potential future line of inquiry should be to determine how current LIS students feel about these types of careers and the training they feel they need to successfully take on those roles in the future.

Author Contributions

Jennifer Abel: Conceptualization (lead), Data curation (lead), Investigation (equal), Methodology (equal), Formal analysis (equal), Validation (supporting), Project administration (lead), Writing – original draft (equal), Writing – review & editing (equal) **Alisa B. Rod:** Conceptualization (supporting), Data curation (supporting), Investigation (equal), Methodology (equal), Formal analysis (equal), Validation (lead), Project administration (supporting), Writing – original draft (equal), Writing – review & editing (equal)

References

Abel, J., & Rod, A.B. (2024). *Documentation for: LIS program representatives' perspectives on preparing students for careers in research data management and data-related librarianship* [Dataset]. Borealis. https://doi.org/10.5683/SP3/J80UA5

Andrikopoulou, A., Rowley, J., & Walton, G. (2022). Research data management (RDM) and the evolving identity of academic libraries and librarians: A literature review. *New Review of Academic Librarianship*, *28*(4), Article 4. https://doi.org/10.1080/13614533.2021.1964549

Atwood, T. P., Condon, P. B., Goldman, J., Hohenstein, T., Mills, C. V., & Painter, Z. W. (2017). Grassroots professional development via the New England Research Data Management Roundtables. *Journal of eScience Librarianship*, *6*(2), Article 2. https://doi.org/10.7191/jeslib.2017.1111

Bright, K. M., & Colón-Aguirre, M. (2022). Prepare to be unprepared? LIS curriculum and academic liaison preparation. *The Journal of Academic Librarianship*, *48*(6), Article 102602. https://doi.org/10.1016/j.acalib.2022.102602

Colón-Aguirre, M., & Bright, K. M. (2024). "So, That Would Have Been Useful": Curriculum in LIS in Support of Liaison Librarian Preparation. *Journal of Education for Library and Information Science*. Advance online publication. https://doi.org/10.3138/jelis-2023-0022

Committee on Accreditation of the American Library Association. (2024). *Accreditation process, policies and procedures (AP3)* (5th ed.). Retrieved July 17, 2024, from https://www.ala.org/sites/default/files/2024-06/AP3_all_sections_5th_edition_COA%20approved%20041924%28UpdatedLinks%29.docx

Conrad, S., Shorish, Y., Whitmire, A. L., & Hswe, P. (2017). Building professional development opportunities in data services for academic librarians. *IFLA Journal*, *43*(1), 65–80. https://doi.org/10.1177/0340035216678237

Corrall, S. (2012). Roles and responsibilities: Libraries, librarians and data. In G. Pryor (Ed.), *Managing Research Data*. (pp. 105–134). Facet. https://doi.org/10.29085/9781856048910.007

Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and research data management services: Emerging trends in library support for research. *Library Trends*, *61*(3), 636–674. https://doi.org/10.1353/lib.2013.0005

Cox, A., Verbaan, E., & Sen, B. (2014). A spider, an octopus, or an animal just coming into existence? Designing a curriculum for librarians to support research data management. *Journal of eScience Librarianship, 3*(1), Article 1. https://doi.org/10.7191/jeslib.2014.1055

Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2017). Developments in research data management in academic libraries: Towards an understanding of research data service maturity. *Journal of the Association for Information Science and Technology*, *68*(9), 2182–2200. https://doi.org/10.1002/asi.23781

Cox, A. M., Kennan, M. A., Lyon, L., Pinfield, S., & Sbaffi, L. (2019). Maturing research data services and the transformation of academic libraries. *Journal of Documentation*, *75*(6), 1432–1462. https://doi.org/10.1108/JD-12-2018-0211

Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches*. Sage.

Davis, H. M., & Cross, W. M. (2015). Using a data management plan review service as a training ground for librarians. *Journal of Librarianship and Scholarly Communication*, *3*(2), Article 2. https://doi.org/10.7710/2162-3309.1243

Eden, B. L. (2018). The relevance of ALA accreditation: An insider's view of the ALA committee on accreditation. In J. Percell, L.C. Sarin, P.T. Jaeger & J.C. Bertot (Eds.), *Re-envisioning the MLS: Perspectives on the future of library and information science education (Advances in Librarianship, Vol.44A).* (pp. 45-56). Emerald Publishing Limited.

Federer, L. (2018). Defining data librarianship: a survey of competencies, skills, and training. *Journal of the Medical Library Association*, *106*(3), 294–303. https://doi.org/10.5195/jmla.2018.306

Fuhr, J. (2019). "How do I do that?" A literature review of research data management skill gaps of Canadian health sciences information professionals. *Journal of the Canadian Health Libraries Association/Journal de l'Association des bibliothèques de la santé du Canada*, *40*(2), 51–60. https://doi.org/10.29173/jchla29371

Fuhr, J. (2022). Developing data services skills in academic libraries. *College & Research Libraries*, *83*(3), 474–502. https://doi.org/10.5860/crl.83.3.474

Government of Canada. (2021). *Tri-Agency research data management policy*. Retrieved August 15, 2024, from https://www.science.gc.ca/eic/site/063.nsf/eng/h_97610.html

Harris-Pierce, R. L., & Quan Liu, Y. (2012). Is data curation education at library and information science schools in North America adequate? *New Library World*, *113*(11/12), 598–613. https://doi.org/10.1108/03074801211282957

Johnson, A. M., & Bresnahan, M. M. (2015). DataDay!: Designing and assessing a research data workshop for subject librarians. *Journal of Librarianship and Scholarly Communication*, *3*(2), Article 2. https://doi.org/10.7710/2162-3309.1229

Kassim, M., Katunzi-Mollel, K., & Mwantimwa, K. (2023). Assessing library and information science graduates' skills and knowledge against 21st-century employability demands. *IFLA journal*, *49*(2), 407–418. https://doi.org/10.1177/03400352221118695

Keralis, S. D. C. (2012). Data curation education: A snapshot. In L. Jahnke, A. Asher & S. D. C. Keralis. *The problem of data* (pp. 32–43). Council on Library and Information Resources. Retrieved July 30, 2024, from http://www.clir.org/pubs/reports/pub154/pub154.pdf

Khair, S., Dara, R., Haigh, S., Leggott, M., Milligan, I., Moon, J., Payne, K., Portales-Casamar, E., Roquet, G., & Wilson, L. (2020). *The current state of research data management in Canada: An update to the LCDRI data management position paper*. New Digital Research Infrastructure Organization (NDRIO). https://alliancecan.ca/sites/default/files/2022-03/rdm_current_state_report-1_1.pdf

Koltay, T. (2016). Facing the challenge of data-intensive research: Research data services and data literacy in academic libraries. In D. Baker & W. Evans (Eds.), *Advances in Library Administration and Organization (Advances in Library Administration and Organization, Vol. 35).* (pp. 45–61). Emerald Group Publishing Limited. https://doi.org/10.1108/S0732-067120160000035008

Krippendorff, K. (2004). Reliability in content analysis: Some common misconceptions and recommendations. *Human communication research*, *30*(3), 411–433. https://doi.org/10.1111/j.1468-2958.2004.tb00738.x

Krippendorff, K. (2018). *Content analysis: An introduction to its methodology*. Sage.

Kurasaki, K. S. (2000). Intercoder reliability for validating conclusions drawn from open-ended interview data. *Field Methods*, *12*(3), 179–194. https://doi.org/10.1177/1525822X0001200301

Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human communication research*, *28*(4), 587–604.

Lyon, L. (2016). Librarians in the lab: Toward radically re-engineering data curation services at the research coalface. *New Review of Academic Librarianship*, *22*(4), 391–409. https://doi.org/10.1080/13614533.2016.1159969

Lyon, L., & Brenner, A. (2015). Bridging the data talent gap: Positioning the iSchool as an agent for change. *International journal of digital curation*, *10*(1), 111–122. https://doi.org/10.2218/ijdc.v10i1.349

National Institutes of Health. (2020). *Final NIH policy for data management and sharing*. https://grants.nih.gov/grants/guide/notice-files/NOT-OD-21-013.html

O'Malley, D. L. (2014). Gaining traction in research data management support: A case study. *Journal of eScience Librarianship*, *3*(1), Article 1. https://doi.org/10.7191/jeslib.2014.1059

Perrier, L., Blondal, E., & MacDonald, H. (2018). Exploring the experiences of academic libraries with research data management: A meta-ethnographic analysis of qualitative studies. *Library & Information Science Research*, *40*(3), 173–183. https://doi.org/10.1016/j.lisr.2018.08.002

Pinfield, S., Cox, A. M., & Smith, J. (2014). Research data management and libraries: Relationships, activities, drivers and influences. *PLoS ONE*, *9*(12), Article e114734. https://doi.org/10.1371/journal.pone.0114734

Raju, J. (2019). Embracing new trends in scholarly communication: From competency requirements in the workplace to LIS curriculum presence. *Journal of Librarianship and Scholarly Communication*, *7*(1), Article eP2291. https://doi.org/10.7710/2162-3309.2291

Rampin, R., & Rampin, V. (2021). Taguette: open-source qualitative data analysis. *Journal of Open Source Software*, *6*(68), Article 3522. https://doi.org/10.21105/joss.03522

Read, K. B., Larson, C., Gillespie, C., Oh, S. Y., & Surkis, A. (2019). A two-tiered curriculum to improve data management practices for researchers. *PLoS ONE*, *14*(5), Article 5. https://doi.org/10.1371/journal.pone.0215509

Rod, A. B. (2023). It Takes a Researcher to Know a Researcher: Academic Librarian Perspectives Regarding Skills and Training for Research Data Support in Canada. *Evidence Based Library and Information Practice*, *18*(2), 44–58. https://doi.org/10.18438/eblip30297

Shipman, J. P., & Tang, R. (2019). The collaborative creation of a Research Data Management Librarian Academy (RDMLA). *Information Services & Use*, *39*(3), Article 3. https://doi.org/10.3233/ISU-190050

Southall, J., & Scutt, C. (2017). Training for research data management at the Bodleian Libraries: National contexts and local implementation for researchers and librarians. *New Review of Academic Librarianship*, 23(2–3), 303–322. https://doi.org/10.1080/13614533.2017.1318766

Steeleworthy, M. (2014). Research Data Management and the Canadian Academic Library: An Organizational Consideration of Data Management and Data Stewardship. Partnership: The Canadian Journal of Library and Information Practice and Research, *9*(1), Article 1. https://doi.org/10.21083/partnership.v9i1.2990

Tang, R., & Hu, Z. (2019). Providing research data management (RDM) services in libraries: Preparedness, roles, challenges, and training for RDM practice. *Data and Information Management*, *3*(2), 84–101. https://doi.org/10.2478/dim-2019-0009

Tayler, F., & Jafary, M. (2021). Shifting horizons: A literature review of research data management train-the-trainer models for library and campus-wide research support staff in Canadian institutions. *Evidence Based Library and Information Practice*, *16*(1), Article 1. https://doi.org/10.18438/eblip29814

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

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2014). Research data management services in academic research libraries and perceptions of librarians. *Library & Information Science Research*, *36*(2), 84–90. https://doi.org/10.1016/j.lisr.2013.11.003

Tenopir, C., Hughes, D., Allard, S., Frame, M., Birch, B., Baird, L., Sandusky, R., Langseth, M., & Lundeen, A. (2015). Research data services in academic libraries: Data intensive roles for the future? *Journal of eScience Librarianship*, *4*(2), Article 2. https://doi.org/10.7191/jeslib.2015.1085

Thielen, J., & Neeser, A. (2020). Making job postings more equitable: Evidence based recommendations from an analysis of data professionals job postings between 2013-2018. *Evidence Based Library and Information Practice*, *15*(3), 103–156. https://doi.org/10.18438/eblip29674

Thomas, C., & Urban, R. (2018). What do data librarians think of the MLIS? Professionals' perceptions of knowledge transfer, trends, and challenges. *College & Research Libraries*, *79*(3), Article 3. https://doi.org/10.5860/crl.79.3.401

Thompson, K., Hill, E., Carlisle-Johnston, E., Dennie, D., & Fortin, E. Eds. (2023). *Research data management in the Canadian context: A guide for practitioners and learners*. University of Western Ontario: Western Libraries. https://doi.org/10.5206/YWOY9668

Wang, Y.-Y., & Lin, C.-S. (2019). A survey of data science programs and courses in the iSchools. *Proceedings of the Association for Information Science and Technology*, *56*(1), Article 1. https://doi.org/10.1002/pra2.184

Wittenberg, J., Sackmann, A., & Jaffe, R. (2018). Situating expertise in practice: Domain-based data management training for liaison librarians. *The Journal of Academic Librarianship, 44*(3), Article 3. https://doi.org/10.1016/j.acalib.2018.04.004

Xu, Z. (2022). Research data management training in academic libraries: A scoping review. *Journal of Librarianship and Scholarly Communication*, *10*(1), Article 1. https://doi.org/10.31274/jlsc.13700

Xu, Z., Zhou, X., Kogut, A., & Watts, J. (2022). A scoping review: Synthesizing evidence on data management instruction in academic libraries. *The Journal of Academic Librarianship*, *48*(3), Article 102508. https://doi.org/10.1016/j.acalib.2022.102508