Diving Deep into Dissertations: Analyzing Graduate Students' Methodological and Data Practices to Inform Research Data Services and Subject Liaison Librarian Support

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We present findings from an exploratory quantitative content analysis case study of 156 doctoral dissertations from Georgia State University that investigates doctoral student researchers' methodology practices (used quantitative, qualitative, or mixed methods) and data practices (used primary data, secondary data, or both). We discuss the implications of our findings for provision of data support services provided by the Georgia State University Library's Research Data Services (RDS) Team and subject liaison librarians in the areas of instructional services, data software support and licensing advocacy, collection development, marketing/outreach, and professional development/expansion.

Introduction

The Georgia State University Library identifies "support of faculty, graduate students, and undergraduates throughout the research life cycle" as a strategic intention, including focus on "build[ing] our capacities to support data services" and "develop[ing] a cutting-edge approach to academic library support of graduate students."[1] The Georgia State University Library's Research Data Services (RDS) Team was formed in 2016 specifically to address these strategic intentions; prior to its formation, no other campus entity existed to provide cross-campus data services support. The RDS Team offers data support services across the entire research lifecycle, including support for finding existing data and statistics, original data collection, data analysis tools and methods, mapping and data visualization, and data cleaning and management.[2] This support primarily takes the form of individual and group consultations, open workshops, and course-embedded sessions, with data analysis and visualization support representing the largest proportion of workshop offerings and consultation topics.[3] In addition, Georgia State

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University Library's subject liaison librarians offer data-related support to campus researchers, such as assistance in finding existing data and statistics and identifying existing surveys/instruments for original data collection, and building print and digital collections to support relevant research methodologies and data analysis software/tools.

Library-Provided Data Services Support for Graduate Students: Is There a Need?

Data on our Research Data Services (RDS) workshop attendance, consultations, and course-embedded instruction sessions point to a substantive need among our university's graduate students for additional data support outside of what they receive within their respective academic departments:

- **2018:** Graduate students accounted for 70 percent of our data consultations and upward of 45 percent of workshop attendees; RDS team members had 15 course-embedded sessions with graduate-level classes.
- **2019:** Graduate students accounted for 56 percent of our data consultations and upward of 59 percent of workshop attendees; RDS team members had 21 course-embedded sessions with graduate-level classes.
- **2020:** Graduate students accounted for 56 percent of our data consultations and upward of 59 percent of workshop attendees; RDS team members had 34 course-embedded sessions with graduate-level classes.[4]

Closer thematic assessments from our inaugural year's data consultations revealed that graduate students needed substantial assistance with specific data analysis tools, with NVivo for qualitative data analysis and SPSS for statistical analysis predominating.[5]

In our fourth year offering data services support, our RDS team completed a series of focus groups with graduate students and faculty to assess the data needs of graduate students, concluding that extradepartmental research data services support is needed to help fill gaps in departmental academic resources. Faculty members noted that incoming students often need additional support with research methods and data analysis; however, faculty noted time and resource constraints that prohibited them from adequately assisting students with their data needs. Consequently, many graduate students must acquire data analysis skills on their own, from other academic departments, and from the library's RDS team. These findings reaffirmed the need for our library to offer research data services and gave insights for future growth areas for support.[6]

Library-Provided Data Services Support for Graduate Students: What Is the Nature of the Need?

These assessments suggest there is a substantive need for extradepartmental data services support among our graduate students and that they see the Georgia State University Library's data support services as a valid place to seek that support. Moreover, these assessments have prompted questions to explore regarding the *nature* of those needs. For example, what can we infer from the comparative popularity of certain quantitative software workshops over others, as gauged from workshop attendance data? Per insights gleaned from our focus group study, should we incorporate more research methodology instruction in our existing workshops or create new workshops solely focused on methodology;

if so, on which methodologies should we focus? How might we use insights from these assessments to guide collection development on research methods topics, or digital data resources, or other areas?

In the spirit of triangulation, we embarked on this present study to collect and examine a third source of data "to provide multiple lines of sight and multiple contexts to enrich the understanding of [our] research question[s]."[7] We employ an exploratory research design because, at this juncture, we are interested in delving into graduate student research practices and their potential for informing data services provision rather than exploring predictive relationships between library services and graduate student success as would be the aim of an explanatory research design. This exploratory case study, via a quantitative content analysis of dissertations produced by our university's doctoral-level graduate students, seeks insights to the following research objective and specific research questions:

> *RESEARCH OBJECTIVE:* To illuminate and explore the patterns of graduate students' data and methodology practices within their dissertation research, from which we draw insights for our provision of data support services in the areas of instructional services, data software support and licensing advocacy, collection development, marketing/outreach, and professional development/expansion.

> *Research Question 1:* What method types (qualitative, quantitative, mixed methods), data types (primary, secondary, both), and analysis software/coding language types (qualitative, quantitative, other, not identified) do graduate students employ in their dissertation research? And what is the distribution of doctoral degree types (PhD, EdD, EDB)?

> *Research Question 2:* When broken down by academic field and department, what distribution patterns emerge across method type and data type, and are there statistically significant associations between academic field and method type and data type?

Review of Relevant Literature
Library-Provided Data Services Support for Graduate Students: Beyond Data Management

The establishment of data services across academic libraries is increasing and evolving alongside the changing research needs of universities, and the body of published literature on the topic grows in tandem. That said, research literature that focuses specifically on data services for graduate students and evaluative pieces of said services remains scant; herein we review the handful of noted exceptions.

Recognizing the need for "data information literacy" support at academic libraries—and particularly among graduate students—several higher education institutions collaborated on the Data Information Literacy (DIL) Project, funded by an Institute of Museum and Library Services grant.[8] The following publications and outcomes stemmed from this project:
- Drawing from interviews with faculty and graduate students regarding graduate stu-

dents' data management needs, Carlson et al. identified 12 competencies for a Data Information Literacy (DIL) curriculum. While this project and the resulting competencies focused primarily on data management literacy aspects of the curation, preservation, and dissemination of data, two competencies branch beyond data management to include data analysis and visualization.[9]

- Carlson and Stowell-Bracke, in their work creating a Data Curation Profile Toolkit, drew on in-depth interviews with graduate students to explore the challenges they encounter when being charged with managing and sharing data on faculty-led projects.[10]
- Johnston and Jeffryes describe their case study with engineering graduate students and the insights gleaned from in-depth interviews regarding their data management skills needs.[11]
- The DIL Project culminated with an edited volume that compiles the DIL Project's case studies, offers extended discussion of the DIL competencies, and includes a DIL Toolkit to aid librarians in developing DIL programs.[12]

As this landmark project illustrates, data management has traditionally been the primary focus of research data support programs offered within academic libraries. However, support is increasingly branching out into areas of data analysis and visualization.

Witnessing this need for support beyond data management among all levels of researchers, university libraries are increasingly implementing data services support that spans the entire research lifecycle. Many libraries offer a suite of data services supported by both librarians and other experts within or outside the library that particularly appeal to graduate students. For example, the University of Arizona Libraries (UAL) librarians offer workshops on statistical software and support for GIS products, and also workshops branded under "reproducible science" that focus on verifying the research process, data management, and open data and access; UAL also partners with specialists across the university to host workshops on big data analysis.[13] Similarly, New York University Health Sciences Library established a data services team consisting of full-time staff and librarians who split their roles between data services and liaison duties and partner with other nonlibrary campus entities to provide workshops on not only data management but also data visualization, qualitative data analysis, data wrangling, big data analysis, and data capture.[14] Likewise, the Data Services division of the Research Commons within New York University's main Bobst Library offers a "studio" model of support for survey, statistical, GIS, and qualitative analysis software and finding existing data sources, in addition to data management support.[15] For additional examples of academic libraries with data services support going beyond data management, see the following: Duke University Libraries Center for Data and Visualization Sciences; University of North Carolina Libraries Davis Library Research Hub; North Carolina State University Libraries Data & Visualization Services; University of Cincinnati Libraries Research & Data Services; University of Michigan Library Data Services.[16]

Literature going beyond describing data support services to include evaluation of existing services for insights to inform further development of such services remains limited, perhaps due in part to the relative newness of data services support in academic libraries. One exception we found in the literature was an assessment by the Rutgers University Library: after offering extensive services across a variety of data services categories, Rutgers University's Dana Library assessed their services and gauged a demand for data computing workshops; they continue to offer workshops on statistical and qualitative data analysis software alongside workshops on data management.[17]

Dissertation Studies to Inform Library Services: Beyond Citation Analysis and Collection Development

The library science literature abounds with citation analyses of graduate student theses and dissertations. Searching ProQuest's Library Science Database (formerly LISA) and the Library, Information Science & Technology Abstracts (LISTA) database, we discovered that, since the year 2010, about 100 published studies examined citation patterns in graduate theses or dissertations. The primary aim of such studies is to gauge what types of secondary library resources graduate students are using to support their original research and to discuss the implications for collection development and management. While a thorough review of these citation studies is not warranted to contextualize our own study (as we are not employing citation analysis), we point to the prevalence of dissertation content analysis methodology within the library science literature as precedent for using findings from such analyses to inform library services provision in the areas of collection development and management. Thus, it is a natural extension to expand the methodology to inform library services in the data support area, encompassing not only collection development but also instructional services, software technology offerings/support, and marketing/outreach.

A noted exception among the library science literature's dissertation content analyses is a 2015 study by Lowry, which served as a springboard for our own study.[18] Lowry performed content analysis on 32 business master's theses with the stated aim of gauging patterns of research design and data collection methods (primary data use versus secondary data use), including comparison across business subareas/specializations. Lowry found that secondary data use predominated overall (72% of theses) and that this pattern mostly continued when broken down by specializations, apart from the marketing specialization being predominated by primary data use (85% of the specialization's theses). Lowry discusses the findings in terms of insights for support services provided by data specialists and liaison librarians to the university's business school researchers. Namely, Lowry noted that the predominance of "data consumers" (secondary data users) rather than "data producers" (primary data producers) among the business graduate researchers had implications for the nature of data management and reference services (for example, focus on data discovery may need to take precedent over primary data management) and collection development (such as heavier focus on providing access to appropriate secondary data resources).[19]

Researchers primarily outside the library science field have used content analysis of theses and dissertations to get a better understanding of methodology and data practices among graduate students. There has been scholarly interest in method type (quantitative, qualitative, mixed) employed in theses and dissertations, mostly within specific disciplines rather than making cross-disciplinary comparisons as we employ in our study.[20] Other scholars have performed content analysis to assess data use (primary data or secondary data) within specific disciplines.[21] While the extant research studies have generally found varying patterns of primary versus secondary data use, the majority have found that quantitative research methods typically dominates over qualitative or mixed methods. A few studies have compared differences in data practices by degree type. One such study employed tests of statistical difference to compare the use of data between doctor of business administration (DBA) students and doctor of philosophy (PhD) students within the Harvard Business School but found no significant differences between the programs in terms of methodology or research type by degree type.[22] A similar study found statistically significant differences in research design and type of statistics employed when comparing dissertations on special education

topics for those submitted for PhD in education versus doctor of education (EdD) degrees.[23] None of the studies looked at differences in methodology and data practices in dissertations across multiple academic disciplines, and only the few aforementioned studies went beyond providing descriptive statistics to perform tests of statistical difference. Our study expands on these prior studies by exploring differences in methodology and data use across disciplines, employing tests of statistical difference, and discussing implications for library services.

Significance of Our Contribution to the Existing Research Literature

Given the scarcity of relevant literature on data services support targeting graduate students and dissertation studies, we attest that our study is unique and fills a gap in the present literature both in terms of content and methodological approach. First, our study expands assessment of graduate students' needs across the entire research lifecycle, in contrast to the data management needs studies that predominate the literature to date. Second, our dissertation study does not employ the traditional citation analysis approach that pervades the library science literature, but instead delves deeper into the methodology and data practices of graduate students when conducting their dissertation research. Third, our multifaceted exploration of method types (quantitative, qualitative, or mixed methods) and data types (primary or secondary) and differences by academic areas is methodologically original. Last, our discussion of the implications for not just collection development but for instructional services, data software support and licensing advocacy, marketing/outreach, and services development offers a comprehensive analysis yet to be presented by previous researchers.

Methods

The Georgia State University institutional repository contains 193 doctoral dissertations completed by graduate students during the 2017–2018 academic year; we gathered 192 of those dissertations for this study.[24] These included dissertations spanning all of the university schools/colleges that encompass social sciences, physical sciences, professional programs (excluding College of Law), humanities, and arts, and completed for degrees of Doctor of Philosophy (PhD), Doctor of Education (EdD), and Executive Doctorate in Business (EDB). Table 1 delineates our inclusion and exclusion criteria for the study, the determination of which was guided by our aim of identifying potential data support needs.

TABLE 1
Inclusion and Exclusion Criteria for Dissertation Content Analysis
INCLUSION CRITERIA: Dissertations using the following research methodologies:

Qualitative methods—analysis of nonnumeric data, such as:
    open-ended survey questions; open-ended interviews; analysis of text and audiovisual materials   using nonnumeric/nonstatistical content analyses; case studies; ethnographies.
Quantitative methods—numeric data subjected to statistical analysis, such as:
    close-ended survey/measurement scale data collection and analysis; analysis of primary (self-   collected) or secondary (previously collected) numeric data.
    Mixed methods—use of both quantitative and qualitative methods.[25]

EXCLUSION CRITERIA: Dissertations of the following nature:
Historical studies of nondata primary sources; literary criticism; rhetorical studies not employing quantitative or qualitative methodologies; narratives and/or oral histories; theoretical explorations not employing data analysis.

Applying the above criteria, 156 dissertations remained upon which to conduct exploratory quantitative content analysis. Quantitative content analysis entails "categorizing qualitative textual data into clusters of similar entities, or conceptual categories, to identify consistent patterns and relationships between variables" and "producing frequencies of preselected categories or values associated with particular variables" to report as descriptive statistics and/or to examine statistical relationships between the variables.[26] We focused our content analysis on the abstracts, methods, and results/findings sections of dissertations, engaging in close reading of these sections to collect the necessary information for coding methodology and data practices. We also used NVivo to construct and run text search queries across the entire dissertation texts to gauge data analysis software use, examining the text search results in context to verify that the dissertation researcher had used the mentioned software to do their own analyses. We constructed the NVivo text search queries to search for software that the Research Data Services (RDS) Team currently supports, software typically used by researchers, and software names gleaned from our close reading.

We compiled a dataset using Google sheets, within which we coded each of the 156 dissertations. We coded for the following nominal categorical variables, with consensus regarding their application reached through discussions prior to and during the coding process:

1. **Method Type:** Category of methodology: *qualitative methods*, *quantitative methods*, or *mixed methods*.[27]
2. **Data Type:** Category of data type used: *primary data* (new data collected by dissertation researcher for their new/original analyses), *secondary data* (existing data reused by dissertation researcher for their new/original analyses), or *primary & secondary data*.[28]
3. **Software Type:** Category of software type: *qualitative*, *quantitative*, *other*, or *not identified.*[29]
4. **Degree Type:** Category of degree type, as noted in the university institutional repository: Doctor of Philosophy (*PhD*), Doctor of Education (*EdD*), Executive Doctorate in Business (*EDB*).
5. **Department:** Category of academic department, as noted in the university institutional repository.
6. **Academic Field:** Broader academic field to which individual departments aligned and/or are affiliated within the university's college/school structure.

To examine that the independent coders were consistently interpreting and applying the codes, we completed double-blind checks on a random selection of 25 percent of cases of the dissertation data. Coders with no knowledge of how the dissertations had been coded in the first pass of coding were then randomly assigned this subsample of the dissertations to do a second pass of coding. We then compared the coding from the original pass and the second pass to examine if there were major differences between the first and second pass of coding. We found no major differences between the coding; thus, a full interrater reliability check was deemed unnecessary and was not conducted. Upon completing our coding process of the 156 dissertations, we imported the Google sheet data into IBM Statistical Package for the Social Sciences (SPSS) software to generate descriptive statistics and perform statistical analyses.

Results

Table 2 contains percentages allowing exploration of our first research question:

Research Question 1: What method types (qualitative, quantitative, mixed methods), data types (primary, secondary, both), and analysis software/coding language types (qualitative, quantitative, other, not identified) do graduate students employ in their dissertation research? And what is the distribution of doctoral degree types (PhD, EdD, EDB)?

TABLE 2 Distribution of Dissertations by Method Type, Data Type, Degree Type, and Software Type (N = 156)					
METHOD TYPE			**DATA TYPE**		
	Qualitative Methods	27.6%		Primary Data	60.3%
	Quantitative Methods	61.5%		Secondary Data	28.2%
	Mixed Methods	10.9%		Primary & Secondary Data	11.5%
DEGREE TYPE			**SOFTWARE TYPE**[a]		
	PhD (Doctor of Philosophy)	87.8%		Qualitative	14.7%
	EdD (Doctor of Education)	5.1%		Quantitative	47.4%
	EDB (Executive Doctorate in Business)	7.1%		Other	19.2%,
				Not identified	30.8%
[a] Individual dissertations could report multiple software types; thus, these percentages do not total to 100%.					

Degree type was overwhelmingly PhD (87.8%) with fewer EDB (7.1%) and EdD (5.1%). Of all dissertations, most used quantitative methods (61.5%), slightly more than a quarter used qualitative methods (27.6%), and a smaller percentage (10.9%) used mixed methods. Doctoral students largely used primary data in their dissertations (60.3%); however, a substantive number of students used secondary data (28.2%) and a smaller percent (11.5%) used both primary and secondary data. For software type, 47.4 percent identified using quantitative software and 14.7 percent used qualitative software. Of note, about a fifth (19.2%) identified using other software, such as survey or lab programs, and a large group of students (30.8%) did not identify the type of software used for their analysis.

Of the 108 dissertations that identified software used (69.2% of total 156), the most frequently reported proprietary quantitative software was IBM SPSS (30, 27.8%), followed by Microsoft Excel (14, 13.0%), Stata (13, 12.0%), Mplus (10, 9.3%), SAS (5, 4.6%), and MATLAB (5, 4.6%). Reported use of open-source quantitative software was minimal, with R (9, 8.3%) reported slightly more frequently than Python (6, 5.6%). For reported use of qualitative software, NVivo (15, 13.9%) was mentioned most frequently, followed by Dedoose (9, 8.3%) and ATLAS.ti (2, 1.9%), all of which are proprietary. Only 14 (13.0%) reported using the Qualtrics survey platform to collect survey data.

Tables 3, 4, and 5 contain statistics allowing exploration of our second research question:

Research Question 2: When broken down by academic field and department, what distribution patterns emerge across method type and data type, and are there statistically significant associations between academic field and method type and data type?[30]

TABLE 3 Distributions of Method Type and Data Type by Academic Field and Department (N = 156)						
ACADEMIC FIELD & DEPARTMENT	**METHOD TYPE**			**DATA TYPE**		
	Qualitative Methods (n = 43)	Quantitative Methods (n = 96)	Mixed Methods (n = 17)	Primary Data (n = 94)	Secondary Data (n = 44)	Primary & Secondary (n = 18)
Business (n = 22, 14.1% of total)	**22.7%[a]**	**63.6%[b]**	**13.6%[c]**	**54.5%[d]**	**40.9%[e]**	**4.5%[f]**
Business Administration (n = 11)	36.4%	45.5%	18.2%	54.5%	45.5%	0.0%
Computer Information Systems[g] (n = 3)	33.3%	66.7%	0.0%	33.3%	33.3%	33.3%
Finance (n = 1)	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Managerial Sciences (n = 2)	0.0%	50.0%	50.0%	100.0%	0.0%	0.0%
Marketing (n = 4)	0.0%	100.0%	0.0%	75.0%	25.0%	0.0%
Risk Management & Insurance (n = 1)	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Physical Sciences & Math/Statistics (n = 42, 26.9% of total)	**9.5%**	**88.1%**	**2.4%**	**85.7%**	**4.8%**	**9.5%**
Biology (n = 14)	14.3%	85.7%	0.0%	100.0%	0.0%	0.0%
Chemistry (n = 9)	0.0%	100.0%	0.0%	77.8%	0.0%	22.2%
Computer Science (n = 5)	20.0%	60.0%	20.0%	40.0%	20.0%	40.0%
Mathematics & Statistics (n = 5)	20.0%	80.0%	0.0%	80.0%	20.0%	0.0%
Neuroscience (n = 5)	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
Physics & Astronomy (n = 4)	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
Education (n = 34, 21.8% of total)	**61.8%**	**29.4%**	**8.8%**	**76.5%**	**2.9%**	**20.6%**
Counseling & Psychological Services (n = 1)	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
Early Childhood & Elementary (n = 5)	40.0%	40.0%	20.0%	80.0%	0.0%	20.0%
Educational Psychology (n = 2)	0.0%	50.0%	50.0%	100.0%	0.0%	0.0%
Educational Policy Studies (n = 9)	66.7%	22.2%	11.1%	22.2%	11.1%	66.7%
Kinesiology[h] (n =3)	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
Middle & Secondary Education (n = 14)	92.9%	7.1%	0.0%	100.0%	0.0%	0.0%

TABLE 3 Distributions of Method Type and Data Type by Academic Field and Department (N = 156)						
	METHOD TYPE			**DATA TYPE**		
ACADEMIC FIELD & DEPARTMENT	**Qualitative Methods (n = 43)**	**Quantitative Methods (n = 96)**	**Mixed Methods (n = 17)**	**Primary Data (n = 94)**	**Secondary Data (n = 44)**	**Primary & Secondary (n = 18)**
Health Sciences (n = 8, 5.1% of total)	**0.0%**	**100.0%**	**0.0%**	**50.0%**	**50.0%**	**0.0%**
Nursing (n = 3)	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
Public Health (n = 5)	0.0%	100.0%	0.0%	20.0%	80.0%	0.0%
Social Sciences (n = 46, 29.5% of total)	**23.9%**	**58.7%**	**17.4%**	**28.3%**	**58.7%**	**13.0%**
Applied Linguistics & ESL (n = 6)	16.7%	33.3%	50.0%	83.3%	16.7%	0.0%
Communication (n = 4)	100.0%	0.0%	0.0%	25.0%	75.0%	0.0%
Criminal Justice (n = 3)	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Economics (n = 7)	0.0%	100.0%	0.0%	0.0%	85.7%	14.3%
Political Science (n = 5)	40.0%	0.0%	60.0%	20.0%	40.0%	40.0%
Psychology (n = 7)	0.0%	85.7%	14.3%	42.9%	42.9%	14.3%
Public Management & Policy (n = 6)	0.0%	100.0%	0.0%	0.0%	83.3%	16.7%
Sociology (n = 8)	50.0%	37.5%	12.5%	37.5%	50.0%	12.5%
Humanities (n = 4, 2.6% of total)	**50.0%**	**0.0%**	**50.0%**	**75.0%**	**25.0%**	**0.0%**
English (n = 1)	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%
Film, Media, & Theater (n = 1)	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%
History (n = 2)	50.0%	0.0%	50.0%	50.0%	50.0%	0.0%

[a] Percent of dissertations within the field that used qualitative methods. [b] Percent of dissertations within the field that used quantitative methods. [c] Percent of dissertations within the field that used mixed methods. [d] Percent of dissertations within the field that used primary data. [e] Percent of dissertations within the field that used secondary data. [f] Percent of dissertations within the field that used both primary and secondary data. [g] We include the Computer Information Systems department in the Business field because that is where it resides at our institution; we recognize that its method type and data type patterns may skew the aggregate Business field pattern due to its not representing a traditional "business" subarea. [h] We include the Kinesiology department in the Education field because that is where it resides at our institution; we recognize that its method type and data type patterns may skew the aggregate Education field pattern due to its not representing a traditional "education" subarea.

Method Type: Academic Field and Department Comparisons

Echoing the aggregate pattern, quantitative methods predominated the dissertations in the fields of business (63.6%), physical sciences and math/statistics (88.1%), health sciences (100%), and social sciences (58.7%). However, the field of education veered from this pattern, with 61.8 percent of the dissertations within this field employing qualitative methods, reflecting a propensity for education doctoral students to complete qualitative case studies in real-life education settings. The humanities field had an interesting split, with 50 percent employing

qualitative methods and 50 percent employing mixed methods, somewhat surprising given a presumption that humanities doctoral students generally might be more inclined toward qualitative inquiry over quantitative.

Looking within the academic fields at individual departments, the communication, political science, and sociology departments had comparatively larger proportions of qualitative methods, whereas quantitative methods predominated the criminal justice, economics, psychology, and public management and policy departments. Some of these department-specific patterns within the social sciences were not altogether surprising, given that some disciplines are traditionally predominated by certain methodologies. However, some point to the importance of not taking for granted that an institution's department mirrors overall disciplinary trends (for instance, quantitative researchers traditionally predominate the overall sociology discipline within the United States, yet our analysis reveals that our institution's sociology department has a large qualitative contingent among its doctoral students).

Data Type: Academic Field and Department Comparisons

The aggregate pattern of primary data predominance continued for the fields of business (54.5%), physical sciences and math/statistics (85.7%), education (76.5%), and humanities (75.0%). In contrast, the health sciences had a 50%/50% split between primary and secondary data use, and the social sciences field was predominated by secondary data use (58.7%).

Looking within academic fields at individual departments, diverging patterns often emerged, some of which are readily explained by methodological approaches characteristic of the specific disciplines. For example, among the business departments, primary data use was more predominant in the managerial sciences (100%) and marketing (75%), and secondary data use in finance (100%) and risk management and insurance (100%), while business administration had a near-even split across primary data use (54.5%) and secondary data use (45.5%) and computer information systems had a 33%/33%/33% split across primary data use, secondary use, and both primary and secondary use. Within the physical sciences and math/statistics field, the computer science department showed 40 percent of dissertations using solely primary data, 20 percent solely secondary data, and 40 percent both primary and secondary data. The divergence between the health sciences departments of nursing (100% primary data use) and public health (20% primary data use, 80% secondary data use) was dramatic yet not surprising, as nursing doctoral students tend to collect primary data in clinical practice settings whereas public health doctoral students gravitate toward using large secondary datasets. Similarly, the majority of the individual education departments were predominated by dissertations using solely primary data (likely tied to the qualitative case-study methodology predominance discussed previously). In contrast, 66.7 percent of the education policy studies dissertations used both primary and secondary data, which reflects this area's focus on looking at the policies themselves as secondary data sources but also often collecting primary data to explore policy-in-practice. Correspondingly, while the social sciences field in aggregate gravitated toward secondary data use, certain disciplines gravitated toward primary data use, such as applied linguistics and English as a Second Language/ESL (83.3% primary data use) and psychology (42.9% primary data use), which again reflect typical patterns of data collection within those disciplines.

Associations between Academic Field and Method Type and Data Type

Tables 4 and 5 contain crosstabulations to examine the association between academic field and method type (see table 4) and academic field and data type (see table 5). For each intersection of the two variables' categories under examination, the table cells display the following:

1. observed count from the data;
2. expected count (in parentheses) if there were no association between the two variables; and
3. standardized residual, which measures the relative strength of the difference between observed and expected counts and allows exploration of which cells are contributing the most/least to the overall chi-square test value. Generally: 1) a standardized residual less than –2.0 indicates that the observed count is notably less than the expected count; and 2) a standardized residual of greater than 2.0 indicates that the observed count is notably greater than the expected count;[31] standardized residuals meeting either of these criteria are indicated with an asterisk (*) in the tables.

Additionally, chi-square tests were performed on the cross-tabulation data to examine associations between the academic type variable and the method type and data type variables, respectively. Due to not meeting the Pearson chi-square test assumption that 80 percent or more of the expected count values must be greater than 5, we report the likelihood-ratio chi-square test statistic (G).[32] We also report the Cramer's V effect size value to examine the strength of association between the variables. The Cramer's V measure is appropriate for crosstabulation tables larger than 2 rows by 2 columns and is interpreted as follows: 1) a value less than 0.2 ≈ a weak association; 2) a value between 0.2 and 0.6 ≈ a moderate association; and 3) a value greater than 0.6 ≈ a strong association.[33]

TABLE 4 Cross-tabulation of Method Type by Academic Field (N = 156)						
METHOD TYPE	**ACADEMIC FIELD**					
	Business	**Physical Sciences and Math/Statistics**	**Education**	**Health Science**	**Social Sciences**	**Humanities**
Qualitative Methods	5[a] (6.1)[b] −0.4[c]	4 (11.6) −2.2*	21 (9.4) 3.8*	0 (2.2) −1.5	11 (12.7) −0.5	2 (1.1) 0.9
Quantitative Methods	14 (13.5) 0.1	37 (25.8) 2.2*	10 (20.9) −2.4*	8 (4.9) 1.4	27 (28.3) −0.2	0 (2.5) −1.6
Mixed Methods	3 (2.4) 0.4	1 (4.6) −1.7	3 (3.7) −0.4	0 (0.9) −0.9	8 (5.0) 1.3	2 (0.4) 2.4*

[a] Observed count. [b] Expected count if no association between the two variables. [c] Standardized residuals. Asterisk (*) indicates standardized residual meets one of the following criteria: 1) standardized residual < −2.0, observed count is notably less than the expected count; 2) a standardized residual > 2.0, observed count is notably greater than the expected count.

A likelihood-ratio chi-square test [G (10, N = 156) = 51.256, $p < 0.001$] indicated a statistically significant relationship between academic field and method type, and a Cramer's V effect size of 0.397 ($p < 0.001$) indicated a moderately strong association between the variables. The standardized residuals indicate that 1) the physical sciences and math/statistics dissertations were comparatively more likely to use quantitative and less likely to use qualitative methods;

2) the education dissertations were comparatively more likely to use qualitative and less likely to use quantitative methods; and 3) the humanities dissertations were comparatively more likely to use mixed methods.

TABLE 5 **Cross-tabulation of Data Type by Academic Field (N = 156)**						
DATA TYPE	**ACADEMIC FIELD**					
	Business	**Physical Sciences and Math/Statistics**	**Education**	**Health Science**	**Social Sciences**	**Humanities**
Primary Data	12[a] (13.3)[b] −0.3[c]	36 (25.3) 2.1*	26 (20.5) 1.2	4 (4.8) −0.4	13 (27.7) −2.8*	3 (2.4) 0.4
Secondary Data	9 (6.2) 1.1	2 (11.8) −2.9*	1 (9.6) −2.8*	4 (2.3) 1.2	27 (13.0) 3.9*	1 (1.1) −0.1
Primary and Secondary Data	1 (2.5) −1.0	4 (4.8) −0.4	7 (3.9) 1.6	0 (0.9) −1.0	6 (5.3) 0.3	0 (0.5) −0.7
[a] Observed count. [b] Expected count if no association between the two variables. [c] Standardized residuals. Asterisk (*) indicates standardized residual meets one of the following criteria: 1) standardized residual < −2.0, observed count is notably less than the expected count; 2) a standardized residual > 2.0, observed count is notably greater than the expected count.						

A likelihood-ratio chi-square test [G (10, N = 156) = 60.660, $p < 0.001$] indicated a statistically significant relationship between academic field and data type, and a Cramer's V effect size of 0.412 ($p < 0.001$) indicated a moderately strong association between the variables. The standardized residuals indicate that 1) the physical sciences and math/statistics dissertations were comparatively more likely to use primary data only and less likely to use secondary data only; 2) the education dissertations were comparatively less likely to use secondary data only; and 3) the social sciences dissertations were comparatively less likely to use primary data only and more likely to use secondary data only.

Discussion and Conclusions
Insights for Research Data Services Support
We dedicate our discussion to two key findings that readily inform provision of data support services by the Georgia State University Library's Research Data Services (RDS) team and the subject liaison librarians in the areas of instructional services, data software support and licensing advocacy, collection development, marketing/outreach, and professional development/expansion.

> *Key Finding 1:* Quantitative methods predominated overall in the investigated dissertations, but there was a substantive qualitative methods contingent, particularly among certain academic fields/departments.

This finding echoes what many extant content analyses of theses and dissertations have found: domination of quantitative methods.[34] Given this finding, the Library's RDS team should continue offering proportionally more services (such as workshops and consultations

support) and resources (like software guides) to support quantitative methods. Similarly, subject liaison librarians should consider focusing collection development efforts on procuring software manuals, methods books, dataset resources, and other material that would benefit quantitative researchers. To better serve the needs of doctoral students, the library should also invest in building particularly the quantitative skills of the RDS team; this could come in the form of supporting training efforts among the current team members in the areas of data analysis and visualization or by hiring additional members with these skills.

Although dissertation authors were less likely to use qualitative methods overall, the RDS team should continue to offer services and resources, and subject liaison librarians should continue to devote collection development efforts toward supporting qualitative methods. Since qualitative methods were used more heavily in certain academic fields (Education) and specific departments (like Middle & Secondary Education, Educational Policy Studies, Communication, and Sociology), the RDS team and the respective subject liaison librarians should target their efforts for qualitative methods and data analysis software support to those specific fields and/or departments.

It would benefit graduate student researchers across disciplines and methodologies if they had easy access to quantitative and qualitative data analysis software. The RDS team and subject liaison librarians are well positioned to advocate for free off-campus access to proprietary software (particularly relevant during the COVID-19 pandemic when university operations went fully online) and for on-campus access to proprietary and open-source analysis software in library and other campus computer labs.

> *Key Finding 2:* Primary data use predominated overall in the investigated dissertations and across all method types, but there was a substantive secondary data use contingent, particularly among certain academic fields/departments.

In contrast to Lowry's finding that business researchers were predominantly "data consumers" (secondary data users), we found that "data producers" (primary data users) predominated our doctoral dissertators when looked at in aggregate.[35] This finding suggests that RDS services should primarily focus on data collection topics such as survey design and administration, use of data collection tools such as the Qualtrics survey platform, qualitative interview methodologies, and web scraping and other primary data collection methods. Offering these services may entail building additional skills such as survey design methodology training among current RDS team members or hiring additional staff with these skills. Subject liaison librarians' collection development efforts should focus on primary data collection resources including books on topics such as survey design, primary data collection in the physical sciences, qualitative interview techniques, and qualitative case study methodologies. Similarly, increased outreach to promote tools and resources for finding existing measurement instruments/surveys may be warranted for relevant academic departments.

The use of secondary data was substantive, particularly among certain fields or departments. This finding suggests that the RDS team should continue offering services related to secondary data collection and perhaps target specific fields (such as Social Sciences) or departments (like Public Health) for those services. Additional collection development efforts should include secondary data resources such as subscriptions to secondary dataset resources for quantitative analysis and textual and archival resources for qualitative analysis.

In addition, the predominance of primary data collection methods may indicate a need for additional outreach for the use of secondary data. Secondary data use can be less time consuming and may be more practical in some situations (for instance, during the COVID-19 pandemic). Investigating and securing subscriptions to secondary dataset resources may be one way to assist researchers in choosing this option and in marketing library services. That said, department-specific practices must inform efforts to push secondary data use among their graduate students. For example, our Dean of the Graduate School noted that "some programs/mentors require primary data collection" of their graduate students because of the "important lessons about the steps involved in those processes," and that faculty-led research projects with which graduate students assist often involve primary data collection from which students "then use portions of those data in their own projects."[36]

Limitations and Implications for Future Research

While our study afforded us meaningful insights for provision of data services at Georgia State University Library, as with all research studies, we recognize its limitations. Analyzing doctoral dissertations from only one academic year gave us a limited snapshot of graduate-level research at our institution that did not allow exploring patterns over time; however, as an initial exploratory study in which we were implementing a unique methodology, restricting our analysis to one year was justified. Similarly, the resulting sample size may have limited the statistical power of chi-square tests, and tempers making broad generalizations about our findings to entire departmental practices. In addition, while an exploratory research design allowed us to examine general patterns and relationships that inform data services provision, it did not afford us the ability to predict the effect of library services on graduate student success, as would be the aim in an explanatory research design. Likewise, as this was a single-university case study, the findings should not be generalized directly to experiences at all institutions.

Our future research could build on these findings by including multiple years of dissertations, which might garner enough data to speculate whether our growing data support services manifest observable long-term impacts on graduate-level research practice, to increase the power of our statistical analyses, and to make broader generalizations about departmental practices. Likewise, inclusion of master's theses in future content analyses could afford interesting comparative data to explore (for example: are master's theses more or less likely than doctoral dissertations to employ secondary data use over primary, certain methodologies over others, and so on). Other institutions could replicate and/or extend our methodological approach to gain deeper insights into the data and methodology practices among their graduate students to generate possibilities for data services provision that fit their institutional context, and they could extend our work through cross-institutional comparisons.

Conclusions

Our content analyses of doctoral dissertations afforded us unique insights into the methodology and data practices of our university's doctoral students that we have used and will continue to use to drive the future development of data support services within the Georgia State University Library. As such, the study benefited us directly. Furthermore, this study benefits other researchers and practitioners in academic libraries who provide data support services. First, we have expanded the published literature on data support services for graduate

students beyond the predominant data management focus to include other key phases of the research lifecycle. Second, our dissertation study may serve as a model for future researchers to expand dissertation and theses content analyses beyond the typical citation analysis to delve more deeply into the methodology and data practices of graduate students and even faculty researchers (such as using our methodology to examine faculty publications). And third, our discussion of the implications for a wide range of data support services and across multiple roles within the academic library reflects the diverse and growing possibilities for data support services in academic libraries.

Acknowledgment

Notes

1. Georgia State University Library, "Strategic Intentions" (September 5, 2021), https://library.gsu.edu/about/strategic/.

2. Georgia State University Library, Research Data Services (RDS) Team, "Research Data Services @ Georgia State University Library" (September 5, 2021), https://library.gsu.edu/data.

3. Mandy J. Swygart-Hobaugh, "Data Services: Where're We Going? Where've We Been? Where're the Lifeboats?" (poster presentation, Association of College & Research Libraries Conference, Cleveland, OH, April 11, 2019), https://works.bepress.com/amanda_swygart-hobaugh/48/.

4. Data cited for years 2018–2020 are from internal unpublished reports.

5. Mandy Swygart-Hobaugh, "Less Naked and Less Afraid, or Giving Graduate Students the Clothes and Confidence for Data Success," in *Transforming Libraries to Serve Graduate Students*, eds. Crystal Renfro and Cheryl Stiles (Chicago, IL: Association of College and Research Libraries, 2018), 281–300, https://works.bepress.com/amanda_swygart-hobaugh/44/.

6. Mandy J. Swygart-Hobaugh et al., "Where Have We Been, and Where Should We Be Going? A Needs Assessment Study of Graduate Students' Data Needs" (poster presentation, Georgia Libraries Conference [GLC], Online/Virtual, October 7, 2020), https://works.bepress.com/amanda_swygart-hobaugh/50/; Joel Gloglowski et al., "Where Have We Been, and Where Should We Be Going? An Assessment of Graduate Students' Data Needs" (short talk presentation, Southeast Data Librarian Symposium [SEDLS], Online/Virtual, October 8, 2020), https://works.bepress.com/amanda_swygart-hobaugh/52/.

7. Sarah L. Hastings, "Triangulation," in *Encyclopedia of Research Design*, ed. Neil J. Salkind (Thousand Oaks, CA: SAGE Publications, 2010), 1538.

8. Jake Carlson et al., "Data Information Literacy," Data Information Literacy (DIL) Project, www.datainfolit.org/.

9. Jacob Carlson et al., "Determining Data Information Literacy Needs: A Study of Students and Research Faculty," *portal: Libraries and the Academy* 11, no. 2 (2011): 629–57.

10. Jake Carlson and Marianne Stowell-Bracke, "Data Management and Sharing from the Perspective of Graduate Students: An Examination of the Culture and Practice at the Water Quality Field Station," *portal: Libraries & the Academy* 13, no. 4 (2013): 343–61.

11. Lisa Johnston and Jon Jeffryes, "Data Management Skills Needed by Structural Engineering Students: Case Study at the University of Minnesota," *Journal of Professional Issues in Engineering Education and Practice* 140, no. 2 (2014): 05013002.

12. *Data Information Literacy: Librarians, Data, and the Education of a New Generation of Researchers*, eds. Jake Carlson and Lisa Johnston (West Lafayette, IN: Purdue University Press, 2015).

13. Jeffrey C. Oliver et al., "Data Science Support at the Academic Library," *Journal of Library Administration* 59, no. 3 (2019): 241–57.

14. Alisa Surkis et al., "Data Day to Day: Building a Community of Expertise to Address Data Skills Gaps in an Academic Medical Center," *Journal of the Medical Library Association* 105, no. 2 (2017): 185–91.

15. Samantha Guss, "A Studio Model for Academic Data Services," in *Databrarianship: The Academic Data Librarian in Theory and Practice*, eds. Lynda Kellam and Kristi Thompson (Chicago, IL: Association of College and Research Libraries, 2016), 9–24.

16. Duke University Libraries, "Center for Data and Visualization Sciences" [accessed 15 August 2020], https://library.duke.edu/data; North Carolina State University Libraries, "Data & Visualization Services" [accessed 15 August 2020], https://www.lib.ncsu.edu/department/data-visualization-services; University of Michigan Library, "Data Services" [accessed 15 August 2020], https://www.lib.umich.edu/research-and-scholarship/data-services; University of North Carolina Chapel Hill Libraries, "Davis Library Research Hub" [accessed 15 August 2020], https://library.unc.edu/data/; University of Cincinnati, "Research & Data Services" [accessed 15 August 2020], https://libraries.uc.edu/research-teaching-support/research-data-services.html.

17. Minglu Wang, "Supporting the Research Process through Expanded Library Data Services," *Program: Electronic Library and Information Systems* 47, no. 3 (2013): 282–303.

18. Linda Lowry, "Bridging the Business Data Divide: Insights into Primary and Secondary Data Use by Business Researchers," *IASSIST Quarterly* 39, no. 2 (2015): 14–25.

19. Lowry, "Bridging the Business Data Divide," 19.

20. Miyase Akcay et al., "An Overview of Postgraduate Thesis on Mainstreaming Education in Turkey," *Cypriot Journal of Educational Sciences* 14, no. 4 (2019): 641–51; Mecit Aslan and Mustafa Saglam, "Methodological Investigation of the Curriculum Evaluation Theses Completed between the Years 2006–2015 in Turkey," *Universal Journal of Educational Research* 5, no. 9 (2017): 1468–78; Ahmet Atalay, "Research Models Used in Doctoral Theses on Sport Management in Turkey: A Content Analysis," *Universal Journal of Educational Research* 6, no. 3 (2018): 541–55; Gurhan Durak et al., "A Content Analysis of Dissertations in the Field of Educational Technology: The Case of Turkey," *Turkish Online Journal of Distance Education* 19, no. 2 (2018): 128–48; Justus Randolph et al., "Page Length and Methodological Characteristics of Recently Published Doctoral Dissertations in Education," *Georgia Educational Researcher* 11, no. 2 (2014): 46–68; David W. Rothwell et al., "Patterns and Trends of Canadian Social Work Doctoral Dissertations," *Journal of Teaching in Social Work* 35, no. 1/2 (2015): 46–64.

21. Shawn W. Nicholson and Terrence B. Bennett, "Transparent Practices: Primary and Secondary Data in Business Ethics Dissertations," *Journal of Business Ethics* 84, no. 3 (2009): 417–25; Rothwell et al., "Patterns and Trends of Canadian Social Work Doctoral Dissertations"; Timothy N. Tansey, Brian N. Phillips, and Stephen A. Zanskas, "Doctoral Dissertation Research in Rehabilitation Counseling: 2008–2010," *Rehabilitation Counseling Bulletin* 55, no. 4 (2012): 232–52; Judith Richards, Cass Dykeman, and Sara Bender, "Historical Trends in Counsellor Education Dissertations," *British Journal of Guidance & Counselling* 44, no. 5 (2016): 550–61; Peter John Miller and Roslyn Cameron, "Mixed Method Research Designs: A Case Study of Their Adoption in a Doctor of Business Administration Program," *International Journal of Multiple Research Approaches* 5, no. 3 (2011): 387–402; Helen MacLennan, Anthony Piña, and Sean Gibbons, "Content Analysis of DBA and PhD Dissertations in Business," *Journal of Education for Business* 93, no. 4 (2018): 149–54.

22. MacLennan, Piña, and Gibbons, "Content Analysis of DBA and PhD Dissertations in Business."

23. David W. Walker and Shannon Haley-Mize, "Content Analysis of PhD and EdD Dissertations in Special Education," *Teacher Education and Special Education* 35, no. 3 (August 1, 2012): 202–11.

24. One dissertation file was missing, resulting in our collection of 192 of the total 193 dissertations completed in the 2017–2018 academic year.

25. For expanded discussions of the distinctions between these methodologies, see: Rogério M. Pinto, "Mixed Methods Design," in Encyclopedia of Research Design, ed. Neil J. Salkind (Thousand Oaks, CA: SAGE Publications, 2010); Karen M. Staller, "Qualitative Research," in Encyclopedia of Research Design, ed. Neil J. Salkind (Thousand Oaks, CA: SAGE Publications, 2010); Marie Kraska, "Quantitative Research," in Encyclopedia of Research Design, ed. Neil J. Salkind (Thousand Oaks, CA: SAGE Publications, 2010).

26. Heidi Julien, "Content Analysis," in *The SAGE Encyclopedia of Qualitative Research Methods*, ed. Lisa M. Given (Thousand Oaks, CA: SAGE Publications, 2008), 120, 121, Gale eBooks.

27. We also recorded the specific analytical methods (like specific quantitative/statistical analysis method, such as linear regression, structural equation modeling, and the like; specific qualitative analysis method, such as case study, textual analysis, and so on) and analysis instruments (like survey instrument, individual or group interviews, and the like). However, we did not report on these distributions in this article.

28. For expanded discussions of the distinctions between these data types, see: Nadini Persaud, "Primary Data Source," in *Encyclopedia of Research Design*, ed. Neil J. Salkind (Thousand Oaks, CA: SAGE Publications, 2010); Michelle K. McGinn, "Secondary Data," in *The SAGE Encyclopedia of Qualitative Research Methods*, ed. Lisa M. Given (Thousand Oaks, CA: SAGE Publications, 2008), Gale eBooks.

29. When software was identified, we recorded the specific software used (examples being SPSS, NVivo, Stata, R, and the like), and then determined at which software type it should be coded by drawing from personal familiarity with the software or investigating the purpose of software for which we had no familiarity.

30. The small number of dissertations for individual departments prohibited within- and between-department statistical comparisons.

31. Stephanie Glen, "Standardized Residuals in Statistics: What Are They?" Statistics How To: Elementary Statistics for the rest of us! (December 10, 2013), https://www.statisticshowto.com/what-is-a-standardized-residuals/.

32. Mary L. McHugh, "The Chi-Square Test of Independence," *Biochemia Medica* 23, no. 2 (2013): 143–49.

33. Jeff Connor-Linton, "Chi-Square Test," in *Encyclopedia of Research Design*, vol. 1, ed. Neil Salkind (Thousand Oaks, CA: SAGE Publications, 2010), 145–49; IBM Corporation, "Cramér's V" (May 18, 2021), https://www.ibm.com/docs/en/cognos-analytics/11.1.0?topic=terms-cramrs-v.

34. Akcay et al., "An Overview of Postgraduate Thesis on Mainstreaming Education in Turkey"; Suleyman Arslantas and Ahmet Kurnaz, "Classifying Master's and PhD Theses Whose Titles Contain Concept of 'Critical Thinking' by Different Variables," *International Journal of Modern Education Studies* 1, no. 1 (2017), 58–68; Aslan and Saglam, "Methodological Investigation of the Curriculum Evaluation Theses Completed between the Years 2006–2015 in Turkey"; Adnan Baki et al., "Trends in Turkish Mathematics Education Research: From 1998 to 2007," *H.U. Journal of Education* 40 (2011): 57–68; Melek Demirel et al., "Examining Graduate Dissertations in the Field of Critical Thinking: A Case from Turkey," Eurasian *Journal of Educational Research* 17, no. 67 (2017): 141–59; Mukaddes Demirok et al., "A Content Analysis of the Postgraduate Thesis Written on Special Education in Turkey Based on Various Variables (2009–2014)," *Procedia: Social and Behavioral Sciences* 197 (2015): 2459–67; Fatih Karip, "Analyzing the Dissertations about Differentiated Instruction in Terms of Their Contents in Turkey," *Educational Research and Reviews* 11, no. 16 (2016): 1590–97; Soner Yavuz, "A Content Analysis Related to Theses in Environmental Education: The Case of Turkey (2011–2015)," *Journal of Education and Training Studies* 4, no. 10 (2016): 118–25; Nihal Yurtseven and Mehtap Bademcioglu, "Teachers' Professional Development: A Content Analysis about the Tendencies in Studies," *Journal of Education and Training Studies* 4, no. 6 (2016): 214–33; Tansey, Phillips, and Zanskas, "Doctoral Dissertation Research in Rehabilitation Counseling: 2008–2010"; Richards, Dykeman, and Bender, "Historical Trends in Counsellor Education Dissertations."

35. Lowry, "Bridging the Business Data Divide," 19.

36. Email message to a co-author, July 25, 2020.