Librarian Instruction of Methods for Evidence Synthesis: A Digital Sociomaterial Ethnographic Study

by

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Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

DEDICATION

To Silas, who reminds me regularly that there are many ways of knowing, being, and becoming.

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ABSTRACT

Academic health librarians work in interdisciplinary landscapes where health professions education, health and biomedical research methods, digital information, and increasingly, online instruction, intersect. These fields come together in the online teaching practices of health librarians when supporting students to develop systematic search strategies for evidence synthesis (ES) research, such as systematic or scoping reviews. While librarians leverage their expertise through teaching ES methods to help build students' capacity for producing and understanding ES research, they must balance that work against other professional responsibilities. Librarians contribute to the academic research environment while simultaneously attending to rapidly changing technological and methodological developments, creating sustainability challenges. Student and institutional expectations for online and accessible learning further compound workload issues. Metrics and reporting regarding instruction and research support in academic libraries fall short of accounting for the amount and nature of labour and expertise required to teach evidence synthesis methods through online pedagogies.

To understand the nature of librarians' work when providing online support for students' ES research, I aimed to unpack the factors that complicate teaching practices. Using digitally-mediated ethnographic methods combined with sociomateriality and practice theories, I studied the online teaching practices of Canadian health librarians. I collected qualitative data through two focus groups, eight observations of online research consultations, and five interviews as well as through material such as such as video tutorials, online library guides, and the digital tools used for evidence syntheses. Analysis involved tracing actions and disruptions to build relational accountings of the human and non-human contributors to online teaching practices. This research used an emic approach informed by my work as an academic health librarian leading evidence synthesis support.

In response to methodological expectations and learners' demonstrated abilities, librarians calibrated their teaching to balance technical and conceptual learning objectives related to the interconnected steps of ES methods. Librarians taught searching, question formulation, and more through the affordances of various technologies, both to deliver the training and in conducting steps of the review. In doing so, librarians' identities and areas of expertise around teaching, searching, information management, technology proficiency, and research methods came together in complex and situated ways with the particular technological and organizational materialities of online teaching in health professions education.

This research contributed a rich understanding of the multiple types of expertise mediated through the social and material elements of academic health librarians' online teaching practices regarding ES methods. By considering the dynamic relationships between and amongst these factors, I have made visible the less recognized labour and materiality of these teaching practices. The acknowledgement of social and material contributors to online teaching of ES methods can inform planning capacity building initiatives for librarians and in developing levels of support for students, depending on available resources along with individual and organizational expectations.

LIST OF ABBREVIATIONS USED

ACRL	Association of College & Research Libraries
AI	Artificial Intelligence
ALA	American Libraries Association
ANT	Actor-Network Theory
CARL	Canadian Academic and Research Libraries
CHLA	Canadian Health Libraries Association
CINAHL	Cumulative Index of Nursing and Allied Health Literature
DLO	Digital Learning Objects
EBP	Evidence-Based Practice
ES	Evidence Synthesis
HPE	Health Professions Education
JBI	Joanna Briggs Institute
KS	Knowledge Synthesis
LIS	Library and Information Science
LIMES	Librarian Instruction of Methods for Evidence Syntheses
MLA	Medical Libraries Association
ScR	Scoping Review
SR	Systematic Review

GLOSSARY

ACRL Framework for Information Literacy in Higher Education	An interconnected set of core concepts related to understanding and using information, used by librarians and other educators in higher education settings to guide information literacy instruction (ACRL Framework for IL, 2015)
Actors/Actants	"Something or someone that acts or to which activity is granted by others" (Bearman & Ajjawi, 2018, p. 1040)
Assemblages	"An assemblage is a complex tangle of natural, technological, human and non-human elements that come together relationally to accomplish both intended and unintended outcomes in everyday life, within a particular time." (MacLeod et al., 2019, p. 178)
Bibliographic database	See citation database
Campbell Collaboration	"The Campbell Collaboration is an international social science research network that produces high quality, open and policy-relevant evidence syntheses, plain language summaries and policy briefs." (Campbell Collaboration, 2024)
CINAHL	Citation database (see below) with literature from allied health professions such as nursing, physical therapy, nutrition, and more.
Citation database	Also called bibliographic database, library electronic database, or citation index, these are organized sets of citation records from publications. Common examples accessed for reviews in health research include: CINAHL, Embase, MEDLINE, PsycINFO, Cochrane Library, and Scopus, amongst others. These databases are made available through publicly available (such as PubMed) or through subscriptions to vendor search interfaces (such as OVID, EbscoHost, Wiley, Elsevier, ProQuest, and others).

Cochrane Collaboration	International health research organization that produces and advocates for the use of synthesized evidence. The Collaboration mission is "independent, diverse, global organization that collaborates to produce trusted synthesized evidence, make it accessible to all, and advocate for its use. Our work is internationally recognized as the benchmark for high-quality information about the effectiveness of health care" (Cochrane Collaboration, 2024a) Also produces the Cochrane Library, which includes the Cochrane Database of Systematic Reviews and the Cochrane Central Register of Controlled Trials. Key source of methodological guidance for conducting and reporting evidence syntheses, especially for systematic reviews of interventions. Cochrane organizes annual colloquia attended by information specialists (including librarians), synthesis methodologists, clinicians, and health policy researchers.
Digital learning objects (DLO)	Also known as e-learning objects and originally defined as "any digital resource that can be reused to support learning" (Wiley, 2000, p. 7). DLO are created, used, and reused by librarians and other educators in higher education, health professions education, and continuing professional development. May include various media resources including video tutorials, web-based modules, electronic text files, podcasts, and more.
Educational materials	Also known as learning or instructional materials. "A broad term for materials used in classrooms to support teaching and learning. These materials may be printed or digital, free (e.g., Open Education Resources) or for purchase, and may include but are not limited to primary sources, literary texts, textbooks, workbooks, computer-based applications, various types of media, and classroom assessments. Materials range from an individual lesson to a comprehensive curricular program, and can be developed by

	teachers, education/outreach organizations, or publishing companies." (HIDOE Office of Curriculum & Instructional Design, n.d.)
Embase	Citation database frequently searched for pharmacological and biomedical literature and often included as a source searched in health evidence syntheses. Available to academic library users through the publisher, Elsevier, as Embase.com, or through the Ovid search interface.
Entanglement	"A central assumption of sociomateriality is that the social and the material are entangled and mutually constituted. … the approach assumes that the world is sociomaterial and is constantly being recreated and reshaped in various arrangements and practices of co-constitution." (Haider & Sundin, 2023, pp. 4–5)
Evidence-based practice (EBP)	A clinical practice and decision-making approach that emphasizes the integration of best available research evidence with patient preferences and context, along with clinical experience, emerging in the 1990s (Sackett, 1997).
Evidence synthesis	This term, which is used here interchangeably with knowledge synthesis, research review, and comprehensive review, includes a range of literature-based research studies that employ a methodologically driven approach to synthesize published evidence in a comprehensive, transparent, and reproducible method. While some methodologists and disciplines make distinctions between what is meant by evidence synthesis, knowledge synthesis, research review, and other related terms, for the purpose of this dissertation, these terms are sometimes used interchangeably and I have strived to mainly use the term evidence

	synthesis throughout this thesis. My understanding, for the intents and purposes of this research, is that the terms, along with the associated processes and outputs, are synonymous in the general sense, while specific methods, such as systematic reviews, scoping reviews, or meta-ethnography, differ in intent, methods, conduct, and reporting (Tricco et al., 2016).
Generative Artificial Intelligence	Algorithms that can create text, images, code, and other content based probabilistically on the large datasets on which they are trained. Related to machine learning and other automated and semi-automated processes that have impacts on education, research, and health care, among other elements of society.
Health Professions Education	Academic and clinical training of medical and other health professional learners, inclusive of undergraduate, graduate, postgraduate, and continuing professional development contexts.
Higher Education	Also known as post-secondary education or tertiary education and inclusive of academic training delivered at degree- or diploma-granting universities or colleges.
Information literacy	"Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (ACRL Framework for IL, 2015, p. 8).
Instructional encounter	Generic term that can include instructional sessions (below) as well as asynchronous contact between librarians and learners, such as emails, providing links to internal or external teaching resources.

Instructional session	Broad term to cover a range of teaching contexts, including large group classes and workshops, individual or small group research consultations, guest lectures in credit courses.
Joanna Briggs Institute (JBI)	"JBI is a global organisation promoting and supporting evidence-based decisions that improve health and health service delivery." (JBI, 2024)
Learners	General term used for anyone new to the topic being taught. Can include health care professional (e.g. practicing clinicians, medical residents), but most often used to refer to students who are completing a professional and/or academic degree. In the context of this doctoral research, a learner refers to a student prior to the completion of their current degree or a postgraduate trainee (for example, medical resident) affiliated with the university.
Liaison Librarian	Professional role in academic libraries where the librarian has teaching, collections, and research support responsibilities with particular disciplines, departments, and/or Faculties. Also known as subject librarian, this role is generally part of the library public services (see below) and librarians in these roles provide support to students, faculty, and staff in their assigned areas. The liaison model is often contrasted with "functional" roles or models where individual or groups of librarians and library staff are assigned to the different library functions such as cataloguing, collection development, reference, systems, teaching, and other emerging areas of support or service.
Library services	Support provided through library-mediated resources, including human resources and collections. In academic libraries, library services may have various labels and include public services (those services that directly interact with individuals and groups

	outside of the library, such as teaching, reference services, student services, etc.). For an example of the services at one institutions, see https://libraries.dal.ca/services.html.
Literature search	Information retrieval process to identify published articles or other documents to meet a particular information need. May be conducted in support of an immediate decision or in the context of a research project.
MEDLINE	"MEDLINE is the online counterpart to the MEDical Literature Analysis and Retrieval System (MEDLARS) that originated in 1964 (see MEDLINE history). A distinctive feature of MEDLINE is that the records are indexed with NLM Medical Subject Headings (MeSH)." (National Library of Medicine, 2024). Searchable through various interfaces such as PubMed (which is short for Public MEDLINE), Ovid, Web of Science, and others. Generally considered essential to search when conducting evidence syntheses on health related topics.
Health Librarian	Used interchangeably with *health sciences librarian* to refer to information professionals who provide library support in fields related to human (and sometimes animal) health. A broader term than the related *medical librarian*, health librarians may work in academic, hospital, government, or other special library settings and may support students, postgraduate trainees, clinicians, policy makers, and others working in health care research and services.
PsycINFO	Citation database frequently searched for literature related to mental health and psychology; often included as a source searched in health evidence syntheses. Available to academic library users through search interfaces such as Ovid, ProQuest, or EbscoHost.

Research consultation	Individual (or small group), personalized support provided by an academic librarian regarding an assignment or research project. Often available through a library's reference service or as part of a liaison librarian's support for the programs and courses in their disciplines.
Search interface	Also called database platform, this refers to the interface through which a publisher has made a citation database available to subscribers. The search functions and syntax varies across search interfaces and in some cases, across citations databases though the same interface (for example the ability to search terms in Title, Abstract, or Keyword fields for PsycINFO through EbscoHost, but only Title or Abstract for CINAHL Full Text through EbscoHost).
Search fields	Searchable elements of record metadata in citation databases, dependent on the functionality of the platform being used. Searchable fields and syntax varies across databases and search interfaces. Common fields to search in the context of systematic searching for evidence synthesis research include title, abstract, keywords (supplied by authors or publishers), and the relevant index terms, where applicable.
Search strategy	Also called search approach, in the context of evidence synthesis methods, the search strategies should be *systematically* developed, run in multiple sources, and reported clearly to support the comprehensive retrieval of all potentially relevant evidence and the rigour and trustworthiness of the research methods.
Health sciences student	Used in the context of this research to refer to a learner at an institute of higher education (ie., university or college) completing a professional or academic degree in a health related field. Can include health sciences research fields, such as epidemiology, or

	health professions, such as medicine, nursing, dentistry, etc. Some fields are variously considered to be within health sciences, sciences, or social sciences, such as psychology, kinesiology, social work, human nutrition, neuroscience, etc.
Teaching	Refers to the practices of librarians (in this context) when engaging with students to support learning.

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Throughout my PhD program, I have lived in Kjipuktuk (Halifax) and then Kespukwitk, a district of Mi'kma'ki along the Bay of Fundy. I am grateful to now live in the rural community in which I was born and to live, work, and play on the traditional and unceded territory of the Mi'kmaq people. In consideration of the Treaties of Peace and Friendship signed in Mi'kma'ki and our collective continual efforts to decolonize and seek reconciliation for the harms of our educational and health systems in what is now known as Canada, I am committed to learning about Indigenous ways of knowing and research methodologies in both health and education contexts. In my own professional and teaching practices, I encourage researchers to incorporate disparate voices and types of knowledge into evidence syntheses and to include those impacted by the issues we are researching throughout the entire research process. In keeping with the sociomateriality philosophy that has been instrumental in my research approach, as well as in appreciation for the traditional knowledge keepers of the land on which I live, I am grateful for the land and animals on our farm, the bodies of water I have swum in throughout Mi'kma'ki, including the many lakes and the Bay of Fundy, and for the many friends and relations who have supported me and my journey.

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CHAPTER 1 INTRODUCTION

1.1 Chapter Overview

This introductory chapter lays out the motivation and plan for the dissertation project, which is a digitally-mediated ethnographic study of academic health librarians' online teaching practices in regards to evidence synthesis methods. The chapter serves as an outline for the thesis, starting with a brief description of the research problem. I have presented the circumstances that led to selection of the research objectives and the research questions, which emerged from my own teaching and professional experience. The context of the research has been described: providing an overview of evidence synthesis methods; explaining the increased use of evidence syntheses as academic outputs; detailing the role of academic librarians in supporting research; and outlining training options for evidence synthesis methods. I have provided the reasoning for the selection of the online teaching setting, describing the conceptual framework that has shaped the research process, and introducing some of the threads that I have carried through the dissertation. The threads have included a performative ontology of becoming (Barad, 2003), entangled social and material factors reciprocally intra-acting with teaching practices (Gherardi, 2009), and the intertwined nature of evidence synthesis methods and technology in online training (Fenwick, 2014). Following the brief description of the research approach, I have described my positionality in relation to the research topic, followed by the roadmap of the dissertation, and an overview of the subsequent chapters.

1.2 Research Problem

Academic librarians play a crucial role in supporting and teaching evidence synthesis methods, especially in the development and transparent reporting of systematic searches. Through training health sciences learners in these methods, academic health librarians facilitate the research contributions of generations of new researchers and fostered evidence-based practice (EBP) competencies for emerging health professionals. For example, in my professional role as the Evidence Synthesis Librarian at an academic health sciences library, I have both taught and conducted evidence synthesis methods research, including through consultations with health

sciences students, teaching classes and workshops, and collaborations with learners and other researchers. While my professional training has focused on developing expertise in the systematic searching required for the comprehensive and transparently reported methods used in evidence synthesis research, I have observed that the support I have provided to students has rarely been limited to the search methods alone. My pedagogical choices in teaching about evidence synthesis methods have been further complicated by methodological and technological changes in the arena of research methods. As the lead for evidence synthesis methods in the library system, I have been privileged with time and support to stay current as methodological expectations have shifted and technology has evolved to support research and remote teaching. However, many academic health librarians providing support for evidence synthesis methods do so in addition to working in other traditional and emerging library functions, such as collections development, general reference and teaching, research data management, data services, or scholarly communications support. These librarians balance support and lifelong learning regarding evidence synthesis methods with a myriad of other demands from library administration and the students and faculty with whom they work.

I have observed that my work regarding evidence synthesis methods has been influenced by at least two emerging trends in the field impacting my perception of the research problem of the complexity of teaching students. One trend of note has been the swing of the research review pendulum away from the focus on systematic and scoping reviews and towards other synthesis methodologies (F. Campbell et al., 2023; Munn et al., 2023). These have included qualitative, interpretive, rapid, and narrative-style reviews (Greenhalgh et al., 2018; Hamel et al., 2021). A second trend has involved conversations amongst health librarians, review methodologists, and medical educators about the role of technology, including but not limited to generative artificial intelligence (AI) and machine learning, in research syntheses. Discussions in these circles have included the use of generative AI and machine learning in creating evidence summaries, including for the development of the systematic search strategies used in these reviews (Guimarães et al., 2024; Wang et al., 2023). These emerging technologies have been explored for their potential to facilitate automation of the other steps in systematic reviews of health research (Alshami et al., 2023; Najafali, Camacho, et al., 2023; Najafali, Reiche, et al., 2023). Although generative AI entered the field during and after the period during which I conducted this study, the technological disruption evoked has been representative of the ongoing conversations about

the role of technology in conducting evidence synthesis research that inspired consideration of materiality in my doctoral research. For example, over the course of my career I have seen the development and proliferation of software dedicated to review project management and facilitation, such as DistillerSR, Covidence, and EPPI-Reviewer (Cowie et al., 2022; Kohl et al., 2018).

Shifting prioritization of evidence synthesis approaches has been reflected in the learners who approach their academic health librarians for support with diverse review types: systematic, scoping, integrative, realist, narrative, rapid, and others (Grant & Booth, 2009). The growing heterogeneity in evidence synthesis purpose, methods, and reporting has had implications for the searching techniques across review types (Sutton et al., 2019). In addition, since librarian searching and information management expertise can have multiple roles in evidence synthesis research, academic librarians must maintain a diverse knowledge base and skill set to remain up to date on review tools, technologies, and documented guidance (Spencer & Eldredge, 2018; Townsend et al., 2017). The methodological variety has had implications on the complexity of supporting and teaching evidence synthesis methods.

Meanwhile, scholars have explored technological changes in searching, evidence synthesis methods, and health research and education more generally (Harrison et al., 2020; Nussbaumer-Streit et al., 2021). As a digitally-based type of "desk" research, evidence syntheses have been uniquely enmeshed with online tools and have been vulnerable to disruption by technology such as search algorithms, generative AI, and machine learning. While conducting online reviews, academic researchers have had remote access to commonly used tools for conducting evidence synthesis research, such as library-subscribed citation databases available by proxy, web-based citation and review management software, and methods guidance for conducting and reporting reviews available from reputable sources through the internet. Scholars reported publication of 11 systematic reviews per day in 2010 (Bastian et al., 2010) and nearly 80 each day from 2000-2019 (Hoffmann et al., 2021). A title search in PubMed for "systematic review" reveals that rate has only increased in the intervening years, as have the rate of publications across all article types. During campus and lab closures of 2020 and 2021, public health measures led students and other researchers to pivot to conducting evidence syntheses in the place of bench and clinical research (Riesen et al., 2024). Alongside these barriers to in-person research and pressures to

publish (Pickering et al., 2014), machine learning and generative AI have further fueled the proliferation of synthesis literature (Alshami et al., 2023). Meanwhile, investigations of the quality of evidence syntheses have suggested that their proliferation has contributed to research waste, with inadequate reporting and failure to follow guidance on rigorous conduct (Ioannidis, 2016; Page et al., 2016; Page & Moher, 2016). While it has not yet become clear whether automation and machine learning in evidence synthesis will ameliorate the problems of rigour and applicability or exacerbate them, researchers need to understand how existing and emerging technologies contribute to evidence synthesis research.

With the practice of conducting evidence synthesis research primarily done online, evidence synthesis methods learning has long been supported through digital resources (Lee et al., 2021; Parker et al., 2018; Parker & Neilson, 2015). Furthermore, parallel to the increase in evidence synthesis research in academic settings during the COVID-19 pandemic, remote teaching of evidence synthesis methods shifted further to online delivery. Just as the types of technology used in evidence synthesis research have affected the methods and the outputs, so too, online teaching and remote learning have been impacted by technology developments. As evidence synthesis research and methods teaching have been done online, it has become important to better understand how the online environment, including its social and material elements, has shaped the work and teaching practices of academic health librarians.

Amid these changes in the landscape of conducting, supporting, and teaching evidence synthesis methods that have complicated the work of librarians, I have been motivated to better understand the relationships between social and material factors in these emergent areas. My interest in the topic of evidence synthesis methods has been grounded in over a decade of experience supporting and teaching evidence synthesis research as an academic health sciences librarian. The focus on remote teaching was intensified by the rapid shift to online delivery of library instruction due to the COVID-19 pandemic. I have aimed to unpack the black box of academic librarians' online teaching practices (Lihosit, 2014) regarding evidence syntheses by looking closely at librarians' interactions with technology and methodology, including how technology has come together with human and non-human elements. As diverse approaches to evidence synthesis methods and online teaching have been increasingly taken up, we need models to render visible academic health librarians' labour navigating these developments and

communicating them to learners. As Ross-White (2021) has identified in relation to creating the searches for evidence syntheses, the complexity of the work of contributing to and teaching evidence synthesis methods may be hidden and undervalued. In making visible the complexities and unseen dimensions of academic librarians' teaching regarding evidence synthesis methods, this research can, in turn, help academic librarians' teaching practices – and the learning they have supported – be better understood, recognized, and acknowledged. Ultimately, this appreciation for the complexity and contributing factors in online teaching practices regarding evidence synthesis methods will assist academic librarians, and the organizations in which they work, to build capacity in evidence synthesis research.

1.3 Research Questions and Objectives

My study aimed to better understand the complexities of academic health librarians' online teaching practices in relation to evidence synthesis methods. I began with two research questions that guided the initial research design. The starting research questions were:

1) What invisible work do academic health librarians engage in to provide online instructional support to learners about evidence synthesis methods, including, but not limited to, literature search methods?;

2) What social and material factors mediate these teaching practices?

As is common in qualitative inquiry (Agee, 2009), as I engaged with the conceptual framework throughout the research process, I further developed the research questions which became better philosophically aligned with the sensitizing theories and onto-epistemology of the research approach described in later sections. Over the course of becoming a sociomaterially-oriented researcher, the research questions have been informed by elements I realized were entwined with the research problem, such as identity and performance (Hultin, 2019; E. L. Young, 2019). In doing so, I reversed the order and revised the original questions with the goal of tracing the sociomaterial practices and further unpacking the unseen issues regarding labour, identity, performativity, and relationality. The original research questions became the following three:

1) What are the social and material elements affecting academic health librarians' online teaching practices regarding evidence synthesis methods?

2) What types of labour are revealed by following the threads of these social and material elements during the librarians' online teaching practices?; and

3) How do these social and material elements interact with each other through the teaching practices to produce these labours?

Health sciences scholarship has been transformed by a dramatic increase in evidence synthesis research, primarily conducted in virtual spaces. Meanwhile, evidence synthesis methods training has shifted from more in-person and offline methods toward new virtual platforms, tools, and processes. The objective of this research project included tracing the social and material aspects of academic health librarians' teaching practices in these virtual contexts, enabling a better understanding of the impact of these changes in the field. I have understood these teaching practices as sociomaterial assemblages, meaning: "gatherings of natural, technological, human, and nonhuman actors" (MacLeod & Ajjawi, 2020, p. 852). Doing so has helped in perceiving the effects of the broader methodological, technological, and pedagogical changes described through the research problem. My objective was to draw attention to sociomaterial elements and assemblages affecting academic librarians' work in the research context, which I have described in the next section.

1.4 Research Context

The questions guiding this research related to academic health sciences librarians' online teaching regarding evidence synthesis methods. In this section, I have provided an overview of evidence synthesis methods and their significance to learners in academic programs. Next, I have described the work of academic health librarians to support evidence synthesis research and their roles in teaching evidence synthesis methods, particularly through online instruction.

1.4.1 Research Context Terminology

I have highlighted here a few important comments regarding the language used in the rest of this chapter and throughout the dissertation. Additional details regarding terminology related to the research have been provided in the Glossary.

1. Various terms are used synonymously to refer to systematic and methodological synthesis, including evidence synthesis, knowledge synthesis, research synthesis, systematic literature review, and other terms for the overall family of research approaches, as well as additional (and equally varying) language to describe specific types of syntheses, such as systematic reviews and scoping reviews (Munn et al., 2023; Tricco et al., 2016). Throughout this dissertation, I have used the term *evidence synthesis* for consistency, but quotations from the literature, participants, and methodological material have included other phrases used in context. I have described evidence synthesis research and methods in Section 1.4.2.
2. While there are distinctions, based on employment and role, between information specialists and academic health librarians, the terms have frequently been used interchangeably. In the academic context of this research, I have focused on librarians with roles in higher education, and I have considered their searching expertise comparable to information specialists referenced in evidence synthesis methodology guidance and elsewhere. Where the literature or guidance documents cited use the term information specialist, I have retained the original term, even when used in the context of discussing *academic health librarians'* and their work. In general, I have used the term *librarian,* for brevity, to refer to the individuals who participated in this study and about whose work this research pertains. I have provided more context regarding academic health librarians' work and teaching in Section 1.4.4 and have detailed the relevant literature in Section 2.6.
3. Literature search approaches developed to thoroughly and methodically retrieve records for potential inclusion in evidence syntheses have been called search strategies, comprehensive searching, exhaustive literature search, information retrieval methods, etc. Throughout the dissertation, I have referred to the searching methods used in the context of evidence synthesis research as *systematic searches* or *systematic searching.* These phrases capture the goal of the search to be both comprehensive (i.e., retrieving all potentially relevant studies) and well-documented for the purpose of reproducibility.
4. The terms teaching and instruction have frequently been used synonymously. However, while I used the term "instruction" in the title of this doctoral study, the phenomenon of interest has more accurately been *teaching*, the active verb, and *teaching practices*, more

specifically. Whereas “instruction” is a noun and can imply a static or stable action, *teaching* is something one does. *Teaching practices* have more readily been viewed through a practice lens emphasizing the dynamic and reciprocal relations between the various elements and actors contributing to those practices.

1.4.2 Evidence Synthesis Research Methods

Evidence synthesis is a scientific approach that enables “the contextualization and integration of research findings of individual research studies within the larger body of knowledge on the topic” (Canadian Institute of Health Research, 2016, p. Synthesis Section). Evidence synthesis methods have involved gathering and summarizing existing evidence, thereby preventing reliance on individual studies to guide practice and policy decisions. When used appropriately, this research approach has helped ensure methodological rigor and accountability (Gough et al., 2020) by assessing for generalisability and consistency (Grimshaw, 2010) and addressing challenges such as duplication, lack of reproducibility and irrelevance to clinical and policy applications (Ioannidis, 2016; Page et al., 2016; Page & Moher, 2016).

Evidence synthesis research methods have emerged within the context of EBP, which itself evolved from the biomedical paradigm of evidence-based medicine (Guyatt, 1992; Montori, 2008; Sackett, 1997). Developed in the 1990s to challenge the previous model of eminence-based medical practice, where the expertise of individual practitioners was paramount, EBP has emphasized the integration of best available research evidence with patient preferences and context, along with clinical experience (Sackett, 1997). Medical and health professions education (HPE) have incorporated EBP into curricula, both during initial training and continuing professional development for clinicians. The production and use of evidence synthesis research has been integral to mobilization of evidence from bench and clinical research into patient care and health care systems policy.

Other sources have provided detailed historical and contextual background behind the development and prevalence of evidence synthesis research methods, including the emergence of systematic reviews in health and social sciences research, the establishment of standardized methods, and the subsequent diversification both of the methods and applications in practice (Hong & Pluye, 2018; L. C. Smith, 2023, p. 2). In an epidemiologic study of systematic review

methods, Page and colleagues (2016) cited the role of systematic reviews in reducing research waste and facilitating knowledge translation from bench to clinical research to bedside practice. These authors have provided overviews of the contexts in which evidence synthesis methods have been developed and the purposes to which they have been applied (Hong & Pluye, 2018; Page et al., 2016; L. C. Smith, 2023). Such overviews have reflected the pervasiveness of evidence syntheses, and especially systematic reviews, in health research.

Evidence synthesis research has gained traction as foundational to knowledge mobilization, meaning the use and application of research evidence in decision making and practice (Canadian Institute of Health Research, 2010). In response, health research organizations such as the Cochrane Collaboration and the Institute of Medicine have elaborated on the standards for conducting systematic reviews (Higgins et al., 2019; Institute of Medicine, 2011). Over the past three decades, the Cochrane Collaboration has drawn together clinicians and researchers, including information specialists, to discuss, research, and disseminate methodological advancements in conducting and reporting systematic reviews (Chandler & Hopewell, 2013). While systematic reviews of evidence for interventions were the initial focus of both the Collaboration and the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2019), the organization has also expanded to guidance for systematic reviews on other clinical questions such as diagnostical test accuracy, prognostic research, and qualitative research (Cochrane Collaboration, 2023, 2024b; Deeks et al., 2023; Harris et al., 2018), thereby adding to the library of rigorously developed methods guidance. Subsequent references in this dissertation to the Cochrane Handbook refer to the 2019 edition pertaining to intervention systematic reviews, unless otherwise noted (Higgins et al., 2019).

Similarly, methodologists for JBI (JBI, 2024), formerly known as the Joanna Briggs Institute, have developed and expanded guidance for other types of systematic reviews and additional synthesis approaches. The current JBI Manual has included chapters on systematic reviews of effectiveness, text and opinion, prevalence and incidence, economic evidence, etiology and risk, diagnostic test accuracy, mixed methods research, and measurement properties as well as chapters on scoping reviews and umbrella reviews (Aromataris & Munn, 2020). For scoping reviews, in particular, the guidance in the JBI manual has helped to expand and standardize the advice from seminal methods articles (Arksey & O'Malley, 2005; Colquhoun et al., 2014; Levac

et al., 2010; Peters et al., 2017). Both the Cochrane Handbook and the JBI Manual have been available online for researchers to use as guidance regardless of affiliation or training. Links to these and other web resources referenced in this dissertation have been provided in Appendix K.

The methods for systematic reviews were first evidence synthesis methods to be developed, refined, and standardized. However, appreciation that a systematic review methodology may not always be the most appropriate choice for different types of research questions, purposes, and contexts has led to the evolution of methods for other evidence synthesis approaches. Scoping reviews have arguably benefitted from the most attention and refinement of methods, with guidance elaborated by JBI and others, and the development of the PRISMA-ScR extension to guide reporting (Colquhoun et al., 2014; Peters et al., 2017; Tricco et al., 2018). Several recent publications have presented explanations and descriptions of various review types (F. Campbell et al., 2023; Munn, Peters, et al., 2018). Similarly, a number of resources have been developed to help researchers and readers determine the best fit of review methods to purpose (Amog et al., 2022; MacLeod et al., 2021) while review methodologists have reflected on the ever expanding typology of review approaches (Munn et al., 2023; Tricco et al., 2016).

In this context of expanding methodological elaboration and diversity, health sciences librarians have served as collaborators and consultants in evidence synthesis research for decades (J. McGowan & Sampson, 2005). These librarians have been acknowledged as search experts by established methods organizations such as Cochrane, Institute of Medicine, and JBI (Aromataris & Munn, 2020; Higgins et al., 2019; Institute of Medicine, 2011). All of these methods texts have recommended involvement of information specialists on synthesis research teams to ensure searches have been comprehensive, thoroughly documented, and clearly reported (Aromataris & Munn, 2020; Higgins et al., 2019; Institute of Medicine, 2011). Research has illustrated that review teams that involved an information specialist, especially as a co-author, have reported search strategies with more transparency, exhaustiveness, and following recommended practices. For example, several researchers have examined correlations between collaborating with an information specialist and thoroughness of the search and the reporting of the search and the review overall, as will be described in more detail in Chapter 2 (Koffel, 2015; Koffel & Rethlefsen, 2016; Rethlefsen et al., 2014, 2015).

Regardless of the specific type of review or topic, evidence syntheses have been distinguished by common steps (Grimshaw, 2010; Parker & Sikora, 2022). This process has been described to include: 1) planning the review; 2) identifying studies and reports for inclusion; 3) evaluation and appraisal of included information; 4) collecting and collating data from the included reports; 5) summarizing and synthesizing the results; 6) writing up and presenting the review process and results (Parker & Sikora, 2022). Following recommendations in the review guidance to seek involvement of information specialists for development of comprehensive search strategies, librarians have most commonly been involved in collaborating or consulting on the first two steps (Higgins et al., 2019; J. McGowan & Sampson, 2005). I have provided more context in Chapter 2 based on literature regarding librarians' roles in evidence synthesis research and supporting systematic searching.

1.4.3 Learners and Evidence Synthesis Research

Higher education literature has demonstrated increasing acceptance of evidence syntheses during graduate and professional training, with descriptions of the prevalence and acceptance of evidence syntheses as the whole or part of theses in programs such as nursing (Christian & Palokas, 2018; Olsson et al., 2014), biomedical sciences (Puljak & Sapunar, 2017), and dentistry (Dotto et al., 2020). Learners may conduct evidence synthesis research as an academic deliverable for their program or as supplemental projects or employment (Mahtani, 2016). These student researchers may have learned the appropriate methods for evidence synthesis research formally in credit courses through their disciplinary department. They frequently also have learned informally, through working with experienced review teams, through self-directed learning using methods texts or web-based tutorials, or in shorter non-credit workshops (Ayala et al., 2022; Parker et al., 2018; Premji et al., 2021).

Assuming student researchers have followed established guidance on conducting evidence syntheses, consultations with a librarian on the search strategies would have increased alongside the rise in evidence synthesis research in academic settings. Personal experience and anecdotal evidence from colleagues have supported this supposition. Librarians have noted the need to address dramatic increases in requested support for evidence synthesis research projects in the first years of the COVID-19 pandemic, when lockdown orders and social distancing limited

work in bench and clinical research settings (Riesen et al., 2024). Conference presentations (Bradley-Ridout et al., 2023), association reports (Premji et al., 2024), and publications (Kallaher et al., 2020; Kline, 2023; Riegelman & Kocher, 2018) have reflected librarian responses to the increase and expansion of evidence synthesis research both within and beyond health sciences. To develop and maintain sustainable library support for evidence synthesis research, we need empirical evidence to help us understand the work that is involved in providing that support.

1.4.4 Academic Health Sciences Librarians and Teaching

Canadian academic librarians have worked in university and college libraries which vary in structure, staffing, and academic programs. Many librarians who have supported health sciences research and professional programs (e.g., medicine, nursing, physical therapy, occupational therapy, epidemiology, public health, dentistry, pharmacy) have worked as liaison librarians with direct responsibilities to teach, provide research and reference support, and manage collections for the health programs within their university. Both in the context of teaching to programs or courses, and in one-to-one reference support to students, academic health librarians have provided guidance and instruction related to library services, information literacy, health literacy, and EBP (Safdari et al., 2018). While not every health librarian identifies as a teacher, teaching has been a common practice for those librarians who have supported health sciences learners as part of their libraries' services for the community at their respective institutions (Blume, 2022; Premji et al., 2020; Sabey & Biddle, 2021).

Academic health sciences librarians may have job titles or descriptions that reference their roles within their library's public services, which includes information services (also known as reference or research services), instruction support, and subject or disciplinary liaison duties as mentioned. Like other public services librarians, academic health librarians have taught in a variety of formats including group sessions through guest lectures, workshops, and seminars, as well as individual instruction via research consultations through the library reference services and by being embedded with courses and programs (Eldredge et al., 2013; Nevius et al., 2018). Furthermore, the settings of librarian teaching can be in-person (aka "face to face"), online synchronous, online asynchronous, or a blend of two or more settings (Amparo, 2020). While studies on academic librarian teaching practices have focused on general information literacy

library instruction (Dunn & Xie, 2017; Julien et al., 2018) the increased demand for evidence synthesis methods training from librarians has suggested research methods instruction as a rich area for exploration. Likewise, there are numerous publications exploring the teaching identity of academic librarians (for example: Drabinski, 2016; Hays & Studebaker, 2019; Sandy et al., 2023; Walter, 2008), but none have looked specifically at the professional identity of academic health librarians who both teach and provide support for evidence synthesis research.

1.4.5 Instruction in Evidence Synthesis Methods

As evidence synthesis research has played an integral role in the paradigm of EBP, librarian instruction for EBP competencies has included teaching learners and clinicians how systematic searching has contributed to evidence synthesis research methods. While academic health librarians may be directly involved in synthesis research projects as collaborating members of the review team, librarians have also been asked to deliver instruction on searching for the studies to consider for inclusion in comprehensive reviews (S. Campbell et al., 2016; Hanneke, 2018; Lenton & Fuller, 2019). Furthermore, information retrieval is a foundational and interconnected component of the evidence synthesis process, with the implications for the chosen type of review, the research question formulation, applying selection criteria, and reporting of the methods. Therefore, instruction from academic health librarians has extended to aspects of the methods beyond the systematic search.

Indeed, a scoping review of the literature related to librarians' roles on systematic reviews found reports of 18 separate responsibilities (Spencer & Eldredge, 2018). This study showed that librarian involvement in evidence synthesis research was not limited to expertise in the systematic search strategy development and execution, though that has been the contribution of librarians receiving the most attention (Spencer & Eldredge, 2018). Teaching has been one of the other roles highlighted in the review, including instruction and capacity building with librarians (Conte et al., 2015; Fyfe & Dennett, 2014) as well as instruction directed at learners at the librarians' employing institutions. There have been numerous publications specifically related to instructional programs and resources developed by librarians to support students learning about systematic review methods (S. Campbell et al., 2016; Fuller et al., 2021; Hayden & Premji, 2022; Lenton & Fuller, 2019; B. S. McGowan et al., 2021; Poole, 2021). These educational

program descriptions and evaluations have been described in the literature review chapter, contextualizing the various formats of teaching approaches for evidence synthesis methods. These publications have not explicitly explored the balance of responsibilities between the established role of librarians as search experts and their roles as teachers supporting learners conducting systematic searches. There has been a lack of clarity regarding the outcomes expected by learners, faculty, and library administration when librarians teach advanced searching in the context of evidence synthesis projects. Without appropriate learning outcomes to guide instruction, librarians must negotiate expectations from the various parties when teaching health sciences students through one or several brief encounters.

1.4.6 Online Context of Library Instruction

Prior to the COVID-19 pandemic library instruction and reference support for academic programs based on campus were mainly delivered in-person (Budhai & Williams, 2021). Even medical schools with distributed campuses have frequently provided on-site library support for students at the satellite locations (Phinney & Horsman, 2018). In 2020, librarians in Canada and elsewhere adapted their teaching to online and remote delivery during and following public health mandates, including campus closures (Charbonneau & Vardell, 2022a). The increase of online instruction built on and accelerated previous momentum towards online and asynchronous teaching supports, such as provision of library research guides (e.g. LibGuides) and linking library resources within online course spaces in the institutional learning management system (LMS). Librarians' instruction for evidence synthesis methods, both to groups and to individuals through research consultations, similarly underwent an accelerated shift to online delivery at the start of the pandemic. While some support has reverted back to in-person format based out of libraries or classrooms, Canadian academic health libraries have continued to deliver online or hybrid teaching for various reasons, including advantages for accessibility and inclusion (MacLeod et al., 2023).

In this section, I have described the aspects of context relevant to the research questions. Each of these contextual factors have in turn been subject to influences from the broader settings of health research methods, higher education, HPE, and academic libraries. Academic librarians' online teaching practices are situated at the nexus of these dynamic, interdisciplinary contexts

when supporting learners in medical and health programs who are conducting evidence synthesis research. There are no known studies describing in-depth the complexity of those teaching practices or the work they have entailed.

1.5 Conceptual Framework

Despite the important role academic librarians play in teaching evidence synthesis methods, a great deal of their work tends to be invisible and unexamined. While existing program descriptions have indicated that librarians put considerable effort into in-person and virtual teaching of evidence synthesis methods, and especially the skills needed for comprehensive searching (Fuller et al., 2021; Hayden & Premji, 2022; B. S. McGowan et al., 2021; Poole, 2021), the literature has not provided much insight into the work involved in this teaching. There has been little understanding of what exactly academic librarians *do* (Gherardi, 2009) during evidence synthesis workshops, courses, and one-to-one sessions. Given rapidly shifting technologies and the rise of new synthesis approaches, which change the setting, processes, and tools involved in this work, such an understanding is crucial. Exploring the complex ways people (librarians, students, supervisors, review methodologists, etc.) and technological and textual elements have come together to produce evidence synthesis education has never been timelier. Theories relating to the invisible labour of academic librarians and sociomaterial approaches to professional practices have been useful concepts to inform this understanding (Fenwick, 2014).

The concept of invisible work has been explored in many contexts since it was first introduced regarding unpaid and undervalued labour done by women in the domestic settings (Daniels, 1987). Daniels pointed out that we can validate and acknowledge invisible work by showing the effort it requires and unpacking how it is constructed (p.405). Originally conceived as a way to understand work that is not financially compensated, takes place in a private sphere, or is devalued by association with the caring and emotional labour of women, scholars have applied this approach to make many types of gendered and contemporary forms of work visible, such as that of teachers who work in two languages (Amanti, 2019), within data-intensive science (Scroggins & Pasquetto, 2020), through various forms of virtual work (Cherry, 2016), and delivery of curriculum across distributed medical education sites (MacLeod et al., 2017).

Regarding librarians' collaborations on evidence synthesis research, Ross-White (2021) has described contributing search expertise as a form of invisible labour, frequently unacknowledged and undervalued by both researchers and library administration. She drew on the earlier work of Ehrlich and Cash regarding the invisibility of information mediation in the work of corporate librarians during the transition to a digital knowledge ecosystem (Ehrlich & Cash, 1999). Similarly, other authors have explored the immaterial and affective labour of academic librarians, especially in the context of teaching and research support (K. P. Nicholson, 2022; Sloniowski, 2016; Zvyagintseva & Blechinger, 2023) and digitally-mediated services (Allison-Cassin, 2020; Huet et al., 2019; Logsdon et al., 2017). The convergence of expertise in searching and review methodologies, teaching practices, and technology has underscored the need for a deeper understanding of the labour of academic librarians in the research context of my doctoral study. This expertise and effort of academic health librarians has been instrumental in imparting skills and concepts related to systematic searching and evidence synthesis research. Yet the labour has been invisible and undervalued, particularly when the online teaching happens outside of the physical library space (McLay Paterson & Eva, 2022b, 2022a).

Extensive technological and digital interfacings have been necessary for conducting and teaching evidence synthesis research, highlighting the importance of materiality in this context. Evidence synthesis instructional content covered by academic librarians has included systematically searching electronic databases and online grey literature sources, handling digital data in the form of citation files and records, and managing the virtual data of project documentation, research data, and research outputs (Spencer & Eldredge, 2018). Since the shift from print journals to online publications in the 1990s, evidence synthesis research generally has been conducted through digital and frequently web-mediated approaches. Furthermore, most review guidance documentation and methods training resources can be found online, either through the websites of evidence synthesis or health research organizations such as Cochrane (Cochrane, 2024), JBI (JBI, 2024), and PRISMA (PRISMA, 2020). Thus, conducting evidence synthesis methods has involved digitally-mediated research practices. Teaching those research practices has similarly been mediated by technology and other material elements.

As academic librarians' teaching practices have been intertwined with a myriad of social and material elements, and online teaching has taken place in less visible locations, research on this

topic has required a conceptual framework that reflected this complexity. I have seen this work as assemblages of librarians and learners navigating technology, methodological expectations, learner requests, and institutional structures (e.g., library-subscribed tools and information resources; library services models; programmatic expectations of student research, etc.), and more. A research approach informed by sociomateriality allowed foregrounding of technological and other material factors in teaching practices, helping articulate academic librarians' invisible work. Sociomaterial approaches have shifted research from a human-centric perspective focused on personal or group experiences, individual cognition, or social activities to perspectives that have equally considered non-human factors influencing what people *do*—the material, technology, and spaces where practices happen *as well as* the people involved (Fenwick, 2014; MacLeod & Ajjawi, 2020).

Research in other domains on both the topics of invisible labour and technologically-mediated work practices have benefited from sociomaterial perspectives and related practice theories (MacLeod et al., 2017; MacLeod & Ajjawi, 2020; Wright, 2016). The sociomaterial approach of Actor-Network Theory (ANT) has also been suggested for research related to librarian instruction (Lihosit, 2014) and applied in select contexts of digital mediation of teaching information literacy and documentary practices (Schreiber, 2017, 2019). Furthermore, a recent chapter of a text on the use of theory in information literacy research has made the case for using sociomateriality as a sensitizing concept situated in posthumanism to study practices related to searching for information in a digital, online world (Haider & Sundin, 2023).

Using a sociomaterial lens to investigate the teaching practices of academic health librarians in online settings has allowed for more understanding of the multi-directional agency of the human, and non-human actors involved in the instructional encounters. Furthermore, I drew on practice theory and an agential realism ontology that have encouraged asking questions of the relational positions of the social and material players in question (Barad, 2003; Hultin, 2019). These research perspectives have been elaborated further in Chapter 3 detailing the conceptual framework and theoretical basis for my research.

1.6 Research Approach

Ethnography has been described as a qualitative research methodology that explores the culture of a group or particular social context through immersion in that setting (Hammersley, 2018) and has been paired with sociomaterial research perspectives (Bridges et al., 2020; MacLeod et al., 2019). As the research questions listed above address issues of teaching practices situated in the context of academic libraries, higher education, HPE, and online learning, using ethnographic methods allowed a close examination of the materials and culture within those intersecting contexts. While traditional approaches to ethnomethodology included prolonged observation by researchers from outside the research setting, many ethnographers have now proposed reducing the extended field time through the researcher's insider perspective to conduct focused or rapid ethnographic studies (Andreassen et al., 2020; Knoblauch, 2005; Vindrola-Padros & Vindrola-Padros, 2018). In my doctoral research, I have taken advantage of a decade of professional experience regarding the phenomena of interest and my participant researcher perspective to focus the framing of the research design, including collecting data from a small number of other participants over a limited period of just under a year.

Recently, ethnographers have extended their research settings to include virtual spaces, as more of life and education takes place online. While terms such as digital ethnography and netnography have largely been used to refer to studies of the online lives and experiences of particular groups, there has been no agreement on terms to apply to ethnographic methods mediated through the online environment. An overview of social sciences research methods developed and expanded in response to the COVID-19 pandemic described the many challenges and advantages regarding ethics, inclusivity, and logistics following the shift to online data collection for many types of social research (Nind et al., 2023). As guidance regarding these methods was developing over the period of planning and conducting this research, the research methodology, from data collection to analysis, evolved over the period of study in response to my own experiences and as emerging guidance was published. For example, in an article published online a short time before I completed my data collection, Cleland and MacLeod provided a brief typology of digital ethnographies in the context of HPE (2022). I have used a research design that best aligned with what they described as network ethnography, due to a focus on socially and materially entangled practices. However, whereas the example they

provided drew on texts and other online resources alone, I have also used digital strategies to collect data from human participants through focus groups, observations, and interviews. Due to the inconsistent use of specific methods labels for this type of research, I have used the general term of digital ethnography, or digitally-mediated ethnography, to describe the approach for this qualitative research study.

In brief, this ethnographic study was conducted using online methods of data collection, including observations, interviews with video reflexive elicitation, and focus groups with synchronous and asynchronous elements. Data analysis was facilitated by repeated viewing of recordings to move through initial coding and generation of ongoing memos through NVivo qualitative data analysis software. Abductive analysis was informed by constant comparative analysis (Boeije, 2002; Strauss & Corbin, 1998), 'description, analysis, interpretation' methods (Wolcott, 1994), and autoethnographic reflection using the sociomaterial principles of relationality and symmetry between human and non-human elements as sensitizing concepts (Hultin, 2019). The design and conduct of the research was interpretivist and situated within a relational onto-epistemology of becoming (Barad, 2003, p. 829), as will be explained in more detail in Chapter 3. In collecting and interpreting the data from the study participants, the contexts in which they worked, and the materials within those contexts, my role as researcher was to look for the individual activities, technologies, materials, and cultural considerations in the online teaching practices. The iterative abductive coding and analysis guided by heuristics of sociomaterial research (C. Adams & Thompson, 2011, 2016) led to interpretation of how the elements acted together and upon each other as intra-actions to create the teaching practices in this study. I provide further details of the methodology and methods of the research in Chapters 3 and 4.

1.7 Reflexivity Thread

My work as an academic medical librarian who specializes in evidence synthesis support has been thoroughly entwined with the decisions I made leading up to and throughout my doctoral journey. Furthermore, my view of the world, which led to my ontological and epistemological choices, has been informed by elements of my personal, professional, and academic experiences.

As a mid-career academic health sciences librarian teaching evidence synthesis methods and conducting evidence synthesis research, I have an insider perspective on the topic of my doctoral research. I have participated in local, national, and international forums with other academic librarians and researchers doing similar work including research and interest groups related to evidence synthesis methods. I have also been privileged in my position as an academic librarian with faculty status to be actively involved with international evidence synthesis methods organizations through attendance at Cochrane Colloquia and numerous symposia with clinical and academic researchers. This position within the community and culture I am researching has allowed me to see and recognize a shared interest in improving practices to support learners working on evidence synthesis projects. Furthermore, concurrent with this doctoral research, I have continued research, teaching, and quality improvement initiatives related to conducting and supporting evidence synthesis research in academic libraries. For example, I have been part of the teaching team of the Canadian Evidence Synthesis Institute three times between 2022 - 2024. This four-day, online professional development workshop targeted to academic librarians outside the health sciences has had a profound impact on the way I have taught and thought about online teaching of evidence synthesis methods as I've had the opportunity to observe colleagues teaching related material. I am also part of a research team that surveyed health sciences librarians who teach evidence synthesis searching and methods to groups of learners with the objective of inventorying instructional content and teaching approaches (Bradley-Ridout et al., 2024). I have contributed to a working group that developed a survey of Canadian library workers across disciplines regarding their professional development needs for the support provided for evidence synthesis research (Premji et al., 2024).

My intersecting identities as a middle-class, white, neurodivergent, cis-gender queer woman who is a settler in Mi'kmak'i has informed my relationship with both the students I work with and the librarian participants of my study, and also has impacted my perspective on the dominant paradigms in health research and higher education. Many of the academic health librarians from across Canada share my relatively privileged demographics, including education and professional experience, which can help in building trust and mutually contributing to the research. On the other hand, I am aware that those same markers of relative power and privilege undoubtedly affect how learners have perceived and responded to me and other white, middle-class, female-presenting academic librarians during instructional encounters. Librarians have

roles as experts in comprehensive search methods while simultaneously being outsiders to the disciplinary faculty who supervise and teach the learners we support, has led to tensions in power dynamics related to authority, respect, and professional identity that I have witnessed through my professional work. Meanwhile, my work at the university as a librarian faculty member with a focus on instruction can feel invisible amidst the many competing priorities of library and university leadership. My choice of research topic and approach has reflected personal insights regarding these constraints as well as perceptions of the invisible labor inherent in adapting teaching to the online environment and in developing the expertise related to knowledge synthesis methods. These ideas combined with my philosophical worldview emphasizing relationality and the interconnectivity of people and the non-human elements with which we co-exist. Together, these elements have led to me becoming a sociomaterial researcher, which has in turn shaped the processes, practices, and output of my research, much as Hultin described regarding their doctoral research (2019). Materiality also has played a significant role in the personal and philosophical perspectives I bring to my research, which I attribute to past careers and hobbies that emphasized the intra-actions of material and embodied practices. A decade as a professional baker, years as a carpenter's assistant, and half a lifetime making pottery has given me a deep appreciation for the ways that tools, physical materials, practical training, and individual experience come together through labour. Regardless of whether the outputs of that work are evidence synthesis research, pastries, cups, training material, or more evidence-informed health care professionals, the contributions of the social and the material are tangled and mutually reciprocal. Throughout this dissertation, I have reflected on the ways that my position in academia and the world impacted my research decisions, from planning, to conducting, analyzing, reporting, and disseminating. In my entangled role with the relational nature of the research, these positions and experiences have shaped what and how I have studied.

1.8 Dissertation Outline

This dissertation consists of eight chapters, including this introduction and followed by the literature review, description of the theoretical and conceptual frameworks, and details of the research approach.. The empirical findings have been reported in Chapters 5, 6, and 7, with each chapter addressing one of the research questions, respectively. I have included relevant details

from the conceptual and theoretical frameworks as well as discussion contextualizing the findings in each of the empirical chapters.

Chapter Two describes the literature about online teaching of evidence synthesis methods by librarians in more depth. In addition, I have provided brief context regarding librarian involvement in teaching research skills and information literacy to learners in academic health programs. The literature review chapter provides additional background regarding the roles of information specialists with evidence synthesis research, teaching health professions learners, and online education, to establish an understanding of the expertise of librarians.

Chapter Three justifies the theoretical and conceptual framework choices employed in the planning and conducting of the research. As sociomaterial approaches have had scant applications in empirical research related to online library instruction in health disciplines, I drew on the related literature from other fields using similar theoretical frameworks. The conceptual framing of the study explored invisible labour and black boxes of assemblages of practices in adjacent disciplines such as HPE, online teaching in higher education, and other types of instruction in academic libraries. Similarly, I have described the choices around the methodological framing of focused, digitally-mediated ethnographic approaches, informed by related methods used in video-reflexive ethnography and autoethnography.

Chapter Four provides details on the ethical considerations and methods used to collect the data underpinning the study and the analytical approaches that guided interpretation. In this chapter, I described planning and conducting two online focus groups, observing eight video-conferenced research consultations, and interviewing five librarians via Zoom. I provided the research data management plan to account for how, where, and why the electronic data from the study has been transmitted and stored. I have included the approvals and revisions from the institutional research ethics board in this chapter and the relevant appendices. The use of constant comparative approach, framework analysis, and qualitative content analysis methods, informed by the theoretical framework previously described, have been elaborated in the context of the methodological choices for the research design.

Chapter Five describes the findings of the study related to the characteristics of the participants and the resources and teaching approaches they interacted with through their online teaching

practices. I have provided the context for subsequent analysis by developing a relational model adapted from the technological, pedagogical, and content knowledge (TPACK) framework (Koehler & Mishra, 2005; Mishra & Koehler, 2006). Based on the adapted model, I presented a matrix of practices, tools, texts, and techniques and followed one type of actor, the library evidence synthesis guide, to understand the material and immaterial entanglements of technological, pedagogical, review methods, and organizational elements. In Chapter 5, I have addressed the first research question regarding the social and material elements in online teaching practices by providing an account of the library guide as an actor across networks. I have shown how library guides perform through assemblages as mediators of the teaching encounters between librarians and learners.

Chapter Six provides a composite accounting of the teaching practices during online evidence synthesis methods research consultations to illustrate the many decision points and choices made by the librarian or other actors in the assemblage of the online evidence synthesis research consultation. By following the story constituted through the intra-actions of the librarians, technologies, practices, and learners, these findings highlighted the invisible labour in teaching practices mediated by the online environment. This account addresses the second research question regarding the types of labour revealed by the sociomaterial elements assembled in the teaching practices. A version of the findings described in this chapter have been published in a peer-reviewed, open-access article in a special issue on teaching in academic libraries in the *Canadian Journal of Academic Librarianship* (Parker & Snelgrove-Clarke, 2023).

Chapter Seven focuses on the ways that tensions in the role and identity of the librarian with regards to evidence synthesis methods instruction surfaced throughout the findings. I used the sociomaterial practice of looking for disruptions and break downs in processes and underlying infrastructures to understand the configurations of human and non-human actors (Haider & Sundin, 2023). I showed how the tensions between librarians' teacher, researcher, and service provider identities were performed within the assemblages of material, technology, and immaterial practices. Chapter Seven addressed the third research question regarding the production of labour through the sociomaterial actors and teaching practices.

Chapter Eight concludes the dissertation by highlighting the main contributions of the study. I have drawn together the implications from the findings reported in Chapters 5, 6, and 7. In this concluding chapter I have described the strengths and limitations of the research, suggested future directions for research, and highlighted implications for practice and research. I have proposed that by considering the myriad of contributing and contextual factors and elements, instruction and library service providers, including librarians and library administrators, can better plan and communicate the ways that academic health librarians' online teaching can impact evidence synthesis research capacity.

CHAPTER 2 LITERATURE REVIEW

2.1 Chapter overview

Librarians have been well-situated to teach learners the fundamentals of evidence synthesis methods, especially comprehensive searching, when the research has been led by students. To support this argument, I have described the evidence synthesis methods instruction provided by librarians and summarized the research and professional standards regarding academic librarians as teachers. This literature review provides a summary of published evidence related to librarians teaching systematic searching and other aspects of evidence synthesis methods in online environments. I then further explored the research related to librarians' roles in the conduct of evidence synthesis research and the impacts of their contributions on research outputs and on librarian workload. I reviewed librarians' role in teaching methods to learners. I have contextualized the teaching role of academic health librarians by highlighting the predominance of teaching searching in the context of evidence-based practice (EBP) over information literacy within health libraries. I have provided additional context online modes of academic librarian teaching, including through the format of research consultations for supporting learners. I have presented the literature on how librarians and others have provided in-person and online instruction to students to support searching skills for EBP and evidence synthesis research.

2.2 Literature Review Approach

I employed a narrative approach to synthesize relevant evidence related to the research questions, providing a description of the context in which librarians teach evidence synthesis methods online (Greenhalgh et al., 2018). This exploratory literature review demonstrated appropriate non-systematic methods when there has been no published literature directly addressing the specific nature of librarians' labour and teaching practices regarding online instruction of evidence synthesis methods. Scoping reviews conducted on the topics of instructional approaches for evidence synthesis methods (Premji et al., 2021), teaching literature searching (Hirt et al., 2020), and assessing individual research consultations generally (Stapleton et al., 2020) have described studies in related areas of library and research methods instruction. There was a paucity of literature specifically related to librarians' online teaching practices around evidence synthesis methods.

The literature in this chapter has come from a variety of sources searched non-systematically. This included iterative database searches from: Scopus; Library, Information Science & Technology Abstracts; Library Literature & Information Science Full Text; and MEDLINE. Information retrieval also included citation chaining from known articles using Scopus and Google Scholar, as well as following relevant #medlibs and #meded scholars on X (formerly Twitter). Additional information has come from research collaborations related to teaching evidence synthesis methods and peer reviewing for journals that publish related studies, such as Journal of the Medical Library Association (JMLA), Journal of Evidence-Based Medicine (JEBM), BMC Medical Education, and BMC Medical Research Methodology.

The included publications were selected based on relevance to the contexts of academic library instruction, librarian contributions to supporting or teaching evidence synthesis methods, and the use of evidence synthesis projects in academic programs. They consisted of several types of articles such as commentaries, book chapters, reviews, program descriptions and evaluations, and cross-sectional studies. Because they were more descriptive than evaluative, I did not formally appraise the methodological rigor of the studies. Formalized methodological appraisal would have been beyond the scope of this thesis literature review. Furthermore, the low quality of the evidence, in terms of risk of bias, would not be considered unusual for literature in the interdisciplinary fields of this research. The available evidence has helped provide an understanding of the material, contextual, and pedagogical background related to online teaching of evidence synthesis methods.

2.3 Librarian Instruction of Methods for Evidence Synthesis in Online Environments

Existing literature on online instruction by librarians related to evidence synthesis methods has focused on describing services, workshops, courses, and digital learning objects (DLO) such as online library research guides (Fuller et al., 2021; Hayden & Premji, 2022; Lee et al., 2021; Poole, 2021; Riesen et al., 2024). Librarians at many institutions have offered online evidence synthesis training, yet only three reports have been published to date describing these training initiatives. In this section, I have highlighted the characteristics of these three online or hybrid (online and in-person) workshop series delivered by librarians in Canada and England. The

characteristics of the workshops, including details of the participants, format, and assessment for each workshop have been summarized in Table 2.1. The program outlines have been reproduced in Table 2.2. These reports have expanded on other work regarding the characteristics of online instructional resources for systematic review methods more generally (Parker et al., 2018) and descriptions of in-person instruction designed and delivered by librarians (Lenton & Fuller, 2019; B. S. McGowan et al., 2021; Pell, 2017). Instructional initiatives reported in the literature that have been offered in-person or led by non-librarians have been described in Section 2.7.

Table 2.1 Online evidence synthesis training: Characteristics of workshops from three institutions

Report	**Hayden and Premji (2022)**	**Fuller et al. (2021)**	**Poole (2021)**
Institution	University of Calgary	University of Toronto	King's College London
Instructors	Not reported; two librarians authored the report	Four librarians and a library school graduate student adapted material from in-person workshops	Not reported; one librarian authored the report
Reporting period; participant numbers and characteristics	In-person version: Summer 2019; 40 participants; 50 participants in one session for virtual	June & July 2020; 2 iterations; 152 registered (~37 attendees per synchronous session)	July 2019 – March 2020; 17 iterations; students (n = 123)
Format	Three 2 – 2.5 hour virtual synchronous sessions through Zoom (adapted from in-person workshops),	Three two-hour synchronous online sessions, plus seven asynchronous online modules hosted in Quercus LMS	One three-hour in-person session, plus compulsory Advanced Health/Systematic Review e-learning

Report	Hayden and Premji (2022)	Fuller et al. (2021)	Poole (2021)
	plus Google Docs and Google Forms		pathway hosted in Moodle LMS
Student assessment	Workshop evaluation and one-minute assessment form for in-person workshops; post-workshop survey for virtual	Pre- (n = 224) and post- (n = 90) class self-assessments; optional reflection-based assignment (n = 12; required to receive credit)	E-learning module included initial self-diagnostic quiz and final quiz; in-class feedback via Padlet; critical incident questionnaire via Microsoft Forms (87 responses); Impact questionnaire (30 responses); Impact interviews (n = 3)
Program/Instructor evaluation	In-person workshops evaluated through observational study with 2 instructor/observers recording notes on checklist for each slide	Number of participants; format and delivery questions in the student self-assessment; informal feedback and observation	Not reported

Table 2.2 Library-led online evidence synthesis training: Program outlines

Hayden and Premji (2022)	**Fuller et al. (2021)**	**Poole (2021)**
Workshop 1: Setting Yourself Up for Success Introduction to knowledge synthesis and review types Researchable question and question frameworks Protocols Inclusion/exclusion criteria Analyzing/mining seed articles Subject headings/keywords (p. 128)	Part I: Structured Approach to Searching the Medical Literature for Knowledge Syntheses 1. Identify the key differences between systematic reviews, scoping reviews, and literature reviews 2. Incorporate tools and resources for proper reporting and management of their review 3. Turn a research question into a searchable question 4. Identify databases for their review and explain when to use them 5. Practice using an objective, structured method for developing sensitive search strategies required for knowledge synthesis 6. Apply a structured approach to searching their question in OVID Medline (Appendix 3)	E-learning objects: 1. Starting your research and exploring frameworks 2. Exploring databases 3. Ways of searching 4. Searching in action 5. Combining your searches with OR and AND 6. Using limits in your searching 7. Accessing an article's full text 8. (Systematic Reviewers) Using methodological filters 9. (Systematic Reviewers) Searching for Grey Literature 10. (Systematic Reviewers) Reading and Recording Search Strategies (p. 70)

Hayden and Premji (2022)	**Fuller et al. (2021)**	**Poole (2021)**
Workshop 2: Developing Your Data Collection Strategy Components of a systematic search Building a comprehensive search in one database (APA PsycInfo via OVID) Testing the search against seed articles Saving, editing searches; data management (p. 128)	Part II: Beyond MEDLINE, Translating Search Strategies for Knowledge Syntheses 1. Delve deeper into the advanced features of interfaces and databases which allow for editing and refining a search strategy 2. Translate and execute structured search strategies using different databases, including OVID Embase, and Ebsco CINAHL, CENTRAL on Wiley (if we have time!) 3. Prepare database search strategies and compose search methods, such that they can be repeated and to ensure proper reporting (Appendix 3)	By the end of the [in-person] intervention learners will be able to: 1. Create a focussed search question and identify key concepts 2. Construct a search strategy using advanced searching techniques demonstrating an understanding of the value of keywords and subject heading searches 3. Appraise and evaluate their own work and the strategies of others 4. Identify types of grey literature used in published systematic reviews, and communicate this to their peers. 5. Demonstrate an understanding of the importance of matching an information need with an appropriate product by selecting an appropriate grey literature source for their
Workshop 3: Next Steps: Translating, Tracking, Reporting, and Study Selection Translating a search from APA PsycInfo to Academic Search Complete (EBSCO)	Part III: Going Grey and Supplementary Search Techniques 1. Identify potential sources for bias in the search and develop strategies to mitigate them 2. Define what grey literature is (and what it is not)	

Hayden and Premji (2022)	Fuller et al. (2021)	Poole (2021)
Overview of supplementary searching strategies Study selection Reporting expectations using PRISMA (p. 128)	3. Develop a strategy for identifying appropriate sources of grey literature 4. Utilize a methodological, transparent approach to searching sources of grey literature 5. Demonstrate best practices for supplementary search techniques including hand-searching and reference tracking 6. Integrate strategies for incorporating grey literature and supplementary search techniques into the review workflow 7. Evaluate search methods to identify proper reporting (Appendix 3)	systematic review topic, and undertaking a search 6. Engage with a community of practice; post on the discussion forum and propose answers to questions from their peers 7. Know where to go for further information and support (p. 70)

The first report (Fuller et al., 2021) communicated an online update of a workshop series from the University of Toronto that was initially delivered in-person (Lenton & Fuller, 2019). A second report (Poole, 2021) described a hybrid classroom on systematic searching for evidence synthesis research. These two workshop descriptions emphasized active learning and reported participant satisfaction with the online aspects (Fuller et al., 2021; Poole, 2021). Both programs included asynchronous and synchronous components (also known as 'flipped classrooms') (Fuller et al., 2021; Poole, 2021). The workshop series reported by Fuller and colleagues (2021) included online synchronous sessions while the workshops described by Poole (2021) included

an in-person synchronous session. The third report by Hayden and Premji (2022) provided an in-depth description of the modifications made to their in-person systematic review workshop series in order to offer it virtually after the switch to remote instruction in 2020.

Each workshop description reported on the learner assessment and program evaluation outcomes. Fuller and colleagues (2021) found learner responses, engagement, and improvement to self-assessed confidence were comparable to the previous iterations of the workshops series that had been offered in-person (Lenton & Fuller, 2019). Poole (2021) indicated that the workshop evaluations were used to further develop the activities for the in-person segments. Themes from comments regarding the entire workshop series reflected improved confidence in systematic searching, satisfaction with the flipped classroom format, and appreciation for opportunities to apply learning through in-class activities (Poole, 2021). Hayden and Premji (2022) incorporated feedback and observations from the in-person pilot to revise their workshop and adapt it to virtual delivery. Material and activities from all of these workshop series, as well as recommendations for future offerings, were shared through the publications and their appendices (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021).

Materials and technology were featured in the three workshop descriptions, which facilitated understanding the pedagogical approaches and the content covered. The publications focused on the instructional processes (program development and delivery) and products (learner satisfaction, feedback, and self-assessments) as well as including author reflections on what worked or did not, and what would be modified in future sessions, based on their teaching experiences (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). The authors also shared their teaching materials, such as workshop activities, (Hayden & Premji, 2022, pp. 140–142), self-assessment and reflection questions (Fuller et al., 2021, appendices 1 and 2), workshop learning objectives (Fuller et al., 2021, appendix 3), and screenshots of discussion boards, online modules, and select slides (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). Each report described the online teaching platform and tools used during the respective workshops. For example, Hayden and Premji (2022) taught over Zoom, including chat, breakout rooms and integrated polls, and used Google Docs for collaborative and small group activities. For the asynchronous, flipped elements of Poole's hybrid instruction, the e-learning modules were hosted in the institution's virtual learning environment within Moodle (p. 70), content was linked

back to the library guide on evidence synthesis methods (p.73), and students provided feedback and posted questions on Padlet (2021, pp. 74–75). Meanwhile, Fuller and colleagues (2021) provided access to e-learning modules created with Articulate Rise 360 (p.102) through the institutional learning management system (Quercus) and referenced learning material on the library evidence synthesis guide. The synchronous sessions for the University of Toronto workshops were conducted through Blackboard Collaborate, making use of the chat, drawing, and breakout rooms features, as well as Google Docs, for interactivity (Fuller et al., 2021, p. 103). Hayden and Premji (2022) described collaboratively managing the online chat and other communication tools during the synchronous sessions.

The three reports covered the workshop objectives and the content, which focused on multiple aspects of systematic searching and touched on other related steps of the review process. Searching content included developing the search strategy, translating searches to run in other sources, searching grey literature, using search filters, and reporting the search, as shown in Table 2.1 (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). While all three series covered review question formulation, the two series from University of Calgary and University of Toronto also included overviews of different types of review methodologies, such as systematic, scoping, and 'literature' reviews (Fuller et al., 2021; Hayden & Premji, 2022). In addition, Hayden and Premji incorporated elements related to developing review protocols, and determining inclusion and exclusion criteria (Hayden & Premji, 2022). The range of technologies, materials, and content featured in these workshop descriptions reflected variation in teaching practices and affordances of the specific communication and teaching technologies available at each institution.

Web-based resources such as library guides have also contributed to librarians' online teaching by serving as platforms for educational and reference material and hosting links to curated library resources. One example comes from Poole (2021): the asynchronous components of the flipped learning workshop material were cross-linked to the library evidence synthesis guide (p. 73). Many libraries have created web-based guides devoted to evidence synthesis methods and/or systematic searching for evidence syntheses. Researchers have analyzed selected library evidence synthesis guides to catalogue their instructional content (Lee et al., 2021). The content analysis study examined the online library guides focused on systematic review methods from 18

universities. They categorized the guide contents based on the resource types and the coverage of the steps of systematic reviews that were included or linked. Lee et al. grouped resource types as information about tools, services to support the review process, or educational resources, created internally or externally. The authors found that the resources on these library guides were overwhelmingly informational and focused on the searching step of the review process. The steps included: Introductory, Guidelines, Planning phase, Conducting searches, Reference management, Screening, Critical Appraisal, Data extraction, and Reporting (Lee et al., 2021). Eight of the nine review steps were represented by several types of resources, with the exception of the Guidelines step. Educational guidance on the use of tools was not present in most guides in the sample. The authors concluded that the library guides in their selection were mainly used as information and link repositories rather than educational resources in themselves (Lee et al., 2021, p. 73). Outside of the 18 analyzed guides, Parker and Neilson (2015) have reported on the quality improvement of a multi-modal online training toolkit made available on their library evidence synthesis guide. They designed the toolkit to assist learners in translating systematic searches from one search interface (for example, PubMed) to another (for example, CINAHL through EbscoHost). Based on a trial of the video tutorials, screen captures in a PDF guide, and a "cheat sheet" handout, they collected feedback from 10 learners to improve comprehension and usability of the content and toolkit format (Parker & Neilson, 2015). Evaluations of online digital learning resources have been informative regarding the types of materials that librarians have made available to learners and have been indicative of the development priorities centering on user experience.

Outside of program evaluations and quality improvement papers, there have been few published acknowledgements of librarian online instruction of evidence synthesis methods. In a book directed at librarians supporting evidence synthesis, Roth (2022) wrote guidance for librarians considering or developing instruction for review methods. Drawing on her own and colleagues' experience teaching about the evidence synthesis research process, Roth provided recommendations and resources for teaching, both in-person and online (synchronous and asynchronous). One example of the latter included recording online synchronous teaching sessions with considerations for accessibility and usability for learners. With an emphasis on developing appropriate learning outcomes, customizing instruction to the target audience, helpful suggestions of content, and links to templates and reusable slide decks, Roth's chapter (2022) has

added to the guidance available to librarians engaged in this type of instruction. The brevity of the chapter and the lack of empirical evidence to explore the complexities of librarian instruction for evidence synthesis methods leaves a gap in knowledge.

Bradley-Rideout and colleagues (Bradley-Ridout et al., 2024) conducted a survey in 2022 which inventoried health sciences librarians who teach systematic searching for evidence synthesis methods to groups of learners. Respondents were asked about the formats of instruction (online, in-person, and/or hybrid) and 87% selected online as at least one method used. The forthcoming report of this study does not specifically focus on online teaching practices, but across all modes of instruction librarians reported using active learning strategies to teach systematic searching concepts and skills. Lectures or reference to external resources were used to integrate instruction related to other steps of the review process. A minority of the survey respondents indicated using instructional design frameworks (n = 19 of 55). Similarly, formal assessments of learner outcomes, such as graded assignments (n = 21 of 55) or pre- and post-tests (n = 5 of 55) were not frequently used by survey respondents. Self-reporting for student assessment was reported by 21 of 55 respondents. This cross-sectional survey captured prevalence of a range of instructional approaches from librarians across multiple institutions, adding to what is known about the formats, content, and pedagogical approaches used across in-person and online teaching. When asked about barriers and facilitators to teaching evidence synthesis methods, open-ended responses offered insights into issues around workload, expectations from faculty, students, and library administration, and acknowledgement that individual research consultations supplemented the reported group instruction strategies (Bradley-Ridout et al., in press). Further explorations of the complete survey responses available through Open Science Framework (https://osf.io/7h3pt/) for the 54 survey respondents who indicated online teaching of systematic searching has given additional insight into the teaching practices, content covered, and materials used, including comparisons with the teaching strategies reported for in-person and hybrid instruction (Bradley-Ridout et al., 2023). In the complete survey data, librarians reported similar content and teaching approaches for online teaching as those described in the reports of online workshops from Table 2.1.

While the literature has included critical consideration of the barriers and advantages resulting from the online delivery, none of the papers have specifically focused on the online teaching

practices; that is, the "sayings, doings, and relations" in online teaching of evidence synthesis methods (MacLeod et al., 2019, p. 178). Furthermore, in all these papers, despite the inclusion of teaching materials and discussion of the respective online tools and teaching platforms, authors have emphasized the human (both learner and librarian) experiences but did not unpack the complex relations between those experiences and the technologies with which the instructors and participants engaged.

Another area underexplored by the literature included the ways that librarians limited, or did not limit, their instruction to the searching step of the review process. For example, the outlines from the workshops encompassed introduction to knowledge synthesis methods, review question development, as well as many elements regarding searching for evidence, as shown in Table 2.1 (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). Without observations of how methodological content in one objective was related to other content and workshop objectives, the impression of the workshops' delivery appeared more linear than it may actually have been in practice. This omission has neglected the complexity of systematic searching skills and knowledge and the intertwined nature with the other steps of evidence synthesis research processes. There are no known studies describing in-depth the online teaching practices of academic librarians supporting learners in medical and health professions programs who are conducting evidence synthesis research.

2.4 Health Sciences Librarian Roles in Evidence Synthesis Methods

Extensive literature supporting the importance of librarians and information specialists as expert searchers has illustrated the complexity of systematic searching practices and the specialized skills such searching requires. Since McGowan and Sampson's (2005) early call that comprehensive reviews need expert searchers' involvement, many researchers have examined the impact of that recommendation by looking for correlations between the reported involvement of a librarian or information specialist and the overall quality of the conducting or reporting of the review methods (Koffel, 2015; Koffel & Rethlefsen, 2016; Meert et al., 2016; Rethlefsen et al., 2014, 2015; Ross-White, 2016). Many more recent cross-sectional studies of reviews from individual institutions, within reviews produced by particular research groups, or in the evidence synthesis publications on specific topics, have catalogued the reporting of librarian involvement

and the corresponding characteristics of the reported review methods and search documentation (Aamodt et al., 2019; Eskrootchi et al., 2020; Pawliuk et al., 2023; Salvador-Oliván et al., 2019). Librarian contributions noted in these publications ranged from mentioning librarian involvement or support in the methods section, to named and unnamed acknowledgement, to co-authorship of the article. These investigations have found that increased extent of involvement, usually reflected in co-authorship, has been correlated with better reporting of the search strategies employed as well as with improved reporting of other elements of the review, in comparison with reviews with little or no mention of an information specialist (Brunskill & Hanneke, 2023). The recommendations for co-authorship laid out by the ICJME have stated that all authors share responsibility for the entirety of the conduct and reporting of the research (International Committee of Medical Journal Editors, 2024), suggesting librarians who were co-authors would have had more influence over the details included in the final paper.

The roles of librarians in systematic searching for evidence synthesis research has been explored extensively in the literature. Spencer and Eldredge's (2018) scoping review provided a benchmark of the research related to librarian roles in systematic review research, detailing findings from 310 papers published up to 2017. They described many distinct roles filled by librarians, including, but not limited to, the aspects of searching for and handling records: managing citation, removing duplicate citations, evaluating search strategies, indexing database terms, peer reviewing search strategies, reporting and documenting search methods, using and developing search filters and hedges, searching databases, general expert searching skills, searching grey literature, developing search protocols, documenting search strategies, creating subject- or topic-specific searches, and selecting sources. In addition to the search and citation management roles, Spencer and Eldredge categorized literature regarding librarian contributions to other aspects of the review process and projects: formulating review questions, planning the review, developing the review protocol, and facilitating access to technological and analytical tools to assist with different parts of the review project. This list of activities that librarians have been reported to contribute to evidence synthesis research was mirrored in the content of the workshop outlines from the online evidence synthesis workshops listed in the previous section (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). Spencer and Eldredge also identified four publications referring to the role of librarians in teaching review methods to other librarians

or to researchers (2018). These and more recent literature relating to librarians teaching review methods will be covered in more depth in Section 2.7.

Librarian roles in evidence synthesis research has not been limited to searching and managing citation records. Spencer & Eldredge's (2018) scoping review reflected literature of librarian support provided through formalized systematic review services, librarians using systematic review approaches to investigate questions related to librarianship, and librarians' involvement in conducting methodological research. While these roles were not directly reflected in the outlines of the workshops summarized in Table 2.1, they indicate that additional labour has been devoted to developing and maintaining librarian expertise related to evidence synthesis methods. Descriptions of evidence synthesis training *for* librarians demonstrated the effort put into building capacity within the profession to support evidence synthesis research (Conte et al., 2015; Foster et al., 2018). This training responded to the methodological and interpersonal challenges librarians face in evidence synthesis collaborations, as identified through a 2017 survey (J. Nicholson et al., 2017). The challenges identified included: handling broad or ambiguous research questions, undefined inclusion criteria, and lack of researcher or student knowledge regarding the methodology.

The plethora of roles and activities for librarians in evidence synthesis research has workload implications. Researchers have measured the time librarians have spent on evidence synthesis projects. For example, Bullers and colleagues (2018) used survey data to investigate the amount of time librarians spent on systematic review tasks. They found that librarians participating on review teams spent an average of nearly 27 hours on various tasks including consulting with the rest of the review team, developing and running the systematic searches, and documenting the methods employed. Similarly, institutions have used administrative data to report the average searching time for systematic reviews projects as 23 hours (Gann & Pratt, 2013) and 29 hours (Kallaher et al., 2020) per project at the University of Texas (UT) MD Anderson Cancer Center and Cornell University, respectively.

Not all of librarians' work on evidence synthesis research has been measured. Ross-White's (2021) editorial on the invisible labour inherent in the expert searcher role touched on the frequently unacknowledged work and skills involved in participating on research teams to

complete systematic searches. The hypothesis that librarian labour has been overlooked was substantiated by a study tracing acknowledgement of librarian contributions in review protocol methods sections, acknowledgments, and authorship (Brunskill & Hanneke, 2023). The study found that the attribution of searching expertise in review protocols was frequently absent in final published reviews (Brunskill & Hanneke, 2023).

Workload challenges and lack of acknowledgement for skilled contributions may be related to professional burnout. A recent study showed that burnout was not uncommon for librarians who contributed to systematic reviews (Demetres et al., 2020). Furthermore, those who identified as reference librarians, as opposed to those who focused on evidence synthesis work, were more likely to have experienced negative effects from the demands of supporting evidence synthesis research (Demetres et al., 2020). Juggling responsibilities, including teaching evidence synthesis methods, has added complexity to the already demanding competencies required to support and contribute to evidence synthesis projects (Townsend et al., 2017).

The literature described here highlighted the librarian competencies involved in supporting evidence synthesis research and the work of librarians as contributors to this type of research. This literature also demonstrated a substantial focus on librarians' work through direct involvement as collaborators on evidence synthesis projects. When supporting students working on evidence synthesis projects, librarians have provided indirect contributions through teaching and advising, as described in the next sections.

2.5 Evidence Syntheses as Student Academic Outputs

In academic health libraries, librarians have teaching and reference responsibilities to the health sciences students with whom we work, including when they are completing evidence synthesis projects. When students conduct evidence syntheses as part of their academic deliverables, the learners themselves must be responsible for all aspects of the research. In that context, librarians have shared searching expertise through consultation rather than collaboration. Student involvement in evidence synthesis research has translated to demand for teaching about systematic searching and related methods (Riesen et al., 2024; Wissinger, 2018). In recognition of academic learning objectives and to maintain academic integrity, librarians supporting these students have taught and provided advice regarding the methods, including systematic searching

(Hanneke, 2018; Wissinger, 2018). Examination of librarians' evidence synthesis guidance for students has become increasingly relevant as students and health professions trainees have been encouraged and expected to publish reviews.

The topic of writing evidence synthesis papers as part of the academic process has been documented extensively in a range of disciplines and geographies, including dentistry in Brazil (Dotto et al., 2020), biomedical doctoral programs in Europe (Puljak & Sapunar, 2017), nursing PhD theses from Scandinavia (Olsson et al., 2014), and graduate programs more generally (Felizardo et al., 2020). These studies reported the prevalence and characteristics of synthesis research output from graduate programs. Researchers have also published commentaries and reflections on the benefits for students of writing evidence syntheses, such as exposure to a range of research methods (Christian & Palokas, 2018), building an international research network, and facilitating a relatively low-cost dissertation (Sambunjak & Puljak, 2010). Furthermore, some learners have written of their experiences working on reviews as part of their academic programs and reflected on the advantages of working with experts in the topic area and learning skills to evaluate research methodologies (Leung et al., 2017), as well as lessons regarding the extent of the work involved in systematic reviews (Daigneault et al., 2014), and the significant role of good information and research data management practices (Bonfield et al., 2018). In an article titled "All Health Researchers Should Begin Their Training By Preparing At Least One Systematic Review", Mahtani (2016) emphasized the impact of systematic reviews on clinical decision making, reducing research waste, and contextualizing primary research proposals. In response to this and similar directives, texts describing the process for students have been made available providing tips and step-by-step instructions for completing evidence syntheses as academic deliverables (Boland et al., 2014; Choi et al., 2019; Pickering & Byrne, 2014).

Despite the availability of textual guidance, students and other novice researchers have faced challenges when embarking on projects using evidence synthesis methods (Ayala et al., 2022; Chalmers, 2005; Krnic Martinic et al., 2019). For example, students have confronted conflicting views on whether synthesis research qualified as original research and valid academic output (Meerpohl et al., 2012; Puljak & Sapunar, 2017). In 2005 Chalmers warned that dismissal of evidence synthesis as a valid research approach within academia was negatively impacting the use and uptake of knowledge from those reviews (Chalmers, 2005). Since that time, the

legitimacy and capacity of robust reviews to guide decision making in clinical and policy environments has improved, yet consensus remains elusive. A recent cross-sectional study (Krnic Martinic et al., 2019), updating a previous study (Meerpohl et al., 2012), examined journal editors' low opinion regarding systematic reviews as original research and revealed that little had changed in 10 years. Regardless, systematic reviews were widely published and were considered valuable research contributions by the respondents to the survey (Martinic et al., 2019). Findings of ambiguity in opinions and practices mirrored those revealed in a survey of doctoral program directors in Europe where slightly more than half of respondents belonged to programs that did not accept systematic reviews as a research method to be used in a PhD thesis (Puljak & Sapunar, 2017). As with the journal editors, doctoral program directors did not consistently view systematic reviews as original research (Krnic Martinic et al., 2019; Meerpohl et al., 2012; Puljak & Sapunar, 2017). Nonetheless, as evidenced by the literature reporting the prevalence of systematic reviews as academic outputs in doctoral programs, and the findings of a systematic map of the literature, evidence syntheses have been extensively integrated into academic programs, especially at graduate and postgraduate levels (Dotto et al., 2020; Olsson et al., 2014; Pickering & Byrne, 2014; Sambunjak & Puljak, 2010).

Additional barriers for early career researchers were identified by a scoping review by Ayala and colleagues (2022). The eight included studies published between 2013 – 2019 revealed common issues such as access to adequate methodological resources and support, uncertainty regarding the methods of the whole process or individual steps, and the amount of time and effort required. Five of the eight included studies identified learning curve challenges for students who were not previously familiar with synthesis methods. The scoping review also identified facilitators to conducting evidence syntheses, which included access to training, mentoring from experts such as statisticians and librarians, and access to the necessary tools, such as MEDLINE. The barriers and facilitators identified highlighted the need for training, supportive technology and tools, and acknowledged that librarians played a key role in facilitating learning (Ayala et al., 2022). To understand how librarians have responded to this need for evidence synthesis methods training and support, in the next section I have elaborated on the organizational and social contexts of academic health library instruction.

2.6 Academic Health Librarians and Teaching

There are many similarities and differences between health librarians' teaching practices and those of other academic librarians. In this section I have focused on the teaching practices that have been most relevant to the context of teaching evidence synthesis methods online. As noted in the introductory chapter regarding the context of the research, the organizational structures in which Canadian academic health librarians work have been varied. Health librarians have been frequently positioned as liaison librarians with responsibilities to departments and programs that train medical and health professions learners. Some academic libraries in Canada and elsewhere have teams of librarians who have been responsible for instruction across Faculties and disciplines. Regardless of organizational structure, librarians who teach in health sciences have demonstrated unique understandings of library instruction mediated by the paradigm of EBP (A. Hicks et al., 2023). Health librarians' teaching practices have emphasized EBP over information literacy, utilized various modes and formats of engaging with students, and focused on developing skills for searching for health research publications.

2.6.1 Information literacy and evidence-based practice instruction

Academic libraries have increasingly recognized the impact that librarians can have on learners through instruction related to searching for and evaluating information sources, which has often been framed as information literacy instruction. In the first decades of the 21st century, academic library associations developed guidelines such as the Association for College and Research Libraries' (ACRL) Information Literacy Competency Standards for Higher Education (hereafter, ACRL 2000 IL Standards) (Association of College & Research Libraries [ACRL], 2000) and the related Information Literacy Competency Standards for Nursing (ACRL, 2013). These 2000 and 2013 Standards were further developed into the ACRL Framework for Information Literacy in Higher Education (hereafter, ACRL IL Framework 2015) (ACRL, 2015). The earlier ACRL IL Standards 2000 and later ACRL IL Framework 2015 both referred to learner outcomes and the impacts of information literacy instruction. The ACRL IL Framework 2015 emphasized the processes of interacting with information, the importance of context to information retrieval, appraisal, and use, over a concrete set of skills or competencies. The ACRL IL Framework 2015

employed the principles of threshold concepts, which are "critical concepts […] essential for learners to fully understand" to progress in their studies (Kiley, 2019, p. 140).

In academic health libraries, framing library teaching around the steps of EBP has been more common than using the threshold concepts described in the ACRL IL Framework 2015. Adams (2014) favourably compared the steps of EBP with the earlier ACRL IL Standards 2000. They concluded that the EBP steps of Ask, Acquire, Appraise, Apply, and Assess can be mapped directly to the first four of the five points in the ACRL IL Standards 2000. The translation of EBP steps to the ACRL IL Framework 2015 has been less direct. There has been little evidence to suggest that health sciences librarians have found the ACRL IL Framework 2015 relevant to structuring and developing their instruction with learners in health professions education (HPE). A 2017 cross-sectional survey study found little uptake of the ACRL IL Framework 2015 amongst health sciences librarians despite the majority of respondents teaching in higher education contexts (Schulte & Knapp, 2017). Hicks and colleagues (2023) found that the concept of information literacy was linked with EBP in nursing literature while public health research tended to prefer the concept of health literacy over the more general concept of information literacy as defined in the ACRL IL Framework 2015. In a descriptive systematic review pertaining to all types of health libraries, other authors found that much of the content taught in these settings could be described generally as 'information skills training' (Safdari et al., 2018). The training reported consisted of information literacy, EBP skills, and health literacy, or pertained to navigating information through technology with little to no reference to the ACRL IL Framework 2015 (Safdari et al., 2018). Thus, although the ACRL IL Framework 2015 was developed to guide academic librarians in developing their teaching, there has not been evidence of its uptake by health librarians.

While there has been more evidence reflective of academic health librarians' involvement in teaching searching in the context of EBP, the literature has not been conclusive regarding the best modes or formats for EBP instruction. Several surveys and systematic reviews have examined how librarians are embedded in EBP instruction or employ the principles of EBP in their instructional practice (Eldredge et al., 2013; P. Li & Wu, 2011; Premji et al., 2020; Swanberg et al., 2016). Premji et al. (2020) conducted a survey of Canadian academic librarians examining their role with EBP in the 17 Canadian medical schools. They found that all 10

reporting schools included EBP in their curriculum and seven of the 11 librarian respondents were involved in the delivery of the EBP curricula (Premji et al., 2020). This aligned with findings from the United States (Eldredge et al., 2013; P. Li & Wu, 2011) and other studies that were included in a quantitative systematic review of librarian instruction of EBP (Swanberg et al., 2016). Swanberg and colleagues' systematic review further found that regardless of the mode of instruction (e.g. lecture, small group, online, etc.), librarian teachers had a positive impact on the searching abilities of learners. Searching skills and confidence, measured through self-report, were the outcomes most commonly targeted by librarian instruction in EBP (Swanberg et al., 2016). Numerous other reviews of educational interventions focused on EBP skills similarly reported a wide range of modes of instruction, with no discernable preferred or most effective approach (Howard et al., 2022; Larsen et al., 2019; Nielsen et al., 2023; Patelarou et al., 2017; Wakibi et al., 2021).

The literature on teaching EBP and searching in academic health libraries has suggested that librarians have situated their teaching in the context of the disciplinary norms of EBP, rather than the information literacy frameworks and standards that have been developed and applied in other library instruction in higher education. Given the significant role of searching and evidence syntheses in the research and practice contexts of EBP, this has helped explain academic health librarians' teaching practices in the domain of systematic searching and related review methods. The contexts in which academic health librarians have supported HPE students through EBP have had implications for their teaching practices.

2.6.2 Modes of instruction: Online teaching and instructional technologies

The modes of instruction have also impacted how academic health librarians have engaged with and taught health sciences students. The ACRL Guidelines for Instruction Programs in Academic Libraries (hereafter, ACRL Guidelines 2006) has provided a useful reference as it has listed the modes relevant to teaching evidence synthesis methods:

> Reference interview; Individual or small group research consultations/appointments [in-person or online]; Digital or print instruction resources; Group instruction in library or campus classrooms; Web tutorials or web-based instruction; Asynchronous modes of instruction (email, social media); Synchronous modes of instruction (chat,

> audio/video/web conferencing); Course management software; Hybrid/Distributed learning/Distance learning, employing combinations of these methods. (ACRL, 2006, p. Section C).

Digitally and web-mediated instructional modes have been used in academic libraries since the ACRL Guidelines for Instruction Programs was first drafted in 2003. The combination of methods, as noted for hybrid learning, has increased over time, particularly as demands have shifted to remote instruction during the COVID-19 pandemic and back to in-person or hybrid as campuses re-opened and students returned to campus (Charbonneau & Vardell, 2022a; Strahan & Blake, 2023).

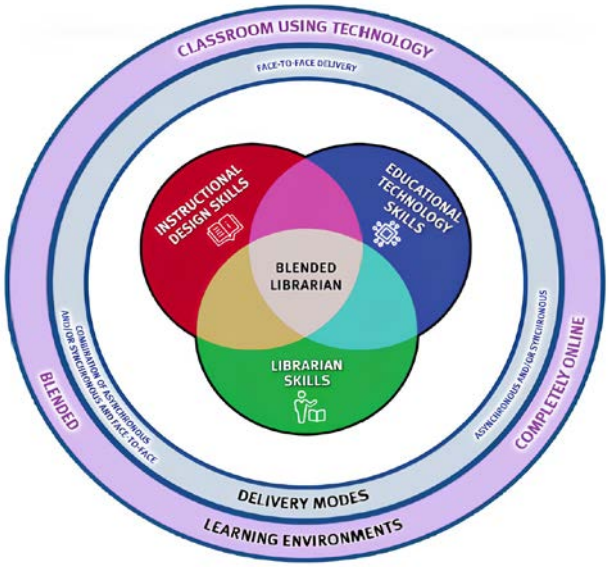
The proficiencies and competencies needed from academic librarians to provide the various modes of library instruction are elaborated by ACRL in the Standards for Proficiencies for Instructional Librarians and Coordinators (ACRL, 2008). This document (hereafter ACRL Proficiencies for Instruction 2008) detailed 12 proficiencies with one to seven elements for instruction librarians in each, totaling 41 competencies. Three of these competencies mentioned the use of technology in the instructional process:

- "3.3. Uses common communication technologies to provide assistance to students in and outside the classroom." (ACRL, 2008, pp. 7; Communication Skills);
- "6.7. Integrates appropriate technology into instruction to support experiential and collaborative learning as well as to improve student receptiveness, comprehension, and retention of information" (ACRL, 2008, pp. 8; Instructional Design Skills); and
- "9.3. Uses classroom instructional technologies and makes smooth transitions between technological tools" (ACRL, 2008, pp. 9–10; Presentation Skills).

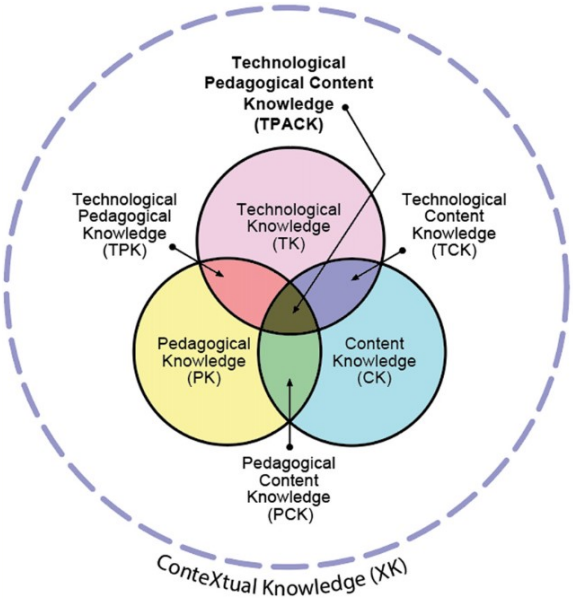
The ACRL Proficiencies for Instruction 2008 reflected the long-standing role of digital technologies in librarian teaching practices, as well as their integration into multiple aspects of instruction that could occur in physical or virtual spaces.

McTavish and Robertson (2020) proposed a framework for academic librarians involved with online teaching, emphasizing the blended roles and proficiencies required for digitally-mediated instruction. This framework distinguished the learning environment from the corresponding

modes of delivery. Instruction using technology within a classroom could be aligned with fully synchronous in-person or fully online teaching with asynchronous and/or synchronous delivery, and "blended" (or hybrid) instruction as that delivered in-person as well as with online components that could be either synchronous or asynchronous, or both (McTavish & Robertson, 2020). The identified relationship between mode and setting was further complicated by the multiple competencies the librarian brought to online instruction as depicted in Figure 1 from their publication (McTavish & Robertson, 2020) reproduced below in the left hand side of Figure 2.1. Although they did not cite another commonly used framework for understanding technologically mediated teaching, the Technological, Pedagogical, and Content Knowledge (TPACK) framework (Mishra, 2019; Mishra & Koehler, 2006), the figure McTavish and Roberston developed bore a striking resemblance to depictions of TPACK (see Figure 2.1). In another doctoral study on the development of blended librarians' professional identity (i.e., librarians who teach information skills and literacy through instructional technology), TPACK was one of the key elements of the study's conceptual model (Amparo, 2020). Others have proposed TPACK as a tool to aid decision-making regarding technologies in academic library instruction (Sobel & Grotti, 2013). The TPACK model shown in Figure 2.1 is the more recent update including consideration for contextual knowledge that was not explicit in original formulations (Koehler & Mishra, 2005; Mishra, 2019; Mishra & Koehler, 2006).



McTavish & Robertson (2020), Figure 1, p. 19



Mishra (2019), Figure 1, p. 77

Figure 2.1 Comparison of frameworks for Blended Librarians and TPACK

Note: Current frameworks for Blended Librarians and TPACK showing intersections of skills and knowledge in domains related to technology, pedagogy, and subject content. Left image adapted from "Figure 1. Blended librarian roles across learning modes" in "Canadian Academic Librarians as Online Teachers" by H. McTavish and L. Robertson, 2020, *Systemics, Cybernetics and Informatics*, *18*(6), p. 19. Copyright 2020 by International Institute of Informatics and Cybernetics. Right image adapted from "Figure 1. Revised version of the TPACK image" in "Considering Contextual Knowledge: The TPACK Diagram Gets an Upgrade," by P. Mishra, 2019, *Journal of Digital Learning in Teacher Education*, *35*(2), p. 77. Copyright 2019 by Taylor and Francis Publishing. Reprinted for educational purposes under the fair dealing provision in the *Copyright Act*.

As reflected in the ACRL Proficiencies for Instruction 2008 and a study of the roles of online teaching in libraries, academic librarians have used a range of competencies when creating online instructional resources, also known as digital learning objects (ACRL, 2008; Withorn & Willenborg, 2020). Digital learning objects (DLO) have been used to support asynchronous learning and have been referred to during online or in-person instruction (Schreiber, 2019; Withorn & Willenborg, 2020). As previously described , examples of DLO described in the literature have included library research guides (e.g. LibGuides) with links to internally or externally created videos and handouts, and recorded video tutorials available through a library website or university learning management system (LMS) (Mestre et al., 2011; Ream & Parker-

Kelly, 2016). Online library guides have featured prominently in academic libraries for sharing curated electronic resources with learners who need not be in the physical library to access library resources and services (Bergstrom-Lynch, 2019; S. Q. Yang & Chou, 2014). Online library research guides evolved from their precursor paper-based pathfinders designed to help students find library resources for particular courses, programs, or topics (Conrad & Stevens, 2019). Using online library guides to facilitate remote access to library resources and services has become a ubiquitous practice at academic and research libraries, as demonstrated by a study of academic libraries. This content analysis revealed that 91% of 799 American academic libraries used online library guides (Neuhaus et al., 2021).

The integration of digital tools to aid instruction and as a topic of instruction is not new in academic libraries. In a longitudinal study of instruction in Canadian academic libraries, over half of the 118 survey respondents reported online instructional methods, including video recordings (n = 61), web-based tutorials (n = 60), and online library research guides (n = 98) (Polkinghorne & Julien, 2018, p. 79).While the use of video recordings, such as tutorials viewable on YouTube, had increased from 3% in 2005 to 51.7% by 2017, the use of library guides and web-mediated instruction had remained steady over the same period of time (Polkinghorne & Julien, 2018, p. 79). These findings reflected the continued use of online educational resources in libraries, though the specific tools have evolved with available technologies.

Siab and colleagues (2023) systematically reviewed the literature related to the digital instruction provided by academic librarians and found scant evidence of academic librarians developing or using pedagogical frameworks for online teaching. Expanding on the skills at the centre of the framework proposed by McTavish and Robertson (2020), Siab et al.'s review concluded: "Academic librarians at higher education institutions must have knowledge of online learning theories, online instructional design and "how and when" to use digital teaching tools to make a significant impact when teaching in a digital environment" and emphasized the crucial components of "online teaching practices, digital pedagogies, digital skills, educational technologies and digital tools related to online library instruction" (Saib et al., 2023, p. 22). Koehler and Mishra's TPACK (Mishra, 2019; Mishra & Koehler, 2006) is one such potential framework, although it was not mentioned in the review or any of the included studies.

The literature on online and hybrid instruction by academic librarians has reflected the considerable interest and long history of librarians working through and with technology to reach students and support their learning needs. The research and publications in this area has tended to describe the skills needed by librarians or the challenges, barriers, and opportunities presented by the online and digital tools and technologies. In other words, the human and the technological perspectives have frequently been addressed separately, whereas an integration of these factors will lead to a more thorough understanding of the intra-actions between the social and the material (Barad, 2003), as I will argue in the next chapter.

2.6.3 Formats of Instruction: Reference Services

As noted in the formats of instruction from the ACRL Guidelines (2006), instruction to groups and creation or curation of DLO to support self-directed and asynchronous learning have not been the only means by which academic librarians have impacted learner outcomes. The reference interview and subsequent instruction to small groups or individuals through research consultations have equally been described under the umbrella of library instruction (ACRL, 2006). Another division of the American Libraries Association, the Reference and User Services Association, has identified standards for librarian behaviours and performance during reference encounters, including facilitating searching for information and evaluating the transaction (Reference and User Services Association [RUSA], 2023). A scoping review of academic library research consultations (Stapleton et al., 2020), updating a previous scoping review (Fournier & Sikora, 2015), summarized the means of assessment of individual research consultations and expanded the findings to describe the use of technology in research consultations. In both reviews, papers using objective measures of impact, such as the quality of the sources used, quality of the citations, and student grades, showed mixed effects. Some included studies showed no improvement and others indicated weakly positive associations with consultations (Fournier & Sikora, 2015; Stapleton et al., 2020). Similarly, in a quantitative, causal-comparison study, findings from objective measures were not conclusive regarding the impact of virtual research consultations with librarians on distance learning graduate students (n = 30) (Mohr et al., 2022). In comparison with a matched cohort that did not meet with a librarian, receiving support through a virtual research consultation had a significant association with GPA ($t(80) = -2.52$,

p = .014) but not with degree completion at follow up more than a year later (Mohr et al., 2022, p. 177).

Despite the inconsistent evidence of effectiveness using objective measures such as GPA, degree completion, or assignment grades, research consultations have been shown to be important means of providing personalized support and building relationships with students (Fournier & Sikora, 2015; Stapleton et al., 2020). Both scoping reviews of research consultation assessments included papers reporting overwhelmingly positive student satisfaction (Fournier & Sikora, 2015; Stapleton et al., 2020). Librarians have seen research consultations as an opportunity to build trust and relationships with learners, through approachability and engagement (Stapleton et al., 2020; RUSA, 2023). In cross-sectional survey studies of library instruction conducted in American and Canadian academic libraries, individualized instruction was reported by 87% (Julien et al., 2018, p. 186) and 89% (Polkinghorne & Julien, 2018, p. 79) of respondents, respectively, and was the most commonly reported means of providing instruction. Additionally, in a survey of Canadian academic librarians' roles, 142 of the 190 respondents to the question regarding teaching and learning reported providing one-to-one instruction, just short of the number who reported classroom teaching (n = 149) (Ducas et al., 2020, p. 50). These reported numbers have indicated that individualized instruction through research and reference consultations have been a staple of teaching in academic libraries. Studies of research consultation effectiveness as a teaching approach have been supported by weak evidence from satisfaction and self-reported confidence surveys of students (Fournier & Sikora, 2015; Stapleton et al., 2020), but due to their prevalence, their role as a means of fostering relationships and engagement around research methods merits further investigation (Ducas et al., 2020; Julien et al., 2018; Polkinghorne & Julien, 2018).

Combining delivery mode with the consultation format, there have been several publications on the provision of online research consultations in academic and other health libraries. A mixed methods service evaluation paper of research consultation screencast recordings highlighted the utility for learners to have access to the information shared during the meeting with the librarian (Flynn, 2021). Flynn's findings were based on high levels of satisfaction reported in the questionnaire and a range of positive affective, conceptual, and behavioural impacts noted from the interviews (2021). Similarly, a literature review of the impact of the COVID-19 pandemic on

library reference and research support noted the significance of and satisfaction with videoconferencing for virtual research consultations (Osorio & Droog, 2021). Another survey of library workers documented the shift to virtual reference in health libraries over the pandemic and similarly found a theme of satisfaction with videoconferenced online meetings for research consultations in the data from an open response question (Strahan & Blake, 2023). Respondents noted a student preference for virtual rather than campus-based meetings due to the accessibility from anywhere as well as the convenience of integration with online calendars and booking systems (Strahan & Blake, 2023).

In a chapter of a book published on virtual services in health sciences libraries, Hanneke (2022) proposed a model for online research consultations. Technological access and impact on interpersonal connections, such as the variable presence and use of cameras and Zoom fatigue, were mentioned as barriers. Improved physical and user-centred accessibility, availability of functions such as screen-sharing, and public health protections were listed as advantages (Hanneke, 2022, pp. 99–100). The challenges and advantages noted were similar to those mentioned by Hayden and Premji (2022) in relation to online teaching of evidence synthesis methods to groups of learners. Hanneke's (2022) model relied on connection through empathy, humor, and listening to help guide and motivate learners (p. 101). She emphasized that allowing the learner to lead, for example by sharing their screen, and customizing content based on what learners expressed as they directed the consultation would help build confidence and self-efficacy (2022, pp. 104–106). While much of Hanneke's advice is applicable for any format of research consultation, she noted the ways the virtual format and technology can both interfere with and enable the process of connecting with learners.

Given the satisfaction with online research consultations (Strahan & Blake, 2023) and the utility of research consultations more generally in meeting the needs of learners when working on a specific evidence synthesis project (Dalton, 2019), the combination of these topics has received surprisingly little attention. Only one study was found investigating research consultations as a way to support students working on evidence synthesis projects and it was not within an online or health context (Dalton, 2019). Explorations of the impact of and satisfaction with online research consultations have covered general research and reference services at academic or health libraries and have not examined the unique aspects of teaching evidence synthesis

methods through online means (Osorio & Droog, 2021; Strahan & Blake, 2023). These studies, along with the related commentary (Hanneke, 2022), have suggested that both the online mode and the format of research consultations constituted a significant part of online teaching at academic libraries. Since teaching has included support of systematic searching and evidence synthesis research, consideration of online teaching practices for evidence synthesis methods ought to include virtual research consultations. Yet, no empirical studies have included both online modes of teaching and personalized instruction through research consultations for evidence synthesis methods.

2.6.4 Teaching Searching Skills

As noted, the context of teaching EBP skills (see Section 2.6.1), academic health librarians have been particularly involved with teaching the techniques for identifying the best available evidence (Premji et al., 2020; Sabey & Biddle, 2021; Swanberg et al., 2016). Many studies have measured the impact of that instruction, including a scoping review on the effectiveness of educational interventions to improve the literature searching skills of health professional trainees (Hirt et al., 2020). The 14 studies included in the review reported a range of improvements to the outcomes of search strategy development and database searching skills, regardless of what format the intervention used. The authors also evaluated the reporting in the included studies and found that while most described the intervention, they did not include sufficient detail about the expertise of the instructors. Without information about the skills and experience of the librarian instructor or the educational material, Hirt et al. (2020) found that fidelity to the instructional interventions could not be evaluated. Although Hirt et al. (2020) concluded that more studies should objectively evaluate the searching skills outcomes, Cooper et al. (2020) found that researchers did not have a consistent definition or appreciation of the effectiveness of literature search strategies.

Others have explored the topic of expert searching and the process of learning advanced searching skills (C. L. Smith, 2015, 2017; C. L. Smith & Roseberry, 2013; Tucker, 2016, 2019). These studies focused on skills and competency acquisition through graduate programs and continuing education for library and information professionals rather than the transfer of those skills to learners in the context of evidence synthesis research. Further exploration through

interviews and focus groups of the characteristics of expert searchers (Bailey & Kelly, 2016) got closer to parsing the personal traits and cognitive competencies for advanced searching skills amongst general student populations. However, none of these investigations of advanced searching processes or expert searching skills have taken those explorations to the next step of exploring the labour and teaching practices involved when librarians have assisted health students in learning systematic searching.

Based on the online workshops on systematic searching for evidence synthesis methods previously described (see Section 2.3), along with the roles (Spencer & Eldredge, 2018) and competencies (Townsend et al., 2017) identified for librarians in evidence synthesis research, effective searching has not been the only set of skills that librarians teach. In conducting evidence syntheses, searching has constituted one aspect of the overall processes from planning to dissemination. The workshop objectives reflected how the skills required for effective searching have been entangled in the broader set of skills and knowledge needed for conducting and reporting evidence synthesis research. In academic settings, conducting evidence synthesis research may be done as part of course or program objectives related to overall research methods or EBP competencies (Choi et al., 2019; Leung et al., 2017). Since conducting an evidence synthesis project can hone the skills and knowledge needed to find and appraise research evidence throughout a learner's professional career, librarians supporting evidence synthesis research may have to situate the teaching related to systematic searching in the broader context of the academic objectives as well as the individual project (Hanneke, 2018).

2.7 Evidence Synthesis Methods Training

In addition to the examples of the online teaching of evidence synthesis methods initiated by librarians (see Section 2.3), this section describes the context of other related training offered by librarians and others, both online and in-person. With an appreciation of the variety of training formats, content, and delivery options, we can better understand the situated environment of librarians' online teaching practices regarding evidence synthesis methods.

Publications have described evidence synthesis methods courses, workshops, and other options, including some evaluating outcomes from the training. A review summarized 17 evaluative papers regarding face-to-face versions of evidence synthesis methods training available to

learners in higher education (Premji et al., 2021). This scoping review included programs descriptions published between 2008 and 2020, consisting of five stand-alone workshops and 12 credit courses. The programs described had to include at least two of the steps of conducting a review and those included covered between four and ten of the following steps: defining the question; developing a protocol; searching the literature; citation management; screening; data extraction; narrative synthesis; meta-analysis; risk of bias; and reporting (Premji et al., 2021, p. 119). Premji and colleagues concluded that effective evidence synthesis methods instruction was customized to the appropriate level of learning for the audience and included a range of approaches featuring active and collaborative learning, regular feedback and discussion, and a solid grounding in the conceptual basis of the aspects of evidence synthesis methods. The evaluations featured in this review highlighted a range of outcomes impacted by the instructional interventions including: improved knowledge and confidence regarding the steps to conduct a review; increased interest in conducting future reviews or other research methods; and development of identity and confidence as a researcher (Premji et al., 2021, p. 133). None of the evaluations were comparative in nature, nor did any have control groups. A few of the papers described courses that used student or course assessment elements such as pre- and post-tests of knowledge or confidence regarding the topics covered by the instruction (Premji et al., 2021).

Other recent papers describing workshops and courses in other settings have been published, such as a report of the outcomes of the JBI Systematic Review Training Program in Portugal (Cardoso et al., 2021) and a report of the development of a nine-workshop curriculum for researchers at hospitals in Japan (Tsujimoto et al., 2021). These papers included the numbers of reviews that were published by participants after training over 6 years and 3 years, respectively: 23 reviews produced by individuals or groups from the 127 participants (Cardoso et al., 2021) and 47 review protocols plus 13 published reviews completed by teams from 233 participants (Tsujimoto et al., 2021). McGowan et al. (2021) reported the development and evaluation of a systematic review credit course for graduate students, led by library faculty at Purdue University. These librarian authors reported the increased confidence in knowledge and comfort from the nine students who completed the pilot of the course (B. S. McGowan et al., 2021).

Several organizations and individuals have developed synchronous, asynchronous, and blended online training for evidence synthesis methods. Colleagues and I published an evaluation of

online, publicly available (i.e. no institutional affiliation required) systematic review training resources available up to 2016, including tutorials, courses, and videos (Parker et al., 2018). The 20 training resources we evaluated scored statistically higher for Content (covering the steps of review methods) than for Design, Usability, and Interactivity. Online courses and web modules from methods organizations and academic institutions were ranked highest, with the five highest ranking resources being created by EPPI-Centre (EPPI Centre, 2024), JBI, and Cochrane, John Hopkins University, and University of Toronto. Several of those resources have been revised or substantially updated since data collection and evaluation for that study, but no further reviews of online asynchronous instruction have been completed. Since 2018, the highly ranked Cochrane offering has been developed into the Cochrane Interactive Learning modules, further improving the content, design, interactivity, and usability (Cochrane Collaboration, 2024a). The first Cochrane Interactive Learning module has been available to anyone on the internet, while the rest of the eleven modules have been accessible to registered Cochrane Review authors as well as individuals and institutions who subscribed to the training. Another highly ranked training option has been continuously available: the massive online open course (MOOC) offered by instructors at John Hopkins, who had also published on previous iterations of the course (T. Li et al., 2014). The John Hopkins MOOC has been joined by other offerings: an online course on systematic reviews and systematic mapping developed by trainers at the Stockholm Environment Institute (https://systematicreviewmethods.github.io/); an open education, interactive textbook developed by instructors at Toronto Metropolitan University (https://pressbooks.library.torontomu.ca/graduatereviews/); and a recently released course from the Campbell Collaboration (https://oli.cmu.edu/courses/systematic-reviews-and-meta-analysis-o-f/) (Valentine et al., 2023).

One web-based systematic review training intervention developed in Croatia (Krnic Martinic, Malisa, et al., 2022) has been evaluated through a randomized controlled trial (Krnic Martinic, Čivljak, et al., 2022). The intervention group (n = 294) accessed text in a web-based interface with the material modified from content from the Cochrane Interactive Learning modules (Cochrane Collaboration, 2024a). The instructional text for the control group (n = 295) was pulled from the PRISMA checklist (Moher et al., 2009). Both the intervention and control lacked the active learning and interactivity noted in other educational initiatives. Nonetheless, the intervention group performed significantly better on the post-intervention questionnaire testing

participant knowledge on aspects of EBP and the steps of systematic reviews, with 23% more correct responses (relative risk=1.23, 95% CI 1.17-1.29) (Krnic Martinic, Čivljak, et al., 2022). This finding suggested that purpose-designed educational interventions may be more effective than self-directed learning from guidelines or standards for evidence synthesis methods alone, at least for short-term learning outcomes. In other regions, trainers have similarly developed online models of teaching evidence synthesis methods but have employed more interactivity and active learning. For example, educators in Africa adapted face to face workshops to an online module and advise: "teachers who are responsible for creating online learning content should consider working in small and efficient teams, striking a balance between content and IT expertise, planning ahead to enable easy updates and on the fly changes, provide an interactive online space through engagement, and consider internet and access restrictions when developing content for low-income and middle-income country audiences" (Mccaul et al., 2020, p. 6).

Another common means of learning about evidence synthesis methods has been through self-directed learning based on texts, such as reading published handbooks or articles that have described appropriate and rigorous methods for conducting reviews. For example, Boland and colleagues (2014) published a handbook directed at students conducting systematic reviews. Boland's handbook has not been readily available as an electronic book at academic libraries. While directed to students, this text would not be as easily accessible online as the JBI Reviews' Manual (Aromataris & Munn, 2020), the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2019), or the asynchronous tutorials and courses already mentioned. A plethora of webinars and journal articles providing overviews or in-depth explorations of evidence synthesis methods have also been available from methodologists and methods institutions or organizations such as Cochrane Centres and JBI.

This evidence has demonstrated that health professions learners have had access to several self-directed and online learning options available to the general population and that some students may have access to graduate courses or other disciplinary training regarding evidence synthesis methods at their home institutions. Nonetheless, both personal experience and reports of formalized evidence synthesis support in libraries has indicated that students and other researchers have been coming to their academic health libraries for training and advice. The demand for collaborations and consultations has been reflected in the creation of evidence

synthesis support services at many libraries, which have included courses, workshop series, a la cart seminar offerings, and self-directed learning toolkits (McKeown & Ross-White, 2019; Nedelina; Harrington et al., 2020; Riesen et al., 2024; Roth, 2018). Further evidence of library support for students conducting evidence syntheses has come from a quality improvement study exploring the impact of individual research consultations with librarians on learners (Dalton, 2019). Dalton argued that the value of personalized support offset the time required for individual consultations (p. 169). Seventeen of the 18 learners reported positive experiences in those consultations (p. 167). Other than the duration of the consultation, Dalton did not collect data regarding the teaching practices. This small study was conducted in the context of supporting social sciences students with in-person consultations (Dalton, 2019), so did not directly translate to the context of my doctoral study.

Overall, program descriptions, evaluations, and recommendations for training illustrated the types of instruction that have been available to learners. This body of literature has provided evidence regarding the possible impacts of educational interventions on outcomes such as: learner satisfaction; evidence synthesis research outputs; searching effectiveness, confidence, and competence; and likeliness to conduct future research or evidence syntheses. There has been a lack of research on *online teaching practices* during both group and individual instruction. Similarly, while the literature has provided an overview of what happened during evidence synthesis methods training, there has been little insight as to how the librarian teachers, health sciences learners, technologies, methods guidance, and various pressures and expectations *intra-act* with each other during that training to influence those outcomes. As Nind (2020) reflected in the conclusion of a paper describing the teaching of systematic reviews in education and social sciences, we need more exploratory and action-oriented research on pedagogical approaches used in the context of evidence synthesis methods (p. 60).

In Chapter 3, I have argued that a sociomaterial approach, within a posthumanist perspective that flattens the hierarchy between the human and non-human elements of a phenomenon, has allowed for tracing of the entangled components of the online teaching practices regarding evidence synthesis methods. This approach has allowed me to unpack the ways in which the contexts described in the literature review chapter have impacted the work and identities of academic health librarians when teaching learners online to conduct evidence synthesis research.

2.8 Chapter Summary

This chapter summarized available evidence related to librarian involvement in evidence synthesis research, building on the strong evidence regarding collaborations with evidence synthesis research teams. I described the relatively limited literature on librarians' instructional efforts related to systematic searching and other steps of the review process, especially in online contexts, which suggested the gap addressed by this doctoral research. Through the reported program evaluations and descriptions, I have demonstrated that academic health librarians' instruction, whether conducted in-person, blended, or online, has garnered high levels of satisfaction from both learners and instructors. Similarly, evidence synthesis training offered by librarians and others has been well-received by learners, but few such programs have been subjected to either objective assessment of effectiveness or in-depth examinations of the labour involved in offering them. Through exploring the evidence regarding the roles of librarians collaborating on evidence syntheses, teaching in higher education and HPE, and supporting the searching skills of HPE students working on evidence synthesis research, I have provided the context in which librarians teach online about these research methods. This context, and the paucity of knowledge regarding what librarians *do* when teaching the methods evidence syntheses in online settings, have provided the basis on which I have developed the conceptual framework for a sociomaterial ethnographic study, as I have described in the next chapter.

CHAPTER 3 THEORETICAL AND CONCEPTUAL FRAMEWORKS

3.1 Chapter Overview

In this chapter, I have described the conceptual framework used to make visible the social and material aspects of academic health sciences librarians' labour when teaching online about evidence synthesis methods. To explain how I arrived at the conceptual framework I have chosen, I have described the need for a theoretical framework to guide designing and conducting the research in Section 3.2. In identifying an appropriate framework I considered the theories and frameworks used in related fields, including the literature in Chapter 2, and looked for alignment with my research perspective. In Section 3.3, I have described in more detail what I sought from a theoretical framework and how that led to adopting a sociomaterial perspective, which helped orient the central problems and questions addressed in this research project. In Section 3.4, I have laid out the key concepts in my adopted theoretical framework. I have provided definitions and concrete example of how the concepts from sociomateriality, Actor Network Theory (ANT, and practice theories related to my analysis and to my understanding of the practical and applied work of teaching evidence synthesis methods. Having determined and described the theoretical framework, in Section 3.5 I detailed a conceptual framework by returning briefly to a review of related literature, how this decision and design is well-suited to the research questions, and how this approach promised to address gaps in our understanding of the labour of academic health sciences librarians in teaching evidence synthesis methods. Finally, the chapter summary in section 3.6 identifies how the theories and concepts that informed my research design will appear as the research questions are addressed in the subsequent, empirical chapters of the dissertation.

As part of my doctoral work, I have previously published some of the ideas described in this chapter (Parker, 2022; Parker & Snelgrove-Clarke, 2023). In describing the conceptual framework and theoretical underpinnings of this study, I drew together observations from those papers with additional descriptions of how I developed the conceptual framework and why I selected the theoretical and research methodology choices employed throughout the design and conduct of this research.

3.2 Significance of Conceptual Frameworks and Theories for Teaching Practices in Academic Health Libraries

Decisions for planning and implementing library instruction and services should be supported by evidence that is relevant to the setting and circumstances under consideration. Based on data from participant satisfaction surveys and some objective evaluations, library training has been shown to change outcomes such as knowledge, behaviour, and attitudes (i.e., competencies) of learners in regards to literature searching, information literacy, and evidence-based practice (EBP) competencies (Hirt et al., 2020; Swanberg et al., 2016; Weightman et al., 2017). However, the available evidence has not clearly shown *how* teaching practices and contexts have contributed to achieving learning outcomes, nor how librarians have determined which teaching practices would be appropriate in different circumstances. As described in the literature review in Chapter 2, publications relating to evidence synthesis methods instruction in academic health libraries and elsewhere have consisted mainly of commentaries, program descriptions, and workshop or course evaluations. While several published program descriptions included details about the materials and techniques employed in that instruction, they lacked explicit theoretical models for planning and implementing the training other than pedagogical approaches such as scaffolding (Hayden & Premji, 2022), active and authentic learning (Fuller et al., 2021; Lenton & Fuller, 2019; Valentine et al., 2023), self-determination theory (B. S. McGowan et al., 2021), "backwards design" (Valentine et al., 2023), and communities of practice (Mccaul et al., 2020). Instructional program evaluations have focused on learning outcomes and satisfaction, or participant competencies and performance, suggesting an implicit framing within positivist/post-positivist and behaviorist approaches to research and education, respectively. Post-positivist and behaviorist paradigms similarly dominate much of the research on competency-based medical education (Sternszus et al., 2023), which is the environment in which teaching evidence synthesis methods takes place. These inherent assumptions of much of the existing research have been oriented to studying the effectiveness of educational interventions by objectively measuring changes to the behaviours and outputs of learners (Nieminen et al., 2022). However, effectiveness has been notoriously hard to measure in the context of teaching and learning because of the range of confounding factors involved in implementing and assessing programs, including the setting, engagement of the learners, skills of the teacher, and much more (Sullivan,

2011). While evaluating effective and impactful teaching and assessing learning can be achieved through positivist research approaches, other paradigms supported by theory can add to the depth of understanding about the role of context on the desired outcomes.

The absence of theoretical grounding in the program descriptions and evaluations of librarian-led online evidence synthesis instruction has posed challenges for instructors interested in designing similar interventions but unsure which elements of the intervention and implementation were essential. There has been a lack of guidance for instructors seeking to understand how the mutually entangled identities of teachers and learners, as well as their respective perceptions of the purpose and practices in the educational encounter, have shaped the outcomes and outputs of educational interventions (Nieminen et al., 2022; Trowler, 2012). Accounting for how the social and material elements perform in particular contexts would help unpack the practices that have worked and under what conditions. Investigations of material and technical components, teacher and learner characteristics, and organizational and pedagogical contexts reveal effective engagement with the learners and could help determine appropriate learning objectives (Parker, 2022).

Scholars have noted how inconsistent applications of theoretical and conceptual frameworks across investigations of teaching and learning the related settings of academic and health libraries, remote learning, higher education, and HPE research have impaired our ability to know why and how educational interventions may work in these respective and intersecting settings (Biesta et al., 2011; Ocholla & Le Roux, 2011; Parker, 2022; Ukwoma & Ngulube, 2023; Zackoff et al., 2019). For example, Biesta et al. (2011) argued that, when seeking to understand teaching and learning, "theoretical work can […] provide different, alternative descriptions of such processes and practices" (p. 233). Making the case for using conceptual frameworks in medical education interventions and research, Zackoff et al. (2019) highlighted their utility for planning program implementation.

> [A] careful examination of the resources needed to implement and evaluate the intervention is necessary to ensure that a practical and feasible approach is taken. […T]he ability to reference established educational theory and the use of a conceptual

> framework will strengthen the rationale for the intervention and could be helpful in making a case for internal or external sources of funding. (p. 140)

Researchers have started addressing the lack of conceptual framing in HPE, with a growing body of qualitative and social constructivist research drawing on social sciences traditions and theories to help unpack the phenomena of teaching and learning (Frye & Hemmer, 2012; O'Leary et al., 2021; Reeves et al., 2013; Rougas et al., 2022; Taylor & Hamdy, 2013; Varpio, Aschenbrener, et al., 2017). Investigations have revealed increased use of theoretical frameworks in research conducted in the intersecting and overlapping fields of HPE (Kusurkar et al., 2012; O'Brien & Battista, 2019; O'Leary & Boland, 2019; Ramis et al., 2019; Sharma, 2019), remote education (Ukwoma & Ngulube, 2023), higher education (Ocholla & Le Roux, 2011), and library and information studies (LIS) (Ocholla & Le Roux, 2011; Roy & Mukhopadhyay, 2023). In a review of theories applied to EBP instruction, the authors reported studies that mentioned or used theories, including Social Cognitive Theory, Roger's Diffusion of Innovation Theory, Cognitive Apprenticeship Theory, Cognitive Flexibility Theory, and Cognitive Load Theory (Ramis et al., 2019). This dispersed pattern of theory application was common across the investigations of the fields related to online teaching evidence synthesis methods. The wealth of theoretical options can feel overwhelming, and researchers have struggled with the process of selecting and developing guiding theories into the conceptual framework for a study (Varpio et al., 2019). With little agreement on which theories and frameworks have aligned with which types of research questions and contexts in higher education, academic librarianship, and HPE, selection and application of appropriate theoretical frameworks has remained challenging for many researchers in these fields.

A few texts have suggested possible theories and the means of aligning theory with research questions and purpose in studying instructional programs (Frye & Hemmer, 2012; Lloyd, 2021). In a description of qualitative approaches for information literacy research, Lloyd (2021) provided a clear overview of commonly invoked types of learning theories used to plan or study information literacy programs, including: behaviourist, social cognitive, sociocultural learning, situated learning, problem-based learning, collaborative learning, blended learning, and postmodern theories. In the context of teaching or learning in academic or health libraries, a few examples of psychosocial theories have appeared in the literature, including Activity Theory

(Roos, 2015), Theory of Planned Behavior (Austvoll-Dahlgren et al., 2012), and Self-Determination Theory (B. S. McGowan et al., 2021). In the latter case, McGowan, a librarian, and colleagues reported on the development and evaluation of a pilot version of a credit course on systematic review methods. McGowan et al.(2021) used Self-Determination Theory in developing the assignments, assessments, and course delivery, emphasizing learner autonomy, relatedness, and competence (p. 324). This practical example demonstrated the utility of using theory to guide decisions in instructional program design. This has been a common practice as shown in a study of theory use in LIS journals (Roy & Mukhopadhyay, 2023). Roy and Mukhopadhyay found that learning theory was frequently used for developing programs and for focusing on learner experiences and outcomes. Pedagogical and cognitive psychology theories have predominated HPE and higher education instruction research and have started to be employed in LIS instruction research. These theories have helped in understanding and designing learners' experiences in educational settings and during specific interventions.

However, in the context of teaching practices, these learning and behavioural theories alone have been insufficient for understanding the work of the instructing librarians and the influences of material and organizational elements in the teaching setting. Addressing this deficit, Lloyd (2021) detailed several key theoretical frameworks based on sociocultural theories appropriate in qualitative studies regarding information literacy. Amongst these, Lloyd (2021) described practice theories as emphasizing the situated, contextual, and material aspects of practice. In her description, 'practice theory' encompassed a range of theories developed by scholars to examine practice "as the primary element shaping everyday life" (p. 19). Referring to materiality as "the range of technologies and artefacts through which the practice emerges and is enacted" (p. 38), Lloyd included theories attending to both the social and the material under the umbrella of practice theories. The concept of 'practice' may refer to the everyday activities of the information literate individual but can equally be applied to the workday activities of librarians involved in information literacy instruction. As I have described in more detail below, this understanding of work and teaching activities through the lens of practice theory can be applied to the online teaching practices regarding systematic searching and evidence synthesis methods.

3.3 Research Paradigm: What I Sought From a Theoretical Framework and How That Led to Adopting a Sociomaterial Perspective

The worldviews I have been drawn to in my personal, professional, and scholarly endeavors have emphasized the interconnected and ever-changing nature of the material and social world, which I have viewed as both inseparable and actively entangled. While I have spent my professional librarian career immersed in the post-positivist paradigm of evidence-based practice (EBP), my research perspective has not been oriented to corresponding objectivism and the search for a singular truth (M. E. Young & Ryan, 2020). Rather, I have taken an interpretive, performative, and post-humanist approach to the research endeavor (Barad, 2003; Fenwick & Edwards, 2013). The ontology and epistemology of this approach has built on understandings of the world and the way we learn about it through de-centering human experience to allow space for the materiality, interconnectedness, and agency of actors and forces both human and nonhuman (Hultin, 2019; MacLeod & Ajjawi, 2020). Whereas some other research approaches have been oriented to representation and description, looking at the social and material elements of practice has helped reveal implicit influences and the reciprocal agency characteristic of theories informed by Latour's ANT (2007). Studies using practice theories, ANT, and sociomaterialism have explored how human activities, such as teaching or research, have been shaped by, and in turn shaped, the technology, texts, and tools used in those practices (Hultin, 2019). With these inspirations, my research has become philosophically aligned with *agential realism* (Barad, 2003; Hultin, 2019), which emphasizes relationality between contributing human and non-human actors. This has been described in more detail in the next section.

The research context of this doctoral study was at the intersection of academic librarianship, organizational research, health research methods, HPE, online higher education studies, and science and technology studies. These fields have not shared coherent, consistent research paradigms or theoretical approaches for resolving research questions related to teaching and learning, research methods, or technology, but scholars in each field have used *sociomaterial* approaches and the influences of ANT and practice theories to unpack complex phenomena and practices. In my research, I have explored the complex activities and intra-actions (Barad, 2003) of librarians using technologies for both teaching and research methods, which has allowed me

to bring to light the taken-for-granted labour of online teaching practices (MacLeod et al., 2017; Ross-White, 2021).

In this chapter, I have argued for a sociomaterial consideration of academic health librarians' online teaching practices regarding evidence synthesis methods. This research approach deprioritized human-centric experiences while simultaneously avoiding a technological deterministic viewpoint presuming human activities result from the conditions set by technological tools and context (Orlikowski, 2007). Instead, as Haider and Sundin have described in the context of studying information literacy, sociomaterial research has assumed that *in addition* to human agency, "nonhuman entities, such as technologies and other tools, also have agency that enables them to play a role in shaping the social and material world" (2023, pp. 3–4). They clarified that these technologies and tools include the digital elements of software and algorithms (Haider & Sundin, 2023, p. 4) in addition to the computers and mobile devices that have mediated our everyday online lives. Viewing all of these elements as actors with agency through the lens of agential realism has aligned with theoretical approaches that have evolved from ANT, in the realm of sociotechnical studies, as applied in various scientific and educational contexts (Fenwick & Edwards, 2011; Latour, 2007, 2017; Tummons, 2021). Throughout the rest of this chapter, the terms and concepts introduced in this section have been elaborated in relation to their uses in this dissertation to plan the research, address the research questions, and inform interpretation.

Drawing similar conclusions as others have regarding complex scenarios in HPE research (MacLeod & Ajjawi, 2020; Varpio, Aschenbrener, et al., 2017), I have felt it is time "to address the complexity of learning processes or how the outcomes measured are influenced by the dynamics between and among the social and material actors involved in the educational session" (Parker, 2022, p. 410). I have argued that examining online teaching practices about digital research methods called for foregrounding materiality in the contexts of the social and organizational setting of academic health libraries (Parker, 2022; Parker & Snelgrove-Clarke, 2023). Thus, as Haider and Sundin claimed that searching is sociomaterial (Haider & Sundin, 2019) and others have highlighted about teaching in digitally-mediated environments (Gourlay, 2021; Pischetola et al., 2021), so too have I argued that teaching how to search for digital information through online modes is fundamentally sociomaterial. It was from this perspective

that I arrived at a sociomaterial theoretical framework, which has variously been described as a research lens, paradigm, and approach or collection of approaches (MacLeod & Ajjawi, 2020).

3.4 Theoretical Framework for this Research: Sociomateriality, Actor Network Theory, and Practice Theories

3.4.1 Sociomateriality

Sociomateriality served as the underlying basis for the theoretical framework and conceptual model for this research project. This viewpoint for research, incorporating both the social and material, has been applied in organizational and information systems by Orlikowski and Scott (Orlikowski, 2000; Orlikowski & Scott, 2021), education studies by Fenwick (e.g. (Fenwick, 2010; Fenwick & Edwards, 2011)) and medical education by Fenwick, MacLeod, Burm, and others (Burm et al., 2019; Fenwick et al., 2012; MacLeod et al., 2017). Sociomaterial perspectives originated from Science and Technology Studies (STS) and the work of Latour, Callon, and Law in sociology that developed into a collection of approaches based on (or in response to) ANT (Callon, 1986; Latour, 2007; Law, 1991, 1999). The application of sociomaterial research approaches has been discussed in various fields including organizational studies (Moura & Bispo, 2020), interprofessional education (Sy et al., 2023), medical education (Burm & MacLeod, 2020; Fenwick & Nimmo, 2015; MacLeod & Ajjawi, 2020), and information literacy (Haider & Sundin, 2023). Various approaches and theories have been described as falling under the umbrella of sociomaterial perspectives, including: ANT and its offshoots (e.g. ANTi-History), complexity theory, 'New Materialisms', spatiality studies, activity theory, and cultural-historical activity theory (CHAT) from Engeström (Engeström, 1987; Fenwick & Nimmo, 2015; McMurtry et al., 2016; Moura & Bispo, 2020; Sy et al., 2023). While most researchers have referred to communities of practice (CoP) within the category of situated learning theories, based on the work of Lave and Wagner, McMurtry and colleagues also included CoP in their study of sociomateriality in interprofessional and collaborative learning (Lave & Wenger, 1991; McMurtry et al., 2016). Likewise, in her coverage of theoretical frameworks for research on information literacy described in a previous section of this chapter, Lloyd (2021) referred to sociomaterial research approaches under the heading of practice theory. Other scholars have presented both sociomaterial and practice theory lenses as theoretical

frameworks that share some, but not all, underlying assumptions and research approaches (Gherardi, 2021).

Many of the authors mentioned above have described the various families of related theories and research approaches within sociomaterial traditions, including contradictions and similarities in key tenets and assumptions (for example: Haider & Sundin, 2023; Hultin, 2019; Moura & Bispo, 2020; Sy et al., 2023). Unpacking these controversies and philosophical debates has not been essential for the practicalities of planning and conducting this research. While acknowledging their complicated histories and evolutions, I have focused on explaining the aspects of the respective and intersecting theoretical frameworks from sociomateriality, ANT, and practice theories that have informed my research. I did not attempt to rigidly adhere to one interpretation of the concepts and perspectives included in these overlapping theories and frameworks. Embracing a "pluralist approach" (Nicolini, 2012a, p. 213), I have described the key concepts applied in my research as well as examples of how those elements were surfaced through the topic of investigation and my research processes. See Table 3.1 for definitions from the literature and examples from my research context for the terms italicized throughout this chapter.

3.4.2 Ontology and Epistemology

Several scholars have described ontology – or how reality has been conceived – in research informed by sociomaterialism. MacLeod and Ajjawi (2020) described the ontological underpinning of sociomateriality as one where we see "the world—people, things, practices—[as] constituted through *assemblages*, or heterogeneous *entanglements* of human and nonhuman elements [emphasis added]" in which those elements all have *agency* to affect change within each other and the world (p. 851). Similarly, Haider and Sundin summarized the key assumptions of a sociomaterial ontology as understanding "*materialities* and the social as *situated*, *co-constituted* and *emergent* [emphasis added]" (2023, p. 14). While some sociomaterial studies have worked within a critical realism paradigm, the perspectives that aligned with this study have been grounded in a *relational ontology of becoming* or *agential realism* (Hultin, 2019; Sørensen, 2009). This relational ontology has been particularly useful for exploring *practices* (Nicolini, 2009). Practices have been described as the activities, such the sayings, doings, and connections, of everyday life, inclusive of activities in work and teaching

settings (MacLeod & Ajjawi, 2020). A relational ontology has been suited to the study of practices since those activities have been enacted into being through the interactions of the involved humans and non-humans (e.g. texts, technologies, physical environment) (Nicolini, 2012b). As Nicolini (2012b) has stated, this ontology aligned with practice theories, which "are inherently relational and see the world as a seamless assemblage, nexus, or confederation of practices" (p.3).

This entangled view of the human and non-human actors with reciprocal agency has implications for a sociomaterial epistemology; in other words, how the sociomaterial researcher understands the acquisition of knowledge about the world. Epistemology, in the sociomaterial context, has been described as being entangled with ontology as an onto-epistemology: "the study of practices of knowing in being" (Barad, 2003, p. 289; Hultin, 2019). This *agential realism* onto-epistemology has shaped my research as I have studied online teaching practices through looking for the ways in which they have come into being. For my research, I adopted an onto-epistemology of agential realism through which I considered the research process and findings through a lens of relational becoming (Barad, 2003; Hultin, 2019). Using this perspective to view "materialities and the social as situated, co-constituted and emergent" (Haider & Sundin, 2023, p. 14), the theoretical approach has provided a framework for the research design, including data collection, analysis, and writing.

Table 3.1 Key concepts in the onto-epistemology of sociomateriality

Concept	**Definition**	**Examples from LIMES**
Actor / actant	"An actant is a human or non-human involved in an activity under study" (MacLeod et al., 2019, p. 178) "Something or someone that acts or to which activity is granted by others" (Bearman & Ajjawi, 2018, p. 1040)	For example: Librarian, student, videoconferencing software, electronic database, PRISMA reporting checklist and standards.
Actor-Network Theory (ANT)	ANT is a framework that falls under the sociomaterial umbrella as it assumes symmetry (i.e., equal ability to act upon each other) between human and non-human *actors* (see above). These actors come together in *entangled* collections to allow and foster actions or tasks. (Booth et al., 2016). ANT and related "approaches share notions of human/non-human symmetry, network not as metaphor but as socio-material performances that enact reality, and translation in multiple and shifting formulations" (Fenwick, 2010, p. 119).	I have invoked ANT in giving equal consideration of the experiences, words, and actions of librarians (the humans) and the role of technologies for research and teaching (some of the non-humans/materials) in contributing to the practices in online teaching.
Agency / Agentic	"The ability to act and/or exert power, which is distributed across networks to people and things" (MacLeod & Ajjawi, 2020, p. 852)	PRISMA reporting checklist has agency to prompt librarians to teach methods steps so the process of conducting the review can be reported transparently; The agency of the

Concept	Definition	Examples from LIMES
	"Can shape other actors" (Bearman & Ajjawi, 2018, p. 1040)	videoconferencing software is demonstrated by the way that librarian and student intra-actions are shaped by the affordances of the technology.
Agential realism / ontology of becoming	"performative relational enactments within the temporal flow of practice" (Hultin, 2019, p. 103)	Whereas the digital citation data and metadata that makes up MEDLINE exists on servers and a systematic review search may be documented in the online supplemental files of a journal publication, in conducting the search the librarian brings these elements together through practice. It is this relational becoming of the search that changes the meaning of the MEDLINE data and the search documentation.
Assemblage	An assemblage is a complex tangle of natural, technological, human and non-human elements that come together relationally to accomplish both intended and unintended outcomes in everyday life, within a particular time. (MacLeod et al., 2019, p. 178) "Heterogeneous—and constantly evolving—gatherings of natural,	An online research consultation (social practice) between a librarian (human) and a medical student (human) through Teams videoconference software (non-human material) to share screens and demonstrate (immaterial practices mediated by technology) developing and documenting a search (material

Concept	Definition	Examples from LIMES
	technological, human, and nonhuman actors" (MacLeod & Ajjawi, 2020, p. 852) Assemblages are relational (Bearman & Ajjawi, 2018, p. 1040)	practices) in MEDLINE through Ovid (material technology).
Co-constitutive	"[T]he things of our world constitute us as much as we constitute them" (C. Adams & Thompson, 2011, p. 738)	Online research consultations are co-constituted by the communication and research technologies, librarians, and learners.
Emergent/ Emergence	"Objects, and even individuals, are not preformed substances but rather surface through a series of negotiations between an ever-evolving assemblage of actors" (MacLeod & Ajjawi, 2020, p. 852)	Academic health sciences librarians can be seen as emergent by becoming teachers and research methods experts through the assemblage of social and material actors in the instructional encounter.
Entanglement	"A central assumption of sociomaterialit y is that the social and the material are entangled and mutually constituted. … the approach assumes that the world is sociomaterial and is constantly being recreated and reshaped in various arrangements and practices of co-constitution." (Haider & Sundin, 2023, pp. 4–5)	Online teaching practices are entangled with the affordances of videoconference software to share information over video, audio, and chat.

Concept	Definition	Examples from LIMES
Materiality	"the range of technologies and artefacts through which the practice emerges and is enacted" (Lloyd, 2021, p. 38) "emphasis on the importance of matter and the material" (Orlikowski & Scott, 2008; Sy et al., 2023, p. 5)	For example, videoconferencing software, review methods guidance texts, the physical environments in which the librarian and learner are respectively located for the online meeting.
Mediators	Material objects that change or modify other elements of the network by acting on them (Bearman & Ajjawi, 2018, p. 1040)	Copying in a search filter in a citation database limits results to a reduced set with higher relevance; Librarians share texts and resources through the mediation of the videoconferencing chat so that students can open the links on their own devices.
Practices	"Practices consist of sayings, doings, and relations in everyday life. A focus on practices means moving away from a traditional concern for the individual human subject and instead attuning to activity (what concretely happens in education) and connection (relationships between people, and between people and the material elements around them)." (MacLeod et al., 2019, p. 178) "heterogenous gatherings of natural, technological, human, and non-human	Sharing the screen through the videoconference software to demonstrate or observe the entry of search terms into an electronic bibliographic database.

Concept	Definition	Examples from LIMES
	actors that form assemblages of bodily movements, mental activities, objects and their use, states of emotions, know-how, and motivation, among others." (Orlikowski & Scott, 2008; Sy et al., 2023, p. 5)	
Relational/ Relationality (see also: intra-activity)	Similar to the concepts of co-constitutive and entangled, relationality assumes a "causal relationship between the apparatuses of bodily production and the phenomena produced is one of 'agential intra-action.'" (Barad, 2003, p. 814) "humans and materials only exist in relation to each other" (Orlikowski & Scott, 2008; Sy et al., 2023, p. 5)	The availability of a chat feature in videoconferencing software creates teaching practices that include sharing resource links while also showing the resource on a shared screen.
Situated	The specific context, environment, and time of the practice or activity.	Findings from this research are situated in the context of HPE and academic health libraries in Canada during the COVID-19 pandemic.

Sociomaterial approaches have foregrounded the entangled nature of material and immaterial actors and have been described as posthumanist (Barad, 2003). The posthumanist approach and related practice theories within the theoretical framework for this research were consistent with the entangled conception of ontology and epistemology.

> Humanist approaches start from human beings as the main (or only) source of agency and methodologically study "humans and their practices" positioning the material world in relation to, but outside, practice. … A posthumanist practice theory assumes a relational epistemology, thus joining contemporary debates on a family of postepistemologies – new feminist materialisms, relational sociologies, affect theory, and postqualitative methodologies – that blur the boundaries between ontology and epistemology. (Gherardi, 2021, p. 2)

Using a performative and non-representational onto-epistemology was aligned with the research objectives of exploring the nature of the labour and teaching practices enacted in various circumstances, to various purposes, and with various human and non-human *actors*. Gherardi (2021) described the onto-epistemology of practice theory in relation to 'management' and 'managing'. I have substituted 'instruction' and 'teaching' respectively into their description to illustrate the parallel application for my research.

> Along with the shift from knowledge to knowing, an epistemology of practice assumes the shift from [instruction] to [teaching]. In moving from the noun to the verb, we also move from issues of ontology (what [instruction] is) to issues of epistemology (how [teaching] is done) to issues of onto-epistemology, that is, how the researcher's language and epistemic practices construct [teaching] as an object of inquiry. (Gherardi, 2021, p. 4).

By exploring the processes and practices that have been used by librarians to teach evidence synthesis methods, I have leaned into this type of *relational* appreciation for how learning and teaching have been understood as developmental processes of *becoming*, regardless of whether one has become an effective searcher, a published researcher, a registered health professional, a confident teacher, or an academic librarian. In the context of engaging with learners in the online environment regarding a research method and information retrieval that has been largely digitally

mediated, it has been appropriate to go beyond the psychological and social motivations of individual people. Therefore, I have proposed an approach emphasizing the relational *agency* of both human and non-human, material and immaterial, as particularly well-suited for addressing the complexity of the entangled elements involved.

3.4.3 Sensitizing Concepts

I have described and contextualized the guiding tenets of the theoretical framework for this study in the next sections of this chapter by drawing on exemplar literature that have used similar perspectives. While sociomaterial approaches have also been implemented to research topics in primary and secondary education (for example: Gourlay, 2021; Meyer et al., 2021; Sarkio et al., 2023), the research in the contexts of higher education and HPE has been more relevant to the adult learners and professional education applicable in academic health librarians' teaching about evidence synthesis methods. The exemplar studies in this section have been selected to represent some of the applications of similar conceptual frameworks in the intersecting domains of online education, HPE, and research methods and to highlight how the sensitizing concepts have informed research processes and findings. In Table 3.2 I have provided definitions from the literature for additional key terms from the sensitizing theories of ANT, practice theory, and sociomateriality along with illustrative examples from my research context

Table 3.2 Additional definitions and examples of sensitizing concepts from theoretical framework

Key terms	**Description**	**Examples from LIMES**
Agential cuts	And agential cut "is a momentarily stable configuration that can be examined and that is achieved through temporal, spatial and relational severances, or cuts" (Haider & Sundin, 2023, p. 5).	Instances in teaching evidence synthesis methods when librarians invoke a particular type of tool or resource, such as a library guide, video tutorial, or search filter.
Becoming	Becoming is "the constant change and development of things and their relations" connected to "doing" (Haider & Sundin, 2023, p. 5).	Teaching practices enacting active and applied learning strategies for evidence synthesis methods wherein the learner becomes a researcher through doing the steps of the review and the project becomes methodologically guided research through the relations between the learner, teacher, technology, and texts.
Configurations	"Thinking in terms of configurations helps to draw boundaries that are culturally and temporally specific, which is a prerequisite for articulating and delimiting objects of study" (Haider & Sundin, 2023, p. 6). [analytic device]	Similar to agential cuts but at a larger scale: the configurations of Canadian academic health librarians connecting with learners through online communication technologies about the tools, techniques, technologies, and methodological guidance for conducting and reporting evidence synthesis research.
Infrastructure	Infrastructure is "the background systems and structures that support and	For example: institutionally provided videoconferencing, email, and scheduling software, academic library database and

Key terms	Description	Examples from LIMES
	shape practices, amongst other things. […] Importantly, infrastructures incorporate standards, build on layers of older infrastructures, and they go unnoticed until they break down (Star, 1999)" (Haider & Sundin, 2023, p. 6)	journal subscriptions, personal or institutional internet networks.
Inseparability	"Material and social entities are intertwined and cannot be discerned separately" (Orlikowski & Scott, 2008; Sy et al., 2023, p. 5). Similar to intra-action below.	Student(s), librarian(s), videoconferencing software, methods guidance, and library citation databases are inseparable in the context of online teaching of systematic searching.
Intermediaries	"Material objects that exist without modifying another element of the network" (Bearman & Ajjawi, 2018, p. 1040).	In the context of agential realism objects are a rarely, if ever viewed as intermediaries, as even objects as seemingly static as a computer screen or keyboard can be understood as mediators having relational agency with the humans and practices in the research context.
Intra-action	"Intra-action differs from the notion of interaction, which presupposes that entities first come into being and then enter into relation with each other. In contrast, intra-action emphasizes that social,	Librarians sharing links and information in the chat of a video call brings attention to the intra-actions of content shared, technology, means of communication, pedagogical approaches, and the individuals on the call.

Key terms	Description	Examples from LIMES
	including discursive, and material entities are not fixed with clear boundaries, but are constantly being created and shaped" (Haider & Sundin, 2023, p. 5).	
Network	"Contested and precarious multiplicities which order practices, bodies, and identities through complex enactments" (Fenwick, 2010, p. 119).	An online research consultation between a specific librarian and learner, through the particular configuration of their institutionally-provided software and library database subscriptions.
Performativity	Performativity assumes that "… things do not simply exist but their meaning is emergent and they are actively involved in producing meaning and shaping the world" (Haider & Sundin, 2023, p. 6). "Only through the relations of human and material elements can agency be enacted through practice" (Orlikowski & Scott, 2008; Sy et al., 2023, p. 5).	Academic health librarians perform as expert searchers and online teachers through the sociomaterial practices of communicating meaning and demonstrating competence in those roles through practices with materials and technologies.
Rupture / breakdown	The accidents and disruptions that threaten the stability of networks (see above) to make	The citation database search interface "timing out" while running a long search strategy during a group or individual teaching session.

Key terms	Description	Examples from LIMES
	temporarily visible everyday practices and material.	
Stabilization	"When the network appears to be complete and durable and to exercise force while concealing all the dynamic translations that created it and continue to maintain it'' (Fenwick, 2010, p. 121).	The library research support service seem stable, masking the labour of coordinating schedules, technology, expertise, and people that make up the assemblage.
Symmetry	"Symmetry is the idea that both material and immaterial, human and non-human, elements are equally important in work and learning. Non-human actors therefore require analytical attention" (MacLeod et al., 2019, p. 178).	Videoconferencing software, chat functions, librarian, student, evidence synthesis methods guidance texts are all equally and reciprocally agentic actors
Translation	''Micro-negotiations among elements that work to shape or change them, and link them into extended chains of interconnected activity'' (Fenwick 2010, p. 121).	Student shares their screen showing the citation database search interface to enter terms of the search.

Following the definition provided in Table 3.1, assemblages have been understood as inherently unstable accountings of local examples of practices that may have occurred in other contexts. Patel and colleagues' proposal of assemblage theory as an alternative to purely focusing on

practice as the unit of analysis has been helpful in conceptualizing flexibility in the boundaries of analytical focus.

> The idea of an assemblage can be used to emphasize the practice of assembling where contingent relations form, shift, endure or disperse; or to describe open-ended groupings or collectives; or to represent an uneven topography across time and space; or to connote emergence rather than a fixed outcome. (Patel et al., 2022, p. 4)

Patel et al. proposed assemblage thinking for their study of scalar events such as the case of the viral video of George Floyd, which was not directly applicable to the average academic library webinar. However, their work expanding on the emergent, transitory, and relational nature of online events emphasized the impermanent, yet impactful, potential of ideas and activities as viewed through sociomateriality. This conception of assemblages aligned with the ANT idea of networks but stressed the transient rather than the fixed nature of the collectives of actors, and has helped highlight the importance of context in my understanding of the research problem.

Three other exemplary studies in related fields demonstrated integrating the relationality of social and material elements in online teaching and learning in different contexts throughout the research and writing processes. In a study of online teaching practices in a newly-implemented virtual learning environment, Calderwood (2023) looked for entanglements of the social and technical, the ways the instructors viewed their position in the environment, as well as the possibilities and tensions arising through practices. In other contexts of online education, sociomateriality has been used with practice theory to help study learning management systems and virtual education settings (Bolldén, 2016). Sociomateriality and practice theories were useful in considering practices and configurations of bodies, technologies, spaces, and learning in remote teaching during the COVID-19 pandemic (Pischetola et al., 2021). Each of these studies drew on diverse methods of data collection and analysis consistent with their respective conceptual frameworks and an ethno-methodology research approach (Lynch, 2001; Nicolini, 2012c). Calderwood's (2023) methods included reflective interviews while watching recordings of teaching, similar to the approach I used during interviews, as described in Section 4.3.2. Others have used a relational analysis framework of "online teaching practices and their virtual material arrangements" (Bolldén, 2016, pp. 447–448) and sociomaterial concepts of assemblage,

intra-action, and emergent "meanings, patterns, and power structures" to orient analysis (Pischetola et al., 2021, p. 393). These examples of integrating sociomaterial and practice theories to study online teaching and learning have been informative in the development of the conceptual framework for my study and provided guidance for analysis. In particular, Bolldén's analytical model for exploring online teaching practices proved useful (see Figure 3.1), as I have elaborated further in Section 3.4.4.

Other examples of sociomaterial studies in HPE have shown dimensions of teaching and learning in interprofessional settings. Sy and colleagues have completed a scoping review of the applications of sociomateriality in HPE in the context of interprofessional education (IPE) and interprofessional collaboration (IPC) (2023). Their findings built on the earlier review conducted by McMurtry and colleagues (2016) on the use of sociomaterial research approaches in interprofessional teams. The findings from Sy et al. emphasized how power has shown up in and mediated IPE and interprofessional collaboration, the roles of non-health professionals in IPE and IPC practices, and the ways that sociomateriality itself served to tool to explore phenomena in IPE and IPC (Sy et al., 2023, pp. 17–18). Some of these findings echoed a sociomaterial study on educational technology and the multitude of actors involved in medical education across distributed campuses at Dalhousie University (MacLeod et al., 2017; Tummons et al., 2015). In their multi-site ethnographic study, MacLeod and colleagues highlighted the articulation work (Star & Strauss, 1999) of the various technology, administrative, and instructor professionals who interacted with each other and the technologically mediated classrooms in the course of the medical school curriculum (MacLeod et al., 2017). They defined articulation work as that which "constitutes a workaround and occurs when workers strategize to overcome breakdowns, oversights, miscommunications and other such social and material challenges" (MacLeod et al., 2017, p. 628). As academic health librarians have been similarly situated adjacent to, but not directly implicated in, the delivery of medical and HPE programs and curriculum, these studies suggested valuable frameworks to examine the questions related to invisible labour, identity, and complexity in teaching practices.

Within the context of higher education and research capacity building, Young used ANT to help understand interdisciplinary research practices through three case studies framed by sociomateriality (E. L. Young, 2019). Focusing on the sociomaterial practices enacted through

development of new technologies, these case studies used a praxiography approach to investigate those practices with ethnographic methods. Young's doctoral research (2019) spotlighted the research methods and knowledge translation intra-actions with technology rather than through teaching practices, but similarly employed an ANT-informed theoretical foundation in the context of interdisciplinary practices. Similarities in the context of the Young's interdisciplinary research mirrored the intersections of multiple fields that have come together in academic librarians' online teaching practices for evidence synthesis methods. Young's case studies showed how the materiality of research and knowledge translation practices can help to understand multiplicities in interdisciplinarity, a concept that contributed to my conception of the tensions in librarian identity and teaching practices.

Gourlay and colleagues also wrote extensively about sociomaterial approaches to exploring teaching, learning, and information practices in online environments. Their lines of research have included higher education during the COVID-19 pandemic (Gourlay, 2021, 2022) and digital and embodied information practices within physical and digital academic libraries (Gourlay et al., 2015). In the latter, Gourlay and colleagues argued for ethnographic research to inform improving library services and they linked sociomateriality with research on practices in academic libraries.

> Such [ethnographic] accounts draw attention to the particularities of practices, and to the ways in which resources and infrastructures are taken up to enable them. This allows contrasts to be drawn between the accounts and local practices, revealing points of commonality and difference; supporting the development of theories, and generating ideas for new configurations of practice. As such, they form bridges between past practices and possibilities for development. (Gourlay et al., 2015, p. 266)

This argument was relevant to my research through framing sociomaterial practice theories as a means to propose improvements to practices, such as librarians' online teaching practices and the provision of support for evidence syntheses in academic libraries.

Other authors have used a more superficial consideration for material and technological aspects of online teaching in higher education and HPE contexts. For example, Fong et al. (2022) acknowledged sociomateriality and used an input-process-output model to consider challenges

and solutions in planning and evaluating online large group teaching in HPE. Their analysis and findings in their relatively brief program evaluation report highlighted practical suggestions for planning and implementing online class sessions. However, they did not engage deeply with the sociomaterial perspective, thereby serving as a reminder of the richer analyses that can be supported when the conceptual framework has been woven throughout the conduct and reporting of the research.

3.4.4 Sociomaterial Methodology: Ethnography

Many researchers have noted the alignment of sociomateriality with ethnographic methodology traditions (Fenwick & Nimmo, 2015; MacLeod et al., 2019; MacLeod & Ajjawi, 2020; Woodward, 2020). The examples of research I have described in the related fields of HPE, higher education, and digital learning have employed ethnomethodologies to observe practices and culture within the entangled domains of the social and material. Modifications of ethnomethodology that originated in colonial anthropology as a means for "outsider" researchers to explore a novel culture have evolved over time. While 'ethnographies' were previously situated within a positivist paradigm preoccupied with objectivity, current ethnographic practices have reflected changing research norms and the understanding that researchers can be insiders to the field of investigation and bring valuable insight through that inherent bias. During research design and planning I took advantage of my insider status as an academic health librarian who teaches evidence synthesis methods online to focus the field and targets of the ethnographic study, as has been done extensively in medical education and health research (Andreassen et al., 2020; Rashid et al., 2019). In their comparison of focused ethnography to traditional anthropology ethnography in health research, Trundle and Phillips noted that focused ethnographies have generally intended to make insights leading to improving health care practice and patient outcomes (Trundle & Phillips, 2023). With the goal of deepening the appreciation of librarian labour and improving online teaching practices to help learner outcomes, a focused ethnography design was appropriate for my research questions. I drew on the ethnomethodologic traditions of naturalistic observation, multiple data sources, insider perspective, and thick description of complex interactions to achieve insights into librarians' online teaching practices.

As has been described in guidance about ethnographic research in medical education and other fields, ethnography is an appropriate methodology to explore the meanings ascribed to actions and practices in a natural, non-experimental setting, with intentions to understand holistically what is happening (Hammersley, 2018; Reeves et al., 2013). Tracing methodological descriptions of practice theory-based research (Nicolini, 2012a) brought me to descriptions of ethnography, ethnomethodology, and microethnography (Streeck & Mehus, 2005). My role as a participant researcher also called forth another member of the ethnomethodology family: autoethnography. By considering the materiality of my own teaching practices and using reflexive journalling, this research drew on elements from autoethnography, particularly in the process of interpretation and suggesting implications (Deitering, 2021; Holt, 2003; Ibrahim et al., 2022; Jackson & Mazzei, 2008).

Furthermore, related methods such as video-reflexive ethnography provided ample opportunities to trace social and material assemblages and allowed co-construction of meaning with study participants (Ajjawi et al., 2020). Indeed, Woermann (2018) noted that video-enhanced ethnographic methods have naturally supplemented focused ethnographies, adding richness of data to the otherwise short period of observation that have characterized the abbreviated adaptation of ethnomethodology. By filming work practices and replaying selected snippets with participants to elicit reflection on the activities and interactions taking place, video-reflexive ethnography offered the chance for the librarian participants and myself, a researcher positioned inside the phenomenon of interest to achieve new insights regarding our teaching practices. Similar to other visual elicitation in interviews, video-reflexive ethnography has allowed the participants and researcher to collaboratively generate ideas to improve or modify what we do when we are teaching through exnovation, collaboration, reflexivity, and care (Ajjawi et al., 2020). Exnovation has been described as a way to suggest changes to address challenges in complex practices, such as health care or education, by adapting local practices that are already in use (Ajjawi et al., 2020, p. 910). While the nature of this doctoral research project constrained the collaborative elements of the analysis, the potential for change and action-oriented research, like participatory action research methods, was appealing and remains an option for future research in this area. For this project, the collection of data through online methods that readily permitted recording and selection of excerpts, as described in the next chapter on the data

collection and analysis methods, has lent itself to adapted video-reflexive ethnographic strategies.

3.4.5 Sociomaterialism-Informed Research Design

Several articles have explicitly laid out how sociomaterial sensibilities have played out in conducting research. For example, Moura and Bispo (2020) presented theoretical approaches under the umbrella of sociomateriality, including New Materialisms, ANT and ANTi-history, Cultural historical activity theory (CHAT), spatiality theories, organizational aesthetics, and science and technology systems, and described how data collection through interviews, observations, and media or document analysis may be informed by these approaches (p. 358). Hultin (2019) has argued that as a sociomaterial researcher, attention was oriented to the processes of a practice: following the "flow" of the materials and "tracing their genealogy" (p. 102). Burm and MacLeod have provided additional suggestions for methods used in sociomaterial research in HPE and noted the utility of using ideas from ANT to unpack the "black box" of everyday activities. Examining taken for granted practices, such as the everyday activities of teaching, can reveal what aspects of those practices might normally have been invisible (Burm & MacLeod, 2020, p. 6). Foremost, they emphasized the presence of materiality throughout the research process and in the reported findings of sociomaterial inquiries, particularly of those materials found within practices that otherwise "ordinarily just fade into the background of everyday practice" (Burm & MacLeod, 2020, p. 8). An approach focused on materiality facilitated identification of the moments of analytical departure as described by Pischetola et al. (2021) in their study of online teaching. These sociomaterial, ANT, and practice-oriented exemplars and methods guidance encouraged focusing on technologies and other materials in data collection and analysis, in addition to collecting data regarding the human participants' activities and practices. I have described how I followed these principles and attended to materiality and practices during data collection and analysis in Sections 4.3.2 and 4.3.4, respectively.

Drawing from the sociomaterial examples in online teaching in higher education for methods insight, Bolldén's (2016) analytical framework was useful given the similarities with my research setting. I have reproduced their framework in Figure 3.1 showing the configuration of

online setting, practice, material, and pedagogy to understand the co-constitutive nature of practices and virtual materials (Bolldén, 2016, p. 447). This visual representation helped to depict the symmetry between the human activities (the teachers'/librarians' and students' doings and sayings) and the "material arrangement[s]" of the online setting (Bolldén, 2016, p. 447).

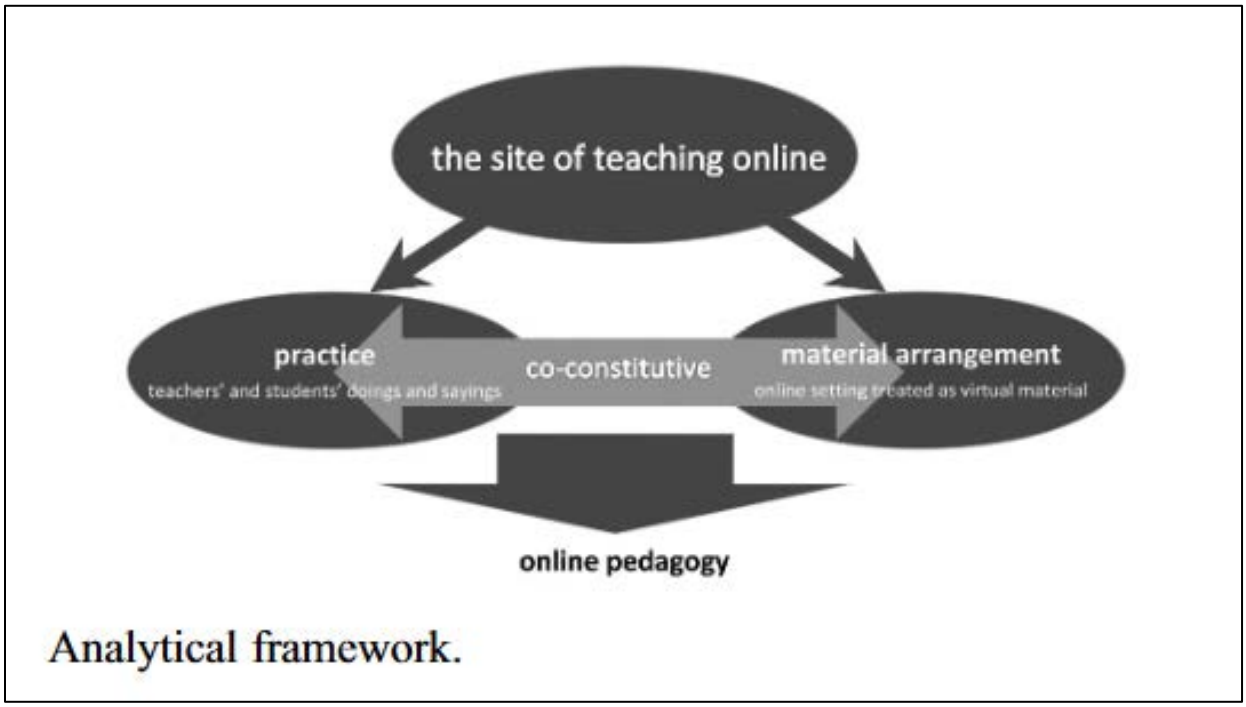


Figure 3.1 Sociomaterial analytical framework from Bolldén, 2016

Note: Sociomaterial analytical framework for online teaching practices. Reproduced from "The emergence of online teaching practices: a socio-material analysis," by K. Bolldén, 2016, *Learning, Media and Technology, 41*(3), 447. © 2015 Taylor & Francis.

In-depth applications of ANT and sociomaterial approaches to digital technologies and online learning in higher education and workplace learning have been further described by Adams and Thompson in their articles and book on interviewing digital objects (C. Adams & Thompson, 2011, 2016). They described eight heuristics in their 2011 article, based on their research guided by phenomenology, ANT, and the inherent connections and disconnections between elements in sociomaterial phenomena. Several of those heuristics have been relevant for this research about librarians' online teaching practices: 1) following the actors; 2) "recognizing the amplification/reduction structure of human–technology relations" (p. 742); 3) applying the laws of media as posited by McLuhan (p.742); 4) studying breakdowns and accidents (p. 743); 5)

untangling tensions (p. 744); and 6) constructing co(a)gents (C. Adams & Thompson, 2011, p. 745). Meanwhile, Haider and Sundin (2023) suggested that the concept of "agential cuts" as a means of viewing complex, ever-changing phenomena (intra-actions) at a moment of temporary stability. They proposed such *agential cuts* as useful tools for defining the boundaries of units for analysis (Haider & Sundin, 2023, p. 5). Such suggestions, along with the heuristics from Adams and Thompson (2011), also aided in reviewing the recordings and transcripts by indicating possible ways to delineate units of analysis, similar to the writing of Pischetola and colleagues (2021) in describing their analysis as "starting from specific 'material moments' […] identified in the reported data" (p. 393). These heuristics and strategies were instrumental in data collection through the interviews, focus group discussions, and consideration of materials in teaching practices. These sensitizing concepts from the theoretical framework also guided analysis and writing throughout the research process as described in Section 4.3.4.

3.5 Frameworks for Studying the Labour of Teaching in Academic Libraries

The previous section provided examples of studies with similar theoretical frameworks in related fields, illustrating how research has been designed and conducted using sociomateriality, ANT, and practice theories. This section provides the conceptual framework for these theories applied in the context of academic libraries, particularly as pertaining to practices and performances in working, teaching, and researching. The findings presented in Chapters 5, 6, and 7 were shaped through this conceptual framing by considering the intersections of the theoretical framework with the contextual understandings described in this section.

3.5.1 Sociomateriality of Evidence Synthesis Research and Online Teaching

Digitally mediated practices can be best understood not as technologically deterministic, but rather consisting of socially and materially entangled actors (Orlikowski, 2007). In the case of conducting evidence synthesis research in the late 20th and early 21st centuries, we can look at the example of how researchers abstract data from their included studies. Whereas the tasks of reading articles and identifying relevant data to help address the research question of a particular review has remained relatively consistent since evidence synthesis methods were first standardized by the Cochrane Collaboration in the 1990s, the actions of reviewers will be

different based on the technological affordances at hand and the researcher preferences and experience. The researcher – at least at one point in history – may have printed out articles onto paper to highlight or annotate the data of interest, then retyped the data into a word processing software or spreadsheet. Or they may have saved copies of the included articles to their computer to copy and paste the selected data into tables or statistical software. Or, depending on the technology available to the researcher, they may have uploaded the full-text of articles into a review management software such as Covidence (Covidence, 2024) or DistillerSR (DistillerSR Inc., 2024), from which they could pull data into previously formatted extraction forms that could subsequently produce electronic outputs for manipulation in other textual, statistical, or visual analysis software options. In the 2020s, emerging applications of artificial intelligence (AI), machine learning, and automation to data abstraction have had further implications for the work of evidence synthesis researchers. Thus, the research activities and practices have been mediated by the analog or digital technologies employed by the researcher, but those technologies have also been subjected to development, modification, and constraints depending on the expectations and actions of researchers, software developers, methodological experts, research organizations, and others. For example, feedback from software users led the developers to add a customizable data Extraction Form 2.0 in Covidence (Covidence, 2024), allowing adaption for studies other than the randomized controlled trial reports permitted in the Extraction Form 1.0 (Owens, 2022). Thus, the data extraction feature of the software could be used for reviews other than systematic reviews of interventions, such as diagnostic study systematic reviews or scoping reviews, as just a couple of examples. With this added feature, researchers could modify the software and interact with it to suit their purpose and project. Their research practices then included going through the research process itself, altering the research software, and extracting data from published study reports into the form, generating additional textual material for subsequent analysis (i.e., research practice). This entanglement of technologies, organizational work, research activities, individual and collective motivations, and other actors has further been compounded in the context of *teaching* evidence synthesis methods through online modes.

The work of supporting evidence synthesis research has frequently been included in academic health sciences librarian job postings, role descriptions, and performance evaluations, based on my experience in the profession. Numerous publications have described the competencies

librarians bring to evidence synthesis research as well as the training opportunities to build those competencies (Conte et al., 2015; Foster et al., 2018; Townsend et al., 2017). Similarly, academic librarians' work in information literacy instruction and health librarians' involvement in EBP instruction have been well documented (Alcock, 2017; Grabowsky & Weisbrod, 2020; B. S. McGowan, 2019; Nevius et al., 2018; Swanberg et al., 2016; Weightman et al., 2017). As reported in Chapter 2, at the intersection of evidence synthesis methods training and academic health librarians' teaching, librarians have published opinion pieces (Hanneke, 2018), program descriptions (Fuller et al., 2021; Hayden & Premji, 2022; Lenton & Fuller, 2019; Poole, 2021), and scans of the environment and literature related to evidence synthesis instruction (Lee et al., 2021; Parker et al., 2018; Premji et al., 2021). However, little research has explored in-depth the teaching practices and labour of librarians engaged in training students for systematic searching and related evidence synthesis methods skills. This gap has suggested that the nuances of this work and its role in professional identity of these library workers may be largely invisible to librarians, library administration, health researchers, and learners alike. To rephrase Sy et al. positioning of interprofessional education and care into terms for the context of my research: "Shifting attention to the non-human elements and positioning them at the foreground of professional practice can provide [academic health librarians] the opportunity to stabilise efficient assemblages and dismantle deficient ones to inform practice towards achieving better [learning] outcomes" (2023, p. 5).

3.5.2 (In)Visibility of Teaching Practices and Teacher Identity in Academic Libraries

The (in)visibility of labour involved in teaching practices may be connected to the undervaluing of the teacher identity and teaching practices within library and information professions, starting from professional training. Several publications have looked at the preparation for teaching in the graduate programs completed by academic librarians. These studies have found a consistent lack of emphasis on information literacy, instruction, pedagogy, and teaching skills, with very few programs requiring a related course and most offering a single elective course (Dodson, 2020; Saunders, 2015; Valenti & Lund, 2021). Furthermore, none of the graduate schools examined in a 2012 study included courses on teaching in the context of health librarianship (Detlefsen, 2012). As reflected in the literature described in Chapter 2, teaching has been reported as a

significant component of academic librarian work, and yet the majority (600 of 925 respondents) of surveyed librarians experienced teaching anxiety (Lundstrom et al., 2021). While the lack of formal preparation and confidence in teaching has not been unique to library professionals in academia (Matos et al., 2022) or HPE (Gottlieb et al., 2022), the gap is significant given the core role of teaching in the services and functions of academic libraries.

In the context of little formal preparation, considerable teaching responsibilities, and psychological responses to teaching, authors have explored the professional identity formation of academic librarians. For example, using the concept of *kairos*, which "frames time as a material force, one which determines the actions that take place during and within it" (p. 481), Drabinski (2014, 2016) explored the teaching identities of academic librarians. Drabinski linked the temporal and material aspects of professionalization in librarian teaching to emphasize the importance of context and situate the ACRL Framework 2015 (ACRL Framework for IL, 2015) in the discourse of academic librarianship. Other theories and conceptual frameworks have been used for similar populations or research questions regarding the professional identity and knowledge of academic librarians. For instance, the previously mentioned Technological, Pedagogical, and Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) has been used to guide reflective practice as part of one librarian's professional practice and identity (Greenwood, 2023). Similarly, TPACK was invoked in a dissertation on professional identity formation of blended librarians, defined as those with a role that "blends the subject matter expertise of a librarian with the technical skillset of an instructional technologist" (Amparo, 2020, p. 2). McTavish used an alternative to TPACK, shown in Figure 2.1, to explore the identities of librarians in digital spaces and investigate the roles of librarians as online teachers (McTavish, 2019; McTavish & Robertson, 2020). As shown by these examples, the TPACK framework can be considered in the context of the components and labour involved in online teaching, but the underlying humanist assumptions have represented the instructor knowledge or skills as the focus of the model. By adapting aspects of this framework with the relational lens of agential realism and consideration for materiality, I have re-oriented my research to the online teaching practices. My work was informed by Mulcahy (2011), who used a sociomaterial approach informed by ANT to examine the professional identity formation of teachers by focusing on practice. I have followed the understanding of 'knowledge' employed in practice theories.

> From a practice perspective, knowledge is conceived largely as a form of mastery that is expressed in the capacity to carry out a social and material activity. Knowledge is thus always a way of knowing shared with others, a set of practical methods acquired through learning, inscribed in objects, embodied, and only partially articulated in discourse. (Nicolini, 2012b, p. 5)

In approaching data analysis, I have used the TPACK framework and various derivatives, such as McTavish's model for online teaching (McTavish, 2019; McTavish & Robertson, 2020), as inspirational frameworks from which I have developed a model to understand the sociomaterial practices of teaching the methods for evidence syntheses. I have described the role of this framework model as an analytical approach further in Chapter 4 and have unpacked the model itself in Chapter 5.

3.5.3 Labour in Academic Libraries

Though the published reviews and program descriptions described in Chapter 2 provided details on some instructional interventions, there have been no empirical studies of the teaching practices of librarians when supporting learners working on evidence synthesis projects, including in the online environment. The paucity of attention to online teaching practices for evidence synthesis methods may be at least partially attributed to the immaterial and underrecognized nature of much of the work entailed. The labour involved in supporting and teaching evidence synthesis methods has not been fully accounted for through the metrics that have dominated assessment of library services. One such example has been the performance data collected for teaching and reference services academic libraries as part of the Canadian Association of Research Libraries and in many library assessments of value (Canadian Association of Research Libraries, 2022; Clarke et al., 2022; Cox et al., 2019). The absence of direct quantitative data accounting for labour in teaching practices has parallelled the invisible work described by Star and Strauss (1999), when "formal and quantitative indicators of work are abstracted away from the work setting, and become the basis for resource allocation and decision-making" (p. 15). They also described another category of invisible work as "circumstances where the workers themselves are quite visible, yet the work they perform is invisible or relegated to a background of expectation" (1999, p. 15). Conflating teaching and

support of evidence synthesis methods with the overall number of research consultations or teaching transactions in academic libraries, along with neglecting to closely examine the work involved in online teaching of evidence synthesis methods, suggested that these teaching practices could be viewed as invisible work.

Descriptions of teaching evidence synthesis methods in the literature have provided examples of digital and knowledge-based labour within academic libraries that other authors have called immaterial and invisible (K. P. Nicholson, 2022; Sloniowski, 2016). Immaterial and affective labour have been discussed in the context of academic libraries, particularly regarding work within public services (K. P. Nicholson, 2022), with digital systems (Allison-Cassin, 2020), and more generally across academic librarianship (Popowich, 2019; Sloniowski, 2016). In other labour-related literature, Demetres and colleagues (2020) examined burnout among librarians who support systematic reviews and found that those who devoted the majority of their time to review support and regularly used review management software had lower levels of burnout. These findings suggested that explicitly focussing on the necessary competencies (Townsend et al., 2017) and having access to supportive technologies could be protective factors (Demetres et al., 2020). Meanwhile, Huet, Alteri, and Taylor (2019) described the work of digital humanities librarians positioned at the juncture of multiple methodologies, disciplines, and embedded digital work as invisible labour. The invisible work of digital humanities librarians at the intersection of various domains mirrored that of academic health librarians teaching evidence synthesis methods in online environments, which has required multiple professional identities and competencies. Librarians have balanced the competencies (Townsend et al., 2017) and roles (Spencer & Eldredge, 2018) of working with evidence synthesis research with the additional practices of teaching online and navigating technologies (Amparo, 2020; McTavish & Robertson, 2020). Librarians have also been obligated to communicate the efforts and resulting value and outputs from these hybrid roles to library users and decision makers both within and beyond the library (Clarke et al., 2022; Huet et al., 2019).

As noted previously, invisible and undervalued work in medical education, higher education, health care, and academic librarianship has been explored and theorized using sociomaterial research sensibilities and related theoretical frameworks (Bergschöld, 2018; Lihosit, 2014; MacLeod et al., 2017; Pischetola et al., 2021; Ulloa et al., 2022). For example, Star and Strauss's

concept of articulation work has been used to foreground the invisible labour of information technology staff and others as well as various technologies in the context of distributed medical education (MacLeod et al., 2017). Other scholars have responded to the shift to remote, online teaching and learning in response to the COVID-19 pandemic to ask "the question 'what does technology do in this class?' [which] triggered a reconceptualization of bodies, material things, and pedagogic space as a dynamic intertwinement of vital agencies" (Pischetola et al., 2021, p. 16). Within health care settings, Ulloa (2022) has unpacked the invisible labour related to technology innovations such as the development and implementation of AI-based tools. Meanwhile, others have highlighted the ways that technology can impact the labour involved in delivering skilled homecare (Bergschöld, 2018). In the context of teaching in academic libraries, Lihosit (2014) argued that academic law librarians could advance the status of their profession and make their contributions to legal education more visible by using the related theoretical construct of Latour and Callon's ANT to build a nuanced understanding of the needs of learners at law school. These studies have used theoretical frameworks aligned with what I have described in Section 3.4 in similar areas to that of librarians teaching evidence synthesis methods online, creating the basis for this doctoral study's conceptual framework to explore the nature of the labour in teaching practices.

Scholars have explicitly linked concepts from a sociomaterial theoretical framework to invisible labour. For example, Fenwick and Edwards (2013) have recommended using ANT in the context of educational research to understand the relationship between the invisible labour and sustaining teaching practices.

> ANT analyses show how the entities that we commonly work with in educational research – classrooms, teaching, students, knowledge generation, curriculum, policy, assessments, inequities, reform – are in fact gatherings of myriad things that order and govern educational practices. Yet, these assemblies are often precarious networks that require a great deal of ongoing work to sustain their linkages. (Fenwick & Edwards, 2013, p. 57)

Others have discussed the tendency of various types of work in academic libraries to be rendered invisible, both through technological implementations and organizational structures. For

example, Galvan (2019) wrote on the lack of visible, human oversight in collection and system management in libraries. While not explicitly sociomaterial, this commentary drew on the embodied and material experience of engaging with library stacks, electronic databases, and search algorithms. Similarly, Haider and Sundin wrote about the material and often invisible function of the concept of search in everyday life (Haider & Sundin, 2019). These texts represented two aspects materiality of invisible work – from the human, embodied perspective and that of the work enacted by the taken-for-granted technological tools.

The related concept of temporality has also been foregrounded to investigate invisible labour in academic library contexts. Nicholson (2019) set the stage to explore temporal labour in a qualitive study of public service librarians who provided reference and information literacy instruction. While also not oriented by sociomateriality, this research was nonetheless guided by questions that touch on materiality, power, and labour practices. Nicholson's study focused on the human agency involved in teaching in academic libraries and the impacts of organizational and cultural factors on managing workload and the expectations of faculty and students. Other researchers have discussed time and temporality in the context of library work, particularly regarding professional librarians as teachers (Drabinski, 2014, 2016; D. Hicks & Schindel, 2016). Nicholson (2022) further elaborated on space-time concepts with spatial thinking to understand the immaterial, invisible, and affective labour of librarians in public service roles at academic libraries. Temporal considerations have been described as essential to research guided by practice theories, since practices should be explored through "relationships in space and time" (Nicolini, 2012, p. 16).

In other contexts, the link between time and effort spent on work activities and technological affordances was made explicitly through sociomaterial research approaches. For example, in study of homecare workers and their use of information and communication technologies, Bergschöld (2018) examined the complex relationship between the supposedly time-saving role of technologies and the workers' professional identity as skilled workers. The topic of invisible labour has been investigated through sociomaterial research approaches in fields such as distributed medical education, where MacLeod and colleagues (2017) elaborated on the invisible labour of individuals in multiple professional roles. Sociomaterial approaches have been well suited to research questions that intend to unpack overlooked or taken for granted practices,

technologies, and phenomena, as the perspective has emphasized tracing assemblages of actors to untangle the mediating and entangled relations.

The conceptual affordances of invisible labour in academic libraries has particularly informed the analysis of the findings presented in Chapter 6. Using a composite accounting of the relational processes between materials and practices, the articulation and immaterial labour in teaching practices during online evidence synthesis research consultations has been foregrounded.

3.5.4 Performativity of Invisible Labour and Teaching Practices

Various researchers have examined librarian teaching practices and identities from the perspective of performing or becoming in ways that parallel sociomaterial approaches (Azadbakht, 2021; Hector, 2023). For example, Hector (2023) referenced the work of Goffman (1959) to explore the performative nature of library instruction in academic libraries. Their work drew on earlier parallels drawn by Quinn (2005) between academic libraries and dramaturgy theory described by Goffman. This theory called on 'performance' as a metaphor to understand how people enact, or perform, various roles depending on the relationships between context (i.e., setting and audience) and their sense of self (i.e., identity) (Goffman, 1959). Quinn's description of the 'front' reflected similar preoccupations with setting, materials, and identity that are seen in sociomaterial investigations and in the context of my doctoral study.

> In an academic library, the setting typically includes computers, printers, books, […]. Certain settings are designated for certain kinds of performances – such as reference, […]. Performers will also exhibit a 'personal front' […that can] be further divided into 'appearance' and 'manner.' (Quinn, 2005, p. 333)

Quinn(2005) went on to note how performances within the traditions of dramaturgy were easily broken: "Performances are depicted by dramaturgists as fragile and delicate and as capable of disintegrating as a result of even the smallest unintended gestures" (p. 336). This description was strikingly similar to the intra-actions and entanglements of sociomaterial approaches (Barad, 2003; Haider & Sundin, 2023). For instance, Haider and Sundin described an agential cut as "a

momentarily stable configuration that can be examined and that is achieved through temporal, spatial and relational severances, or cuts" (Haider & Sundin, 2023, p. 5).

In the context of performance in reference services, which included individual research consultations, Hicks and VanScoy conducted a discourse analysis based on the professional competency documents of several library associations (2019). They identified three main categories for expertise: as domain knowledge, as technical knowledge, and as performance (D. Hicks & VanScoy, 2019). Regarding the latter, the behaviours and attributes expected by those delivering the service were highlighted: "the competency documents conflated the appearance of expertise with the possession of expertise. As a result, the act of providing service was discursively valued over the possession of expertise" (D. Hicks & VanScoy, 2019, p. 47). The *Guidelines for Behavioral Performance of Reference and Information Service Providers 2023* from ALA's Reference and User Services Association (RUSA) explicitly connected research support services to performance expectations (RUSA, 2023). These RUSA Guidelines offered six domains of behaviours for consideration: Inclusion, Approachability, Engagement, Searching, Evaluation, and Closure (RUSA, 2023). With another colleague, Hicks has also critically engaged with the concept of learner performance as a result of active learning pedagogies in academic library instruction (A. Hicks & Sinkinson, 2021). They suggested that an overemphasis on active learning in teaching practices risks setting up students for "participative performativity" and could undermine inclusivity (p. 757).

Nicolini has described the relationship between performance and practice theories: "Practice-based theories use a performative perspective to offer a new vista on the social world" (2012c, p. 7). By reflecting that "organizations and institutions are made and remade thanks to material and discursive work" (p.8), Nicolini made clear that practices, and the structures in which they are enacted, come into being through the performance of sociomaterial actors. As has been noted through the theoretical framing, in context of this doctoral study, these actors include the teaching librarians, the students, and various technologies, texts, and other nonhuman contributors. The processes of co-constituting online teaching practices through performance of (sometimes competing) identities have been unpacked in Chapter 7 by presenting findings of tension and disruptions in the research data.

3.6 Chapter summary

This chapter described how I arrived at a conceptual framework to explore the complex and technologically-mediated work involved in online teaching practices regarding systematic searching and evidence synthesis methods. In response to the absence of an existing, consistently applied theoretical framework for studying the research problem, I reviewed various theories and frameworks used in online teaching in higher education, regarding the use of technologies in HPE, and in studies of information literacy. This exploration led to the intersecting and overlapping research perspectives of sociomateriality, posthumanism, practice theories, and ANT that have made up the theoretical framework adopted for this doctoral research.

My research approach used the concepts from the interconnected theories of the theoretical framework as follows. First, through a lens of relational becoming, I have considered the ways that the various actors, including humans and non-human things, impacted and have been impacted by each other in the process of teaching research methods online. In this dissertation, this lens can be seen in the focus on relationships, entanglements, and my interpretation of the intra-actions between the elements and activities observed across teaching practices. Second, using a sociomaterial onto-epistemology informed my selection of methods and analyses including what data I collected and how I collected and analysed data, as described further in the Chapter 4. This onto-epistemology impacted choices to foreground the presence and agency of materials, such as digital technologies and texts, along with the activities and discourses of human participants, and the analytical focus on relational becoming described above.

The theoretical framework also informed the conceptual framework to study the labour and practices of teaching online to support evidence synthesis methods. I have used the theoretical framework to draw conceptually on literature from academic libraries and other related contexts: 1) pertaining to teaching practices and teacher identities for academic librarians; 2) discussing labour in academic libraries; and 3) conceptualizing performance of identity and performativity of practices. These three aspects of the conceptual framework in combination with the theoretical framework have guided the research approach and findings described in the rest of this dissertation.

CHAPTER 4 METHODS

4.1 Chapter Overview

In this chapter I have described the research design, including ethical considerations, the methods for determining the sample, collecting data, handling of the data and material produced in the research process, and the analysis procedures. The sociomaterial perspective and theoretical framework described in Chapter 3 informed all aspects of the methods for this focused digital ethnography.

4.2 Planning Sociomaterial Ethnomethodology in Online Environments

With over 10 years of experience, my involvement with this field of research has inevitably impacted research design, analysis, interpretation, and conclusions, including the selection of the focused ethnography methodology (Andreassen et al., 2020; Knoblauch, 2005; Vindrola-Padros & Vindrola-Padros, 2018). The timing of my research planning coincided with the start of the COVID-19 pandemic and the move to remote teaching significantly contributed to decisions regarding the online methods of data collection. Mere weeks before the closure of campuses in response to public health measures I had observed a growing trend in my research consultations of meeting online via Zoom to provide better accessibility to graduate students who were not able to meet me on campus. I was influenced by the materiality of the research consultation encounter when reflecting on the improved ease of communicating with learners through videoconferencing and screensharing compared to the experience of demonstrating searching on computer monitors in my office on campus. The campus closures during the period planned for data collection further solidified the selection of the online research setting.

During the planning of this research in 2020 and 2021 there were scarce methodological resources regarding the conduct of ethnomethodological research on education in the online environment (Tummons et al., 2015). Rapidly changing technologies for online communications made inferences from guidance even a few years old challenging. For instance, a book chapter on ethnographies in digitally-mediated education published in 2020 only included referenced studies up to 2018 and referred to conducting remote interviews using Skype and GoToMeeting (Tummons, 2020). These technologies were less commonly used by the time I started data

collection in 2021. Between my original research planning in 2019 and completing my data collection in 2022, the landscape of virtual, internet-mediated research methods in social and health sciences had evolved rapidly. A rapid review completed by Nind et al. in 2021 and updated in 2022 reflected the proliferation of guidance on methods adapted to virtual or socially-distanced research, necessitated by the responses to the COVID-19 pandemic, and described trends in over 2000 publications from 2020 – 2021 (Nind et al., 2021, 2022). While the methodological support was lacking during initial planning, the increased availability of guidance facilitated later stages of the research process and validated choices made regarding online data collection.

The research planning for virtually-mediated focus groups, observations, and interviews drew mainly on personal experience and a few sources from the pre-pandemic era prior to the rapid video-conferencing shifts that took place in 2020 (Gaiser, 2008; Gordon et al., 2021; Williams et al., 2012). Other methods papers have since been published that support the rigour and impact of using video-conferencing technology to collect qualitative data to explore the sociocultural and sociomaterial conditions of researching, working, teaching, and learning (Nind et al., 2023). In many ways, planning and conducting this digital ethnography has felt like riding a cresting wave of methodological guidance. A paper from Cleland and MacLeod (2022) on theory and applied methods in digital ethnography in health professions education (HPE) was published in April 2022, at which point I had collected more than half of my data following REB approval obtained in June 2021. Their suggestions validated my use of a sociomaterial theoretical framework to integrate consideration of materiality into the focus group and interview prompts, as described in the section below on data collection. However, even Cleland and MacLeod's paper did not provide guidance on integrating data from online-mediated focus groups, observations, and interviews. As a result, I had some trial and error in the methods I used to collect data for this sociomaterial ethnographic study. In some cases, these experiences resulted in requesting amendments to the original research ethics application. Drawing on emerging methodological literature and my own experience, I have reflected on the implications of the modifications to the methods throughout this chapter.

As noted in Chapter 3, sociomateriality combined with the sensitizing theories of Actor Network Theory (ANT) and practice theories served to conceptually guide the planning and conduct of the

research. Analysis was not based on coding and generating themes from the data, but instead consisted of looking for relational networks of actors through the data and following the threads of material throughout the practices observed (C. Adams & Thompson, 2016; Burm & MacLeod, 2020; Haider & Sundin, 2023; Lloyd, 2014). Furthermore, the emic perspective in insider research provided a nuanced understanding of online teaching practices, allowing me to delve deeply into interpretations of the social and material intra-actions of librarians' work. The research methodology drew on elements of autoethnography through my reflections as a participant-researcher and by weaving reflexivity throughout the research process. The insider perspective has been described as essential for conducting focused or rapid ethnographic studies (Andreassen et al., 2020; Knoblauch, 2005; Vindrola-Padros & Vindrola-Padros, 2018) and has facilitated the analysis and interpretation of all data provided by human and non-human actors in sociomaterial research (Due, 2023).

4.3 Methods

To address the objectives of this research, I used the following methods for collecting and analysing a range of qualitative data related to academic health Librarian Instruction of Methods for Evidence Synthesis (LIMES) in online environments. I collected data through online focus groups, observations of online research consultations, Zoom-mediated interviews, a brief electronic survey, and retrieval of texts, documents, and resources mentioned by participants.

4.3.1. Population

This research was oriented around the teaching practices of Canadian academic librarians supporting evidence syntheses and teaching evidence synthesis methods to learners in health fields. I researched the phenomenon of librarian teaching practices by collecting social (e.g., actions and discourses) and material (e.g. digital technologies and texts) data when librarians teach learners about evidence synthesis projects and methods. Since learners who met with health librarians for methods support on evidence synthesis projects were present in the case of research consultation observations, I observed their actions in the context of the instructional encounter, but their experiences were not the focus of the research.

Canadian academic health librarians have been defined in this research as professional librarians (holding a graduate degree) working at Canadian academic institutions in support of learners and researchers in medicine, nursing, pharmacy, dentistry, physical therapy, occupational therapy, and other health-related disciplines. Canadian academic libraries vary in structure and organization and librarians working in any type of academic library were eligible, so long as they provided support to learners in any health professional program. Eligible librarians also provided support and instruction (including on evidence synthesis methods) to learners in other disciplines or to health care professionals in health care (i.e., hospital) settings.

No census exists of Canadian health librarians providing evidence synthesis support in academic institutions. However, we can get a picture of the population numbers based on the most recently publicly available report from the Canadian Association of Research Libraries (CARL). In CARL's 2018-2019 survey, 31 research libraries reported employing 1509 librarians in total, collectively delivering 20,233 and 1,055,247 instruction sessions and reference transactions, respectively, (Canadian Association of Research Libraries, 2022). These libraries supported research intensive institutions including 16 of the 17 Canadian medical schools as well as the majority of other health professions training programs. Meanwhile, the Canadian Health Library Association (CHLA) membership directory listed nearly 360 members in good standing as of January 2024, some of which may be institutional members. Not all academic health librarians in Canada are members of CHLA, nor are all CHLA members academic librarians, as many work within health systems or for research or health associations. Based on the employer information listed in the member list in January 2024, approximately 120 CHLA members worked at libraries affiliated with universities. Not all academic health librarians provide evidence synthesis support and instruction, although anecdotal evidence has suggested that most librarians in these positions do provide support for evidence synthesis research. The CHLA special interest group for knowledge synthesis (KSIG) listed 51 members as of early 2024, including hospital and association librarians and information specialists. A 2022 survey of Canadian research librarians supporting evidence synthesis methods returned 57 responses from librarians working with researchers in health sciences disciplines, offering a reasonable approximation of the population (Premji et al., 2024).

Eligibility

To participate, librarians had to meet all the following criteria:

1) Be a Canadian academic health librarian;
2) Work with a learner population that includes health professions trainees;
3) Provide individual (ie., research consultations) or group instruction on evidence synthesis methods (including, but not limited to systematic searching) in English at least once per month (on average) during the academic year; AND
4) Deliver online instruction on evidence synthesis methods during the period of study.
5) Other librarians from Dalhousie University were excluded to avoid conflicts of interest.

Learners involved in the research consultations observed had to be trainees in any health profession or health sciences program working on any type of evidence synthesis project, including, but not limited to, systematic or scoping reviews. Participating learners could be working on an evidence synthesis project as part of their own academic work or as a researcher on a supervisor's project and could be included so long as they request an evidence synthesis methods research consultation from an academic health librarian. Learner participants from Dalhousie University were excluded to avoid conflicts of interest.

Recruitment and informed consent

I recruited participating librarians from Canadian health sciences libraries through my professional networks, including the Canadian Health Libraries Association (CHLA), the Knowledge Synthesis Interest Group (KSIG) of the CHLA, and the Canadian Academic Medical Education Librarian Special Interest Group (CAMEL SIG) of CHLA. I sent emails to the respective listservs, including a brief description of the study and a link to the Microsoft Forms eligibility criteria survey (see appendices B and C) and I also relied on snowball sampling (also known as chain referral) by soliciting suggestions of other possible participants within the eligibility survey. I also briefly mentioned the research project and shared the link to the eligibility screening survey through the chat function during a virtual meeting of KSIG as part the online annual conference of CHLA in June 2021.

I conveyed the study information to all prospective librarian participants who met eligibility via the survey, sharing the study information via email prior to and at the start of each method of

data collection. The librarian consent form (Appendix D) included options to agree to participate in any of the data collection methods described in Section 4.3.2 and included descriptions of what was expected of the participants along with potential risks and benefits of participating.

The observation data collection also involved learner participants who were invited to participate by the librarian participants after scheduling an online research consultation regarding evidence synthesis methods. Librarian participants selected learners with whom they had met previously or those with whom they did not have a prior relationship, so long as the requesting learner had made it clear that they needed support on an evidence synthesis project at any stage of completion. The meeting was scheduled at least two days in advance to allow learners time to receive and read the Learner Consent Letter. Librarian participants sent the students a recruitment email using the text provided (see Appendix B) with the learner consent letter (Appendix E) attached. The recruitment script to learners emphasized that they were free to accept or decline the invitation to participate and that their decision in no way impacted the support they would receive from the librarian. They could decline via response email, in which case no information about the learner was communicated to the researcher. If the student(s) did not object, the librarian participant invited me to the scheduled online research consultation by forwarding me the meeting invite or emailing the link to the videoconference platform. Oral consent was confirmed during the observation (where the learner participant was still be able to withhold consent or withdraw consent without impacting the support they would receive from the librarian). Librarian and learner participants were given the option to consent to participate with, or without, a screen recording of the session.

4.3.2 Data Collection

I used internet-mediated methods to collect all the data for this study from my home office in Nova Scotia. Participants were located at their homes or places of work/study across Canada. In chronological order, I conducted two online focus groups with librarians in August 2021 (n = 5) and October 2021 (n = 6), observed eight online research consultations between five librarians and eleven learners who were working on evidence synthesis projects (November – December 2021), and interviewed the same five librarians who had been observed (April – May 2022). A brief, follow up online questionnaire was sent to all 11 librarian participants in June 2022 to

collect details regarding their work context and life experience in relation to the research topic. The data collection timeline has been shown in Figure 4.1, including the collection of data regarding materials used and referenced during data familiarization after each data collection method. Details of the data collection process, including methods, number of participants, amount of time required of participants, and tools used to collect and manage data have been provided in Table 4.2. Further information about each data collection method, including which participants contributed, which types of teaching were the focus, and how materiality was considered have been presented in Table 4.3 following the descriptions of the data collection methods.

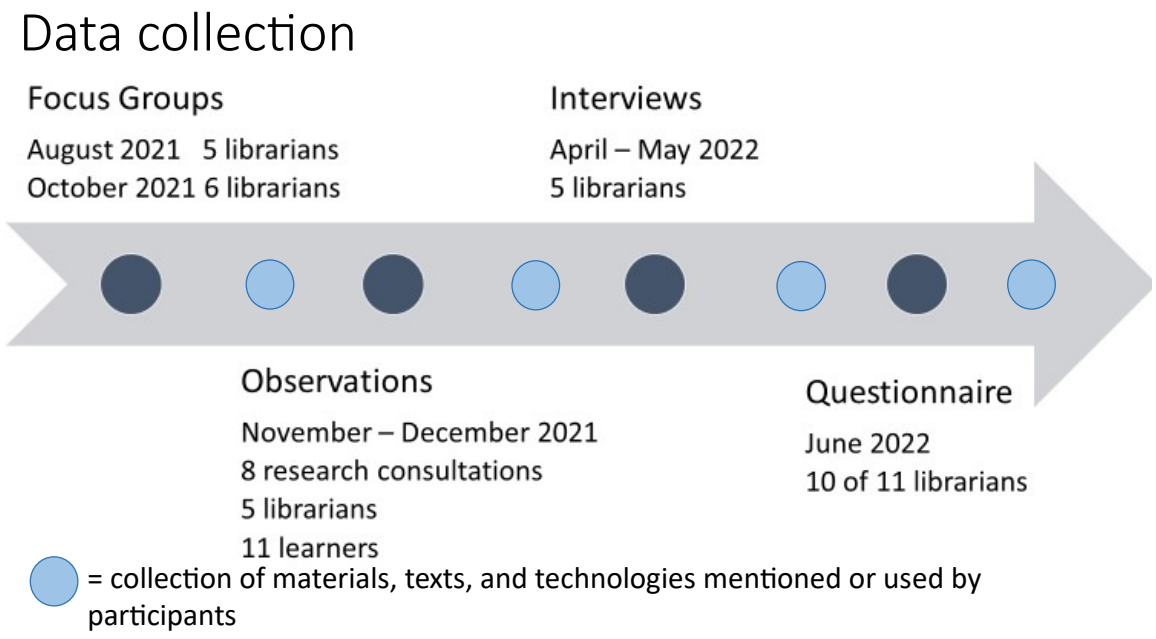


Figure 4.1 Timeline for data collection from participating librarians, including material, texts, and technologies mentioned or used by participants

Focus groups

During the focus groups, qualitative data regarding librarian reflections on teaching materials was collected in response to workshop slides and material posted to Padlet.com. The systematic searching workshop material used to stimulate discussion came from LIB 261 Search Techniques for Systematic Reviews taught at King's College London (Libraries and Collections King's College London, 2024). The presentation slides and accompanying worksheets and support

material were pulled from the publicly available course website (https://libguides.kcl.ac.uk/systematicreview/train) in August 2021 with permission from the course developer. The King's College London library workshop was selected as an example for two main reasons: I chose a workshop from outside of Canada so eligible librarian participants would be unlikely to have been involved or familiar with its creation; and initial review of the workshop material through a sociomaterial lens indicated the use of texts and technologies alongside methodological content and a range of approaches to engage learners. In addition to the workshop material, the discussion forum included the prompts from semi-structured focus group guide (see Appendix F). The questions to prompt discussion used a sociomaterial orientation to encourage reflection on the workshop material and participants' teaching practices. The semi-structured focus group guide included questions regarding the methodological content, pedagogical approaches, and use of material in the workshop or their own teaching. Further prompts were designed with materiality and practice theories in mind to elicit reflection on teaching practices, ways to engage learners during online teaching, and challenges experienced during teaching online with and through technologies. The semi-structured guides for the focus groups and the later interviews (described below) aimed to address the initial research questions regarding the relationships between the human and non-human actors in teaching encounters and the types of labour revealed by those interactions.

The Padlet board was password protected and hidden from the public, but accessible to participants who were provided with the link and the password. Participating librarians had access to their respective focus group Padlet board prior to the synchronous, Zoom-based focus groups. As facilitator, I shared my screen with the Padlet board at times during the Zoom focus groups to serve as a reference to specific elements and encourage reflection overall. A screen capture of the Padlet discussion board is shown in Figure 4.2.

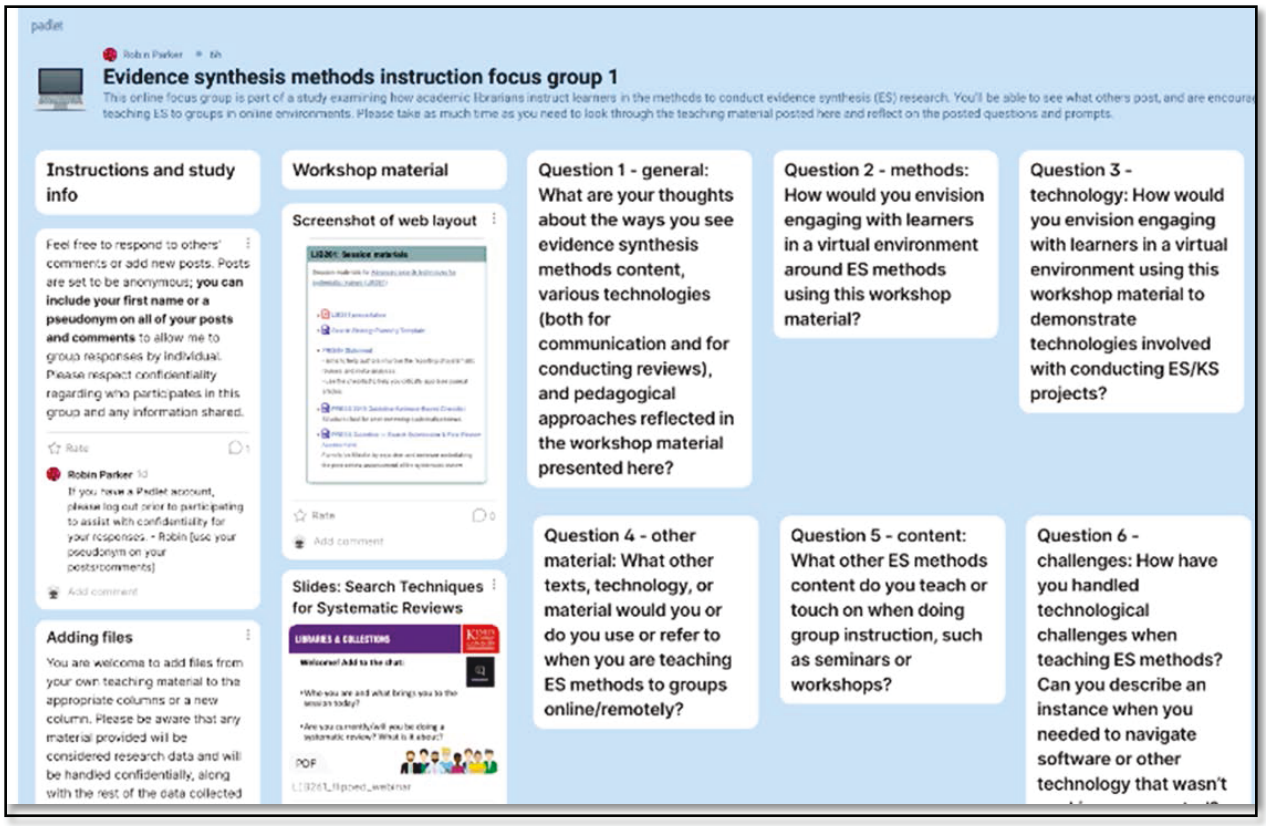


Figure 4.2 Screen capture of online discussion board with workshop material and prompting questions for focus groups

Participants in the first focus group had access to view the material and prompting questions on a locked Padlet board to give them time to look through the material for three days prior to joining an audio-recorded Zoom call with myself and other participants. During the recorded time participants reflected on the teaching material and addressed the prompting questions. The prompts were posted on the discussion board as well as asked during the recorded session. For 48 hours following the recorded session, participants were given access to add comments or post material to the Padlet board. This focus group took place at the end of August 2021 and has been referenced throughout the rest of the dissertation as FG1.

The design of the two focus groups allowed for different modes of data collection through a text-based, asynchronous discussion forum in addition to the videoconferenced data collection previously described. Previous evidence has shown equally rich data from discussion forums and that asynchronous participation can improve accessibility (Namey, 2020). Participants in the second focus group initially contributed anonymous, asynchronous, text-based responses to the

online discussion board (Padlet) where they could work in their own time to accommodate their schedules. Participants contributed comments and discussion on the materials and the reflection prompts. The board was open and available for two weeks during data collection and then locked. Over a two-week period in August 2021, participants were provided with additional questions on the board and by email and were reminded to contribute several times before the board was locked and the data exported. Participants also posted examples of files (with encouragement to redact names and institutions) or links used in their own teaching. Once the group had been initiated, I found that there were several issues navigating the site and with motivation to engage with the asynchronous discussion forum. Participants reported that they had trouble reading or making sense of the content and comments in the format of the Padlet discussion board. Following an amendment to my ethics approval, I also conducted this focus group synchonously via Zoom. I scheduled all participants from this group for a later date and completed the data collection in early October 2021. This focus group has been referenced throughout the rest of the dissertation as FG2.

The two focus groups allowed a smaller number of participants in each, with the potential for richer discussion and less time required for participants to navigate and consider the large amounts of text that can result from written responses, in the case of the planned asynchronous focus group (Namey et al., 2020; Williams et al., 2012). Splitting focus group participants into the two groups had been based on preference and availability to meet synchronously during the focus group study period (August - October 2021), with consideration for including librarians from different sized institutions in each group. I had planned to compare to the data collected from the asynchronous data collection from FG2 to the data from the initial synchronous focus group discussion (FG1). Following Namey et al. (2020), I had planned to analyze the different modes of data collection (text-based/asynchronous and oral/synchronous) separately and comparatively before being merged for additional analysis. However, based on the reasons noted above I revised the asynchronous, text-based focus group (FG2) to also meet synchronously via Zoom, so no comparison was conducted. The text-based responses from FG2 were merged with data from the synchronous FG2 session and all comments and material were considered together for review and analysis.

Zoom audio, video and chat were recorded to my computer. Text from the Padlet boards was exported to PDF, extracted, and saved as text files. Files, referenced documents, and links posted to the two Padlet boards or to the Zoom chat were downloaded and included as material data in analysis. The video and audio from the Zoom focus group sessions were saved as mp3 and mp4 files. The audio was transcribed using Otter.ai to generate automatic transcriptions to text files (verified manually). The video was reviewed for extraction of use of or reference to material (e.g., texts, technologies, instructional material, etc.). All data files (video, audio, and text) were imported into NVivo for analysis. See Appendix J for a complete plan for managing the research data from all data collection methods.

Observations

As Woodward has advised regarding material ethnographies, I observed the activity of online evidence synthesis methods research consultations between librarians and health sciences students (2020, p. 12). During these observations participating librarians conducted online evidence synthesis methods instruction to individual learners and invited me to attend the online meeting using whatever platform they normally used. Neither the librarian nor the learner(s) needed to do anything additional or make any changes to their normal teaching or learning practices for the research other than to set aside time at the beginning for the consent process. Librarians could be observed more than once (with either the same or different learners), but no more than three times to not overly burden any single librarian participant. From October to December 2021, I observed five librarians in eight research consultations with a total of eleven learners. I concluded observations based on preliminary review of the data, which suggested the eight observations had achieved theoretical sufficiency regarding the range of teaching practices, breadth of material used and referenced, and diversity of participant contexts (e.g. geographic distribution, institution size, academic levels and disciplines of learners).

Observations and field notes were framed by the sociomaterial and practice theories framework and captured reference to or use of material (e.g. various technologies and texts), including when there were disruptions (e.g. failure of a webpage to load, difficulty navigating a website, challenges with finding a file) (C. Adams & Thompson, 2011, 2016). Pedagogical approaches (e.g. librarian or student sharing their screen) and processes were also noted, such as when the student asked clarifying questions or struggled to follow instructions. See Appendix G for the

form in which I wrote observation field notes. These notes were written electronically using my password protected iPad Pro and the Notability app, which was backed up automatically to my Dalhousie OneDrive account. Field note files in PDF format were then saved to the final NVivo project for analysis. All participants agreed to recording and the sessions were recorded using Panopto software to capture video of the screen and computer audio. Following each observation, I noted reflections and memos in an electronic research journal. All data files (video, audio, and text) were imported into NVivo for analysis. I did not obtain consent to use direct quotations from the observations, but transcribed the audio of the recordings using Otter.ai for the sole purpose of facilitating analysis. For example, I used the search function in NVivo to look for discourse related to particular materials such as PRISMA.

Interviews

After providing consent, the five librarian participants who were observed were asked to answer questions over Zoom to elaborate on their online teaching practices regarding evidence synthesis methods. The librarians selected a 90-minute meeting that worked for them using Microsoft Bookings software. To facilitate reflection on the social and material aspects of teaching evidence synthesis methods, clips of the observation recording (of their own prior evidence synthesis research consultation) were shared with the interviewee. The recording clips were selected and prepared based on guidance from Iedema et al., 2019 and Ajjawi et al., 2020 to reflect moments in the research consultation when there were technological or methodological disruptions or conflicts. I watched the recordings of the librarians' respective research consultation(s) prior to interviewing each of them, took additional notes, and selected excerpts to share for the video-reflexive ethnographic prompts to use during the interview.

All participants turned on their camera, after confirming they felt comfortable doing so. See Appendix H and Table 4.1 for the semi-structured guide of interview questions that included demographic questions (describing the population served by the librarian, size of institution, years of experience, and proportion of work spent on evidence synthesis support), and questions probing the networks of material and social influences involved in the teaching encounters when supporting evidence synthesis methods, and the video reflection prompts. Following the guidance of McKenzie and Dalmer (2020), questions began with "what" and "how" type queries and probes explored challenges and breakdowns with the material and technological aspects of

teaching (p. 6). Taking inspiration from the sociomaterial "interview to the double" technique described by Nicolini (2009), Fenwick and Nimmo (2015) and others, questions during the interviews asked participants to walk through the tools and approaches they use in different types for teaching evidence synthesis methods. This strategy can make visible the aspects of practices and everyday activities that may be invisible even to the individual performing them (Fenwick & Nimmo, 2015), contributing to the subsequent data analysis, described in Section 4.3.4. Table 4.1 shows the questions and prompts from the semi-structured interview guide.

Table 4.1 Semi-structured interview questions

Questions and prompts
1. Work conditions and expectations a. How long have you worked as an academic librarian supporting health profession learners? b. What programs and types of learners do you work with, in particular for ES instruction? c. Is knowledge synthesis/systematic review support or instruction part of your job description? If so, approximately how much of your role are you expected to dedicate to supporting or teaching KS methods? d. Whether or not ES methods instruction is included in your job description, approximately what proportion of your work time do you spend preparing or delivering ES methods instruction, including assessing learners and providing feedback? 2. What online ES instruction have you done in the past year? a. Individual/small group? b. Large group? 3. How do you conduct that instruction? a. What tools and technology do you employ in order to teach? (e.g. email, videoconferencing software, chat software, appointment booking tools, online registration platforms, etc.)? b. What tools, resources, and technologies do you teach as part of the ES methods content? 4. [Clips of the observation recording were played to highlight specific interactions with the learner and/or technology and other material. Clips were selected and prepared following guidance from Iedema et al., 2019 and Ajjawi et al., 2020. Prompts followed playing of short (30-60 second) clips of observation recordings, not more than 4-5 minutes total.] I was able to observe your interactions with learners and noted several types of interactions with technology, including the videoconferencing software, citation databases, etc. Here are some examples of the types of interactions I observed.

Questions and prompts
a. Reflecting on the behaviours and interactions shown in these clips, do you feel this is typical of your evidence synthesis teaching? In what way is it or is it not typical? b. Are there any other technologies or materials that you employ often (or rarely) when teaching KS methods and/or comprehensive searching? c. How do you decide which technologies and materials to use in your instructional sessions (both individual or group)? 5. In what ways do you engage with the technology/materials and the learner(s)? a. How have you handled technological challenges when teaching ES methods? For example, issues with the videoconferencing software? Or problems with the databases or systematic review management software? b. Can you describe an instance when you needed to navigate software or other technology that wasn't working as expected? [The impact of disruption in technology is a way of understanding its role in sociomaterial approaches.] 6. Describe some of the ways that you prepare for individual research consultations related to ES projects when it involves a student project (in other words, you will not be developing and conducting the comprehensive search yourself). a. How do you ask the learner to prepare for the ES research consult? 7. Describe the ways, if any, that you interact with ES methods organizations, such as Cochrane, JBI, Campbell, etc.? For example, are you a member or author with any ES organization? a. What standards or guidance do you refer to in your instruction? 8. How has the instruction related to ES methods changed as a result of teaching remotely since the start of the pandemic? 9. The details about how you developed the skills and competencies you use when teaching KS methods (including comprehensive searching) is beyond the scope of this project. However, I'd like you to reflect on one surprising thing you have had to learn to do your best supporting learners with KS methods? For example, has there been a particular skill (or set of skills) or type of knowledge that you did not have when you started in your role that you wish you had gained or known sooner?

Zoom recordings of the interviews were saved to my computer and were subsequently moved to my Dalhousie OneDrive folder and copied into NVivo on the desktop of my Dalhousie-issued laptop. The audio was transcribed using Otter.ai to generate automatic transcriptions to text files that were subsequently manually verified. The video, audio, and transcriptions were reviewed multiple times in NVivo for further collection of materials used and referenced and for analysis.

The interview format through videocall facilitated certain types of situated and sociomaterial insights, as participants shared their screen with me to show documents, software, and other

technologies that they engaged with during evidence synthesis instruction and support. For example, P05 showed the student-facing side of the consult request form and the back end where the librarians selected requested appointments from the ticketing system. In another example, P02 looked around their computer in response to the prompt of what other technologies or texts they may have referred to in an online evidence synthesis research consultation. In other words, conducting the interviews in the same setting in which they teach (both online and in the same physical workspace) reinforced the situated and embodied experience of teaching online. The online format therefore enabled material and environmental observations during the interviews, as did the online format of the research consultation observations.

Participant characteristics questionnaire

The final data collection from participants was an online questionnaire. I designed the questionnaire to ensure I had consistent information about the types of learners supported by all participating librarians, along with details of the expectations and reported work around teaching evidence synthesis methods. The questionnaire also provided participants with an opportunity to reflect on their own positionality. The questionnaire data provided additional context to help situate the participants in the sociocultural setting of their employment at academic institutions, aligned with the sociomaterial, practice-oriented research perspective. I sent a link to all 11 librarians who participated in any aspect of the study (focus group, observations, interviews) via email to a Microsoft Form questionnaire (Appendix I). The questionnaire asked for details related to their work and life experience in relation to the research topic of online teaching of synthesis methods. The Microsoft Form questionnaire included eight questions, seven of which were set in Forms as required to ensure participants do not miss one. Participants were clearly instructed that they could have indicated if they did not want to respond in the text box to proceed; the 10 completed questionnaires included responses to all required questions. The questionnaire took no more than 10 minutes to complete. The librarian participants were not asked about their gender or ethnic identities, although I want to note thatacademic librarians, especially those with liaison and reference support responsibilities, are predominantly white women in Canada and other parts of the world (Kung et al., 2020; Mars, 2018). I have preferred to not assume or risk (mis)identifying the participants and therefore throughout this dissertation I have used the singular pronouns they/them/their for all librarian participants as well as for the

learners observed in the research consultations. The responses to the questionnaire were exported from Microsoft Forms to Excel and saved to a project folder on my Dalhousie OneDrive account. A column was added to assign anonymous participant numbers to the responses and the Excel sheet was added to the NVivo project to create cases for each librarian participant.

Participants were not asked to report their institutional affiliation or location, but as members of a small professional community in Canada and because of information shared during other phases of the data collection, I was aware of the geographic and institutional distribution. To protect the confidentiality of the participants, the institutions have not been identified by name, and I have described the geographic distribution of participants in broad terms in Chapter 5.

Table 4.2 Data collection methods summary

Data Collection Method	**Number of participants**	**Amount of time/participant**	**Tools to support data collection**
Focus group (FG1) (synchronous)	5	Approximately 30 minutes to review material + 90 minutes for group interview	Padlet.com Zoom Otter.ai
Focus group (FG2) (asynchronous)	6	Approximately 1-2 hours (depending on participants) over 2 weeks	Padlet.com
Focus group (FG2) (synchronous)	6 (same participants as above)	30-60 minutes to review material (FG2) and 60 minutes for group interview	Padlet.com Zoom/Teams Otter.ai
Observations	5 librarians plus 11 learners	30-90 minutes per session observed	Zoom or Teams Screen and sound recording by Dalhousie's Panopto software
Interviews	5	60-90 minutes	Zoom/Teams Otter.ai

Data Collection Method	Number of participants	Amount of time/participant	Tools to support data collection
Participant Characteristics Questionnaire	11 participants invited; 10 respondents	10 minutes	Microsoft Forms

The sociomaterial focus on materials and practices, along with my participation as a full member in the culture of evidence synthesis methods instruction and the multiple methods of data collection guided decisions regarding data collection and the number of participants, more so than reliance on qualitative research guidance. Empirical evidence related to appropriate sample sizes in qualitative research has indicated that data from 10-20 participants reached theoretical sufficiency (Guest, Bunce, & Johnson, 2006). Other literature has recommended more than 20 interview participants when examining a phenomenon at multiple sites (Hagaman & Wutich, 2017). Ultimately, the final number of participants depended on achieving theoretical sufficiency, conceptual depth, and informational power (Varpio, Ajjawi, et al., 2017), which I determined through ongoing and iterative analysis of the data from all data sources through the lens of the sociomaterial research approach. The richness of data was enhanced by the analysis and cross comparison of human-generated data from the focus groups, observations, and interviews, and the sociomaterial practice of including materials and other non-human sources of data, which resulted in reaching theoretical sufficiency, with 11 librarian participants. While additional recruitment would have been possible, it was not attempted as the richness of the data was sufficient to the aims of achieving thick description of the phenomenon and addressing the research questions. My emic research approach using ongoing reflexivity regarding the teaching practices observed through the data collection informed determining theoretical sufficiency. For example, I integrated observed teaching strategies and review methods resources into my own practices as I collected data and commenced iterative analysis. I therefore recognized that while more observations or participants might have suggested additional perspectives, teaching approaches, and materials, concluding formal data collection would allow me to explore the networks of actors, assemblages of practices, and the relationships between and amongst the data. Therefore, I also did not collect additional data from documents or materials related to teaching evidence synthesis methods (for instance, through an environmental scan of library

guides), but did attend to materiality throughout data collection, processing, and analysis as noted in Table 4.3 and Section 4.3.4. Materials, methodological texts, and teaching resources that were mentioned or shared during any data collection method were collected and assembled in NVivo and have been cited or compiled in the archive of internet resources in Appendix K.

A total of 11 librarians (P01-P11) contributed data to at least one of my data collection approaches. Participants could consent to one or more of the data collection methods; the different data collection methods (focus groups, observations, interviews) did not necessarily all involve the same participants. The participants included two small focus groups of 5 and 6 librarians each, (Namey et al., 2020), observations of five librarians (a subset of the same individuals who participated in the focus groups) with the corresponding 11 learners they taught in eight separate research consultations, and the same five librarians for interviews (the same individuals who participated in the observations). Five interviews were conducted with only the five librarian participants who had been observed. For anonymity and confidentiality, I have provided numbers from the participant key (P01-P11); these participant identifiers have been provided, along with the data collection methods to which the respective participants contributed, in Table 4.3.

Table 4.3 Summary of sociomaterial-oriented data collection

Data collection	**Participants**	**Materiality**	**Teaching focus**
Focus Groups (n = 2)	1) P01-P05; 2) P06-P11	Questions prompting reflections on material, practices, and disruptions; Collected materials referenced in discussion forum, discussion group, or video chat.	Online group instruction, research consultations, asynchronous teaching
Observations (n = 8)	P01: 1 graduate student (Obs 1); 2 PhD students (Obs 2)	Observed instances of material and technological disruption and tension; Collected materials	Online research consultations

Data collection	Participants	Materiality	Teaching focus
	P02: 3 graduate students (Obs 1); 1 graduate student (Obs 2; non-ES consult) P05: 1 graduate student (Obs 1; non-ES consult); 1 medical student (Obs 2) P06: 1 graduate student (Obs 1) P07: 1 PhD student (Obs 1)	referenced or used during consultations.	
Interviews (n = 5)	P01, P02, P05, P06, P07	Questions prompting reflections on material, practices, and disruptions; Collected materials referenced in interview, shared through shared screen, or linked in video chat.	All online instruction
Participant characteristics questionnaire (n = 10)	All but one from P01 – P11 (non-response redacted to preserve confidentiality)	Questions regarding labour allocation for teaching evidence synthesis methods; invitation to reflect on relationships between context, participant positionality, and teaching practices.	
Combined	11 librarians; 11 students	Attending to materiality through design of data collection methods, interpretation, and analysis.	Social and material assemblages

4.3.3 Ethical Considerations

Planning this research included ethical review through Dalhousie University's Social Sciences & Humanities Research Ethics Board. Approval for REB file # 2021-5642 was first obtained 11 June, 2021 and subsequently following an annual report (letter dated 11 May, 2022) and two revisions (letters dated 15 September, 2021 and 03 June, 2022). Copies of the first and final approval letters have been provided in Appendix A.

Informed consent

Information about the study and a form to provide consent to each type of data collection was distributed as described above.

It is relevant to note that librarians have a responsibility to those accessing their services, which under the ALA code of ethics included protecting "each library user's right to privacy and confidentiality" (American Library Assocation, 2017). I did not consider the librarian participants to have been advocates or proxies for the research team, but rather saw them as an advocate for the learner participant. They were asked to forward information to the learner participant and were not asked to record consent.

Each synchronous session (focus group, observation, or interview) began with a brief description of the study, the opportunity to answer any questions, and confirmation of informed consent. All consent letters and the verbal consent scripts offered participants the opportunity to ask any questions to ensure they were fully informed. Ongoing consent was obtained at the start and end of every data collection instance and participants could withdraw at any time up until completion of data analysis and reporting. All data collection was conducted virtually, which means participants could stop all future participation by leaving whatever communication tool was in use or by indicating withdrawal from the study by email.

Consent from participating librarians was documented by a scanned or electronic signature on the signature page of the consent letter or receipt of an email message from an institutional email address stating consent to participate. Confirmation of consent was also audio-recorded at the start of the synchronous focus groups and each interview (see oral consent scripts in Appendix D). Learners and librarians were informed again of the purpose of the study and observations

(see oral consent script in Appendix G) at the start of the research consultation being observed, and oral consent was audio-recorded and noted in the field notes after participants were given the opportunity to ask any questions and have them answered to their satisfaction. No participants withdrew consent at any point, though one participant noted that subsequent sharing of de-identified qualitative data would require extensive redaction of the transcripts and emphasized that they did not want their contributions to be traceable back to their employer. Another librarian participant did not respond to the final participant characteristics questionnaire after three email reminders over three weeks, but neither did they indicate they wished to withdraw from the study. Where possible, missing demographic data for this one participant was obtained via publicly available information on LinkedIn and their professional profile on the institutional library website.

Potential benefits and harms

The risks associated with this study were minimal, but some people have found personal reflection, watching recordings of teaching moments, and peer observation of work activities to involve judgement and cause discomfort. How each participant's experience was embodied in a social, material, and interconnected world was essential to the sociomaterial perspective, but it can also be confronting and novel to reflect on how one's lived, personal experience affected their professional practices. There were no questions about job performance or employment evaluation, other than an item on the participant characteristic questionnaire about whether synthesis methods instruction was considered part of the participant's job description and/or evaluation. Participants could stop participating or ask to stop reviewing clips during the data collection at any time if they felt uncomfortable. There were no other known risks for participating in this research beyond the impact on time constraints and workload. Each type of data collection was optional and was designed to be relatively brief and scheduled at the participant's convenience to minimize that impact. Risk was also mitigated by assuring participants of confidentiality, and reminding participants that the content of the focus group should be considered confidential and should not be shared with identifiable information beyond the group.

Learner participants could have experienced similar discomfort with being observed during a consultation, could have considered the observation a barrier to accessing librarian support, or

might have had concerns about possible evaluation of learning. These potential risks were mitigated by ensuring they understood that their access of librarian support was in no way dependent on their decision to participate in the research or not. Furthermore, the learners were reassured that there was no evaluation of their learning by the researcher and were reminded that participation in the study was confidential.

Participating in this study included reflection on current practices related to teaching and learning evidence synthesis methods, which could enhance teaching and professional practice. The opportunity to reflect on practice, and to hear reflection from others (in the case of focus groups), was generally a positive benefit of participation. In addition, although participating in the study might not have directly benefited participants, my findings could benefit others who are developing their instructional skills or teaching practices related to evidence synthesis methods. The findings of this study could be used to inform continuing professional development for librarians who teach evidence synthesis methods. Librarians benefited indirectly from this study, which advanced our understanding of evidence synthesis training in academic libraries. Learners may have benefited indirectly from the librarian participants being encouraged to be reflective about their teaching practices and being given the opportunity to learn from peers' reflection.

4.3.4 Data Analysis

All data was imported into NVivo 12 qualitative data analysis software, assisting with initial inductive qualitative data coding and facilitating analysis and linkage with the data across data collection methods. The responses from the short participant characteristics questionnaire were used to create cases in NVivo 12 software so that data could be linked across data collection methods to provide context for the interpretation of the qualitative data. The work conditions and life experiences of participants provided important background information to situate the findings and facilitated nuanced interpretation based on each participants environment and positionality, as appropriate when using a qualitative, sociomaterialist research lens.

Qualitative and sociomaterial data analyses consistent with ethnographic research approaches were used to analyse data from field notes, video recordings, and screen captures of observations, PDFs from the focus group discussion forums, the audio recording and chat

transcriptions from the focus groups and interviews, and material referenced during any data collection. Analysis was framed by sociomaterial principles prioritizing technical, social, and material factors just as much as the human perspectives. Following these principles, I analysed data by looking for networks of intra-actions between the various social and material, human and non-human elements. Actor-Network Theory (ANT) and practice theories offered heuristics for an analytic framework and served as sensitizing concepts and I applied heuristics from Adams and Thompson (2011) for analysis using materiality. These heuristics included: following the actors; "recognizing the amplification/reduction structure of human–technology relations" (p. 742); studying breakdowns and accidents (p. 743); untangling tensions (p. 744); and constructing co(a)gents (p. 745). These heuristics, along with the concept of *agential cuts* to determine units of analysis (Haider & Sundin, 2023) when following particular actors or types of actants, helped foreground materiality and relationality. Using agential cuts involved looking for instances where actants (human or non-human elements present in the teaching practices) had agency to impact the performance, activities, or discourses of other actants.

Following the recommendations of Sechelski and Onwuegbuzie (2019), my analysis approaches pulled from several traditions in order to add depth and address the data and interpretation from multiple perspectives, including combined deductive and inductive approaches to coding and interpretation. A combination of the constant comparison approach (Boeije, 2002; Corbin & Strauss, 2008), qualitative content analysis (Assarroudi et al., 2018), Wolcott's (1994) 'description, analysis, interpretation' steps, and framework analysis (Goldsmith, 2021) constituted a 'bricolage approach' similar to that described by Houtman (2021) in their dissertation. Sechelski and Onwuegbuzie (2019) similarly recommended and described combining analysis approaches to enhance interpretation and saturation with qualitative research data. These analysis methods shared processes involving multiple close viewings of all data to manually verify the automated transcription and observe participant actions. Throughout these initial steps, as well as the later stages of analysis and interpretation described below I used the heuristics from the theoretical framework to sensitize my research and analysis to materiality, as described above and depicted in Figure 4.4. The following description elaborates the data analysis model in Figure 4.4 regarding how these approaches were applied to the analysis and interpretation of data from the various sources.

Consistent with descriptions of materiality studies with visual data, the recordings were considered valuable modes of analysis to observe non-verbal aspects of the entanglements of actions and technologies (Ajjawi et al., 2020; Pink et al., 2017). Similar to the methods described by Boeije (2002), and in keeping with the chronology of the data collection I first examined the recording and transcription for the first completed focus group and compared the data internally, and subsequently compared the data and analysis with that of the other focus group, then with each sequential observation (and later, with each interview). After collecting data through observations, I compared the recordings and memos both to other observations and to the data from both focus groups, as described below. Similarly, the analysis of transcripts and recordings from the interviews were compared both with each other and with the field notes and memos from the observations and the initial codes from the focus groups.

This constant comparison also contributed to the sequential design of the data collection, particularly using excerpts selected from the recorded observations as elicitations during the interviews. After watching the recorded research consultations for each librarian multiple times, while making notes of the assemblages of technology, methods guidance, librarian skills, and student contributions, excerpts of one to two minutes were selected as reflexive prompts to play during the interview with the respective librarian. Selections were based on examples of complex interactions between the methods being taught and the technologies being used, in particular when there was a disruption of the technologies, following the materiality heuristics from Adams and Thompson (2011, 2016), noting that the breakdowns in usual practices have been illustrative of the actions and actors assembled. Prompts in the subsequent interview elicited reflection on what the librarian participant was doing and hoping to accomplish, while drawing attention to the mediating and occasionally disruptive role of the technological interface of the videoconference software or the electronic bibliographic database.

While thematic analysis and the creation of strict categories were not in keeping with a relational onto-epistemology, initial reviewing of the data included coding following qualitative content analysis and constant comparison analysis methods (Assarroudi et al., 2018; Sechelski & Onwuegbuzie, 2019). During initial review of the data and comparison internally and cross-methods, I used semantic or manifest coding (i.e., descriptive coding based on explicit and relatively surface meanings drawn from the data) (Braun & Clarke, 2019). Unlike thematic

analysis or grounded theory analysis, these codes were not explicitly used for further steps of the analysis, but assisted with familiarization with the data and with comparison across data collected through different methods. During comparison, I looked for similar and discordant instances including: referenced and used materials or technologies, teaching approaches, aspects of evidence synthesis methods, and work involved in the teaching practices. Examples of the temporary semantic codes and the hierarchy of their structure have been included in reported in Table 4.4.

Table 4.4 Codes generated from familiarization coding

Temporary Codes
Administrative [tasks]
Asynchronous learning tool
e-learning resources
LibGuide
Video tutorials
Online search tutorial
Benefits of change
Citation management
deduplication
Cognitive load
Demand for KS instruction
Disruption - methods
Disruption - tech
Facilitator - tech
Faculty and student relationships
Learning perceptions
Active learning activities
Authentic learning activities
Help refining question
Learner motivation
Learning Objectives
Needs assessment
Peer-to-peer learning
Scaffolding
Skills based learning
underestimating time to review completion
Understanding of review methods
Online Reference and Research support
Other disciplines
Performance
Professional development

Temporary Codes
Public Health concerns
Reference to external texts
Methods resource
Cochrane
PRESS
PRISMA
PRISMA-S
Protocol registry
Published reviews
Response to tech issues
Review methods
Appraisal
Appraisal tools
Grey literature
Protocol
Purpose of reviews
Question development
Review definitions
Screening
Inclusion and exclusion criteria
Types of reviews
narrative review
Scoping reviews
Searching
Advanced searching
Database selection
Search concepts
Search development
Use of Examples
search documentation
Search filters
search functionality
Boolean
Subject headings
Text word search
Search peer review
Search specifics
search terms
Search translation
Searching as just one part of methods
Testing search retrieval
Service
Space for working and teaching
Teaching elements

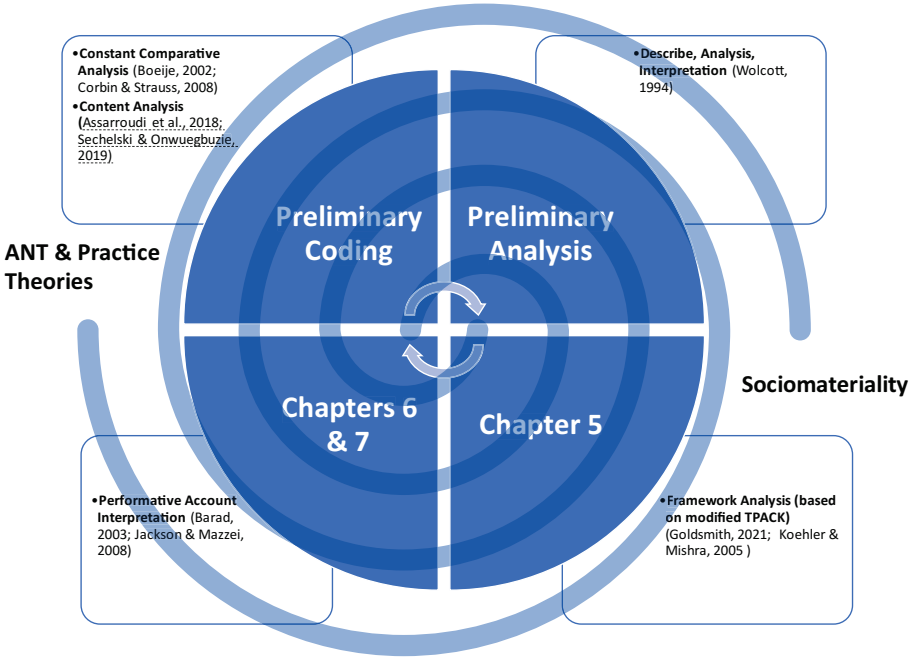
Temporary Codes
Accessibility
assignment
Chat discussion
Context of teaching searching
Demonstrating searching
Directions
Duration
Engagement tools and techniques
Discussion board
Interactivity
Feedback
Assignments
Flipped classroom
Handouts
Impact of teaching
Overlap group and individual teaching approaches
Pre-work
Recording teaching session
Recycling content
Reference to external tools
Reuse of teaching ideas or approaches
Screen sharing
Screenshots
Session feedback or evaluation
Sharing slides
Stand alone slides
Teaching format
Embedded teaching
Workshop
Teaching Material
Team teaching
Use of Libguides during instruction
Visual depictions
Worksheet
Technology elements
Citation management software
Collaboration tools
Compatability
Email
Info sharing software
Interactive Technology
Presentation software
Privacy concerns
Review management software

Temporary Codes
Scheduling and registration
LibCal
Teaching platform
Technology navigation
Technology transitions
Videoconferencing platform
Teams
Workload
Time
Work life balance

Using the resulting temporary codes, I applied aspects of framework analysis including: data familiarization, framework identification, indexing, charting, and mapping and interpretation (Goldsmith, 2021). Although it comes from a humanist tradition, the Technological, Pedagogical and Content Knowledge framework (TPACK) (Koehler & Mishra, 2005; Rosenberg & Koehler, 2015) shown in Figure 2.1 was identified as a starting place to initiate indexing. Charting, mapping, and interpretation depended on modifying TPACK to focus on practices rather than knowledge, adding a social/organizational dimension, and further development of a matrix and then network to trace the reciprocal and entangled concepts of materiality and immaterial practices. This relational process of analysis, wherein the analysis becomes part of the interpretation of findings, has been described in Chapter 5. In that chapter, I have provided an accounting of the modification of the TPACK model and the application of the resulting framework analysis. The findings described in Chapter 5 were interpreted using this analytical approach and resulted in following the thread traced by library guides throughout librarian teaching practices.

In keeping with the methodological decisions described in the previous chapter regarding focused ethnography, autoethnography, and researcher reflexivity, I also drew from personal experience in the field of study (Alejandro & Knott, 2022; Deitering, 2021; Jackson & Mazzei, 2008). As a researcher with an insider perspective on the teaching practices under investigation, coming from a similar context of working in a Canadian academic health sciences library, I brought my own observations and experiences to the analysis (Bordonaro, 2020; Koopman et al., 2020). Memos and journal entries were made after each data collection session, following each iterative review of the data, after discussion with members of my research advisory committee,

or as my own teaching and professional practice prompted reflection. These reflexive memos helped inform the framework identification and led to reflecting on the implications of the research process on my own instructional practices. For example, grappling with the expectations of a novel (to me) research approach gave me greater appreciation for the challenges of students learning evidence synthesis methods. Memos made during close listening and reading of the recordings and transcripts offered additional sources of data, following guidance from Leonard (2023) to practice analysis through writing. These memos were generated while viewing recordings of the focus groups, observations, and interviews, and in which I highlighted examples disruptions to teaching practices. All resulting text files were added to NVivo for inclusion in analysis and copies were stored in a project folder on my Dalhousie OneDrive account. In addition, the semi-structured interviews and my insider perspective provided the opportunity for dialogue during the interviews that included reflections on the questions and interviewees responses from my own experience. Using autoethnographic reflections in combination with data from the human participants and materials allowed for an adapted performative account interpretation to follow the threads of activities and relations between human and non-human actors (Barad, 2003; Jackson & Mazzei, 2008). This analysis resulted in a composite account of the invisible labour of librarians who teach evidence synthesis methods to individual or small groups of learners in online research consultations, presented in Chapter 6 and published in a recent article (Parker & Snelgrove-Clarke, 2023). The findings presented in Chapter 7 were similarly the result of performative account interpretation as well as analysis through writing and ‘thinking with theory’ (Jackson & Mazzei, 2013, 2022).



Heuristics for analysis using materiality:

1) following the actors;
2) "recognizing the amplification/reduction structure of human–technology relations" (p. 742);
3) studying breakdowns and accidents (p. 743);
4) untangling tensions (p. 744); and
5) constructing co(a)gents (p. 745).

(Adams & Thompson, 2011)

6) Agential cuts
(Haider & Sundin, 2023)

Figure 4.3 Iterative and Integrated Analysis Process

Throughout the subsequent empirical chapters reporting the findings, I have provided examples of how reflexive adaptations to interactions with technology and learners in online research consultations and other instruction were shaped by the entangled practices observed during data collection and interpreted through analysis. The direct applications of the iterative and integrated analysis processes have been described in the context of each respective empirical chapter.

4.4 Research Data Management Plan

Considerations for handling and retention of the research data were made during the research ethics application process, where described for each data collection method in Section 4.3.2, and have been summarized in Appendix J. During data collection and analysis, all files collected and produced were stored both on my password protected, Dalhousie-issued laptop and in my Dalhousie OneDrive project folder. Observation notes, reflexive memos, and journalling were captured on my encrypted, password protected iPad Pro through an app (Notability) which backed up to my OneDrive account. All relevant files from Notability were exported in PDF format and uploaded to NVivo qualitative data analysis software which had been downloaded

onto my laptop desktop. As part of the data management, quotations from transcripts that have been used in this dissertation have been lightly cleaned for grammatical and clarity purposes.

4.5 Chapter Summary

In this chapter, I moved from the conceptual framing to describe the implications for the digitally-mediated, focused ethnographic methodology used for this study. I provided details about the context and academic health librarian population of the research setting of Canadian academic health sciences libraries, with research planning and data collection taking place from 2020 to 2022 during mainly remote teaching periods of the COVID-19 pandemic. This methods chapter included information regarding the eligibility of the participants and the process of recruitment and assuring informed consent. I acknowledged ethics board review and approval and laid out the ethical considerations of informed consent, including potential minimal harms and largely indirect benefits to participants. After detailing the internet-mediated data collection methods using focus groups, observations of online research consultations, and interviews, I described my qualitative and sociomaterial data analysis approaches. These approaches drew on multiple strategies and examples from within sociomaterial research as well as adapting research and practice frameworks related to online teaching.

CHAPTER 5 MATERIAL AND IMMATERIAL ASSEMBLAGES OF DIGITAL TEACHING PRACTICES

5.1 Chapter Overview

In this chapter I have described the people and some of the tools, technologies, resources entangled in the online teaching practices of academic health librarians when working with groups or individual learners regarding evidence syntheses methods. The findings presented here aimed to address the research question: What are the social and material elements affecting academic health librarians' online teaching practices regarding evidence synthesis methods?

The sociomaterial lens of this research brought the focus of inquiry beyond the immediate human players to include the material, immaterial, and non-human actors. In this chapter, I have first introduced the human actors, presenting the key characteristics of the librarian participants and the contexts in which they teach evidence synthesis methods through their work in academic health sciences libraries. Next, following guidance from Jackson and Mazzei (2022) regarding *thinking with theory*, I developed a model from previous frameworks of online and technologically-mediated instruction. I modified the Technological, Pedagogical, and Content Knowledge framework (TPACK) using the lenses of Actor-Network Theory (ANT), practice theories, and sociomateriality to conceptualize the social (for example, organizational), material (for example, technological and textual), and immaterial (for example pedagogical strategies and research methods practices) actors. Using this model as a guide, I then *followed the actor* (C. Adams & Thompson, 2011; Haider & Sundin, 2023; Latour, 2007) of the library evidence synthesis guides that were entangled with the teaching practices. By tracing the intra-actions between the human and non-human, material and immaterial, as mediated by the library evidence synthesis guides, I made visible the social and material complexities of online teaching practices regarding evidence synthesis methods. In doing so, I understood practices as the "everyday sayings, doings, and relations with objects that make up what people do in their everyday lives" (MacLeod & Ajjawi, 2020, p. 852), and have considered teaching practices to be the things academic librarians *do* in their everyday work with learners at their respective institutions.

In this chapter, I have mapped networks (i.e., temporarily stable configurations of multiple elements that act with agency upon others) assembled of mediating actors. Mapping the networks involved finding instances of practices that were consistent both locally (i.e., in the specific situation described) and trans-locally (i.e., occurring across multiple instances) to make visible the immaterial and organizational actors involved in the online teaching practices. Through this process of making visible taken for granted practices and actors, I focused on the role of library evidence synthesis guides as primary actors in these networks. Library evidence synthesis guides (hereafter referred to as library guides) are webpages with links and resources that have been constructed by librarians to support learning about methods and conducting evidence synthesis research. Orienting the findings in this chapter around the library guides as resources that librarians created, used, and invoked when teaching evidence synthesis methods online, I have presented instances illustrating the reciprocal relations between materials and immaterial practices.

Following the sections regarding the framework for analysis and tracing the assemblages by following a particular material actor, I have discussed these findings in the context of other literature related to library guides, invisible labour, and the theoretical framework. In Section 5.7, I have highlighted some implications for practice, based on the findings and discussion. The chapter concludes with a chapter summary.

5.2 Librarian Participant Characteristics

To provide the context for this and subsequent findings chapters, I have described the relevant characteristics of the participating librarians. Because of the study population in a close professional community, no individual characteristics have been attached to specific responses in the chapters reporting findings to preserve anonymity. In this section, I described the overall characteristics of the participants, their work environments, and their experience with teaching evidence synthesis. Ten of the eleven participants completed the participant characteristics questionnaire, which provided the data for the amalgamated information here. Responses to basic demographic information for the one librarian who did not complete the questionnaire have been extrapolated from a publicly available LinkedIn profile.

The librarians who participated in this study had between 15 months and 15 years experience in academic health sciences libraries at the time of completing the participant characteristics questionnaire in June 2022. They worked with a range of types of learners at their institutions. In Figure 5.2, I have shown the number of years of professional experience as an academic health librarian. The participating librarians supported undergraduate, graduate, postgraduate (i.e., residents) and professional (faculty, staff, and clinician) learners working on knowledge syntheses. The librarians noted that the learners who they worked with came from agriculture, animal welfare, biology, biomedical ethics, biostatistics, e-health, epidemiology, global health, health & health sciences, health policy, interdisciplinary studies, human kinetics/kinesiology, medicine (specific mentions of undergraduate medicine, all specialties, family medicine, psychiatry, and surgery), nursing, nutrition, occupational health, occupational therapy, physical therapy, psychology, public & population health, rehabilitation science, speech language pathology. Some disciplines appeared more frequently than others in the areas supported by the participating librarians. For example, six of the 11 librarians reported they provided support to nursing and seven indicated working with learners in various levels and specialities in medicine. Support for learners in each of global health, rehabilitation science, and public/population health was noted by two librarians. The relative representation of different disciplines and levels of learners supported by the participating librarians have been shown through word clouds in Figure 5.1 and in tabular format in Table 5.1, with participant numbers redacted to avoid inadvertent identification of participants or institutions. Figure 5.1 was generated using NVivo from responses provided in the questionnaire.

Figure 5.1 Learner levels and disciplines supported by participating librarians

Table 5.1 Learner disciplines and levels supported by individual librarian participants

Disciplines	**Learner levels**
nursing; nutrition; animal welfare; agriculture	undergraduate students; graduate students; postdoctoral; faculty; researchers
nursing; health sciences; psychology; biology; interdisciplinary studies	faculty; researchers; graduate students; undergraduate students; honours undergraduate students
nursing; medicine; epidemiology; public health; population health; rehabilitation sciences	undergraduate students; graduate students; residents; faculty
nursing; kinesiology; health sciences; medicine; public health; epidemiology	graduate students
health sciences; medicine; physiotherapy; rehabilitation science; occupational therapy; global health; nursing; speech language pathology; public health; health education; e-health; health policy; surgery; medicine	undergraduate students; graduate students; residents
nursing; kinesiology; psychology	undergraduate students; graduate students; faculty
physical therapy; occupational therapy; psychiatry	graduate students
Medicine	undergraduate students; graduate students; residents; fellows; clinical faculty; faculty; research assistants; research managers; non-academic staff
Medicine	undergraduate
Medicine	residents; clinical fellows; medical students; graduate students; doctoral candidates; postdoctoral
biomedical ethics; family medicine; biostatistics; occupational health; epidemiology; global health; pediatrics	undergraduate students; graduate students; faculty; residents

The 11 librarian participants came from six institutions across five provinces from the West Coast to Atlantic Canada. Several participants worked at the same institution so that three institutions had one participating librarian each, while another institution had two, and two

institutions contributed three librarians each to the total pool of 11 participants. I have depicted the regional distribution of the librarian participants and their affiliated institutions across Canada in Figure 5.3. The participants included two librarians from two institutions in Western Canada (British Columbia, Alberta, Saskatchewan, and Manitoba), seven librarians from three institutions in Eastern Canada (Ontario and Quebec), and two librarians from one institution in Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador). All data collected from participants was in English, but several participants worked in institutions and/or provinces that use both of Canada's official languages.

Using autoethnographic reflections as a complete insider-participant researcher, my experiences and observations from online teaching of evidence synthesis methods has been integrated throughout my research. Therefore, I have also included my number of years of professional experience and my geographic location in Figures 5.2 and 5.3, respectively. The extent of my professional experience and work location were relevant to the data collection and analysis. The former could have influenced the relational dynamics with the participating librarians, who had a collective average number of years experiences (mean = 9.34 years) lower than my 12 years of experience at the time of data collection. The latter factor of location contributed to my understanding of context as related practices in academic libraries in various institutional and provincial settings. The relational dynamics between researcher and research participants and the contextual factors have been explored further in Chapter 7.

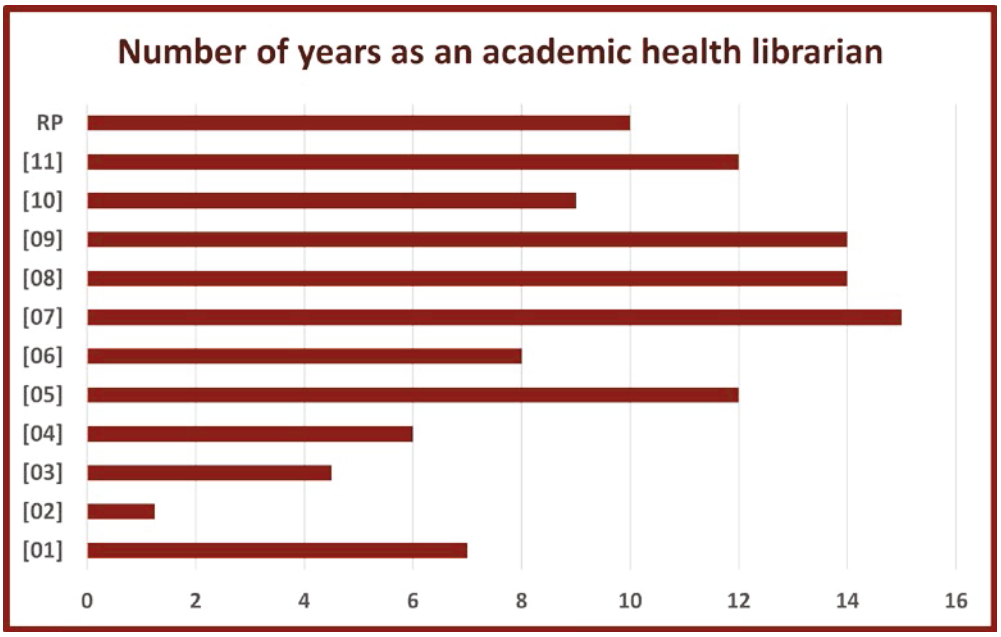


Figure 5.1 Librarian participant years of professional experience in 2022

Figure 5.2 Geographic distribution of librarian participants

(Figure created using www.presentationgo.com)

Because of the research questions related to invisible work, librarians were asked to report whether evidence synthesis support or instruction was included in their job descriptions or performance evaluations. Half of the ten respondents reported that this type of work was mentioned, but the majority of these did not have an explicit amount or ratio of their workload allocated to evidence synthesis support or instruction. Two participants noted ten percent or four to six hours per week (approximately the same ratio for the average work week of 40 hours) for both the expected and reported amount of time spent on this category of labour. Two participants explicitly indicated ambiguity regarding the formal inclusion of teaching evidence synthesis methods in their job description (by selecting the option for maybe/sort of) and declared, along with several other participants, that there was not an explicit or set amount of time dedicated for evidence synthesis research consultations or teaching. One participant who reported that 20% of their time was explicitly earmarked for evidence synthesis support also reflected that they may spend up to 50% of their work time on evidence synthesis consultations. The questions regarding accountability, expectations, and estimated reported work time regarding evidence synthesis support are provided in Table 5.2

Table 5.2 Accountability, expectations, and estimations of reported work time regarding evidence synthesis support questions from participant characteristics questionnaire

Question purpose	**Question**
Accountability regarding evidence synthesis support question:	Is knowledge synthesis/systematic review support or instruction part of your job description or included in your performance evaluation?
Expected evidence synthesis work time question:	If so, approximately how much of your role are you expected to dedicate to supporting or teaching KS methods? Responses can be the proportion of your job (e.g. 20%) or approximate hours per week, on average (e.g. 4 hours per week).
Estimated actual time on evidence synthesis teaching question:	Whether or not ES methods instruction is included in your job description, approximately what proportion of your work time do you spend preparing or delivering ES methods instruction, including assessing learners and providing feedback? This includes any group/class sessions as well as individual consultations. Responses can be the proportion of your job (e.g. 20%) or approximate hours per week, on average (e.g. 4 hours per week).

When asked to estimate the amount of time spent supporting learners with evidence synthesis methods, the participants reported a range from 7% to 50% of their work time. Other participants reported the approximate number of hours per week or month: 1-2 hours, 2-5 hours, 4-6 hours, 6 hours, or 7 hours per week; 15 hours per month. Responses to this question included mentions of the inconsistent demands and time obligations, such as the amount of time to prepare for a yearly workshop. Respondents also highlighted that their reported time included providing feedback via email.

In addition to the professional and work characteristics reported, the questionnaire asked respondents to comment on any other identity-related or experience-based contributors to their perception of teaching evidence synthesis methods. The responses to that question (n = 8) and the final open-ended prompt for additional reflections (n = 4) have been incorporated into other sections of this dissertation.

5.3 Weaving a Sociomaterial Matrix From a TPACK-Informed Framework

Other researchers have used the Technological, Pedagogical, and Content Knowledge (TPACK) framework (Koehler & Mishra, 2005; Mishra & Koehler, 2006) presented in Chapter 2 to explore academic librarians and their online teaching identities and practices (Amparo, 2020; Greenwood, 2023). These and others studies have generally used TPACK as a humanist framework for designing training and implementing technology in education (Rosenberg & Koehler, 2015; Sobel & Grotti, 2013). Nonetheless, as shown in the literature review in Chapter 2, the domains of knowledge that others have modelled for online and technologically mediated teaching in TPACK and related models for blended librarians have helped illustrate how the areas of expertise overlap and intersect. Therefore, as I became immersed in the data, I adapted this framework to foreground the entanglements of the technological, pedagogical, and social actors that influenced choices and practices regarding online teaching of evidence synthesis methods. Untangling these relationships of symmetrically agentic actors helped to make the implicit decisions and actions of librarians' online teaching practices visible and explicit. Revealing the complexity of the work allowed me to explore the ever-changing nature of technologically-mediated research and teaching.

The representation of TPACK from the creators of the framework included a Venn diagram with the intersections between the domains highlighted as shown in Figure 5.4 (Koehler & Mishra, 2005). This model illustrated the overlap between the three domains of technological, pedagogical, and content knowledge, within the contextual knowledge of the instructional environment.

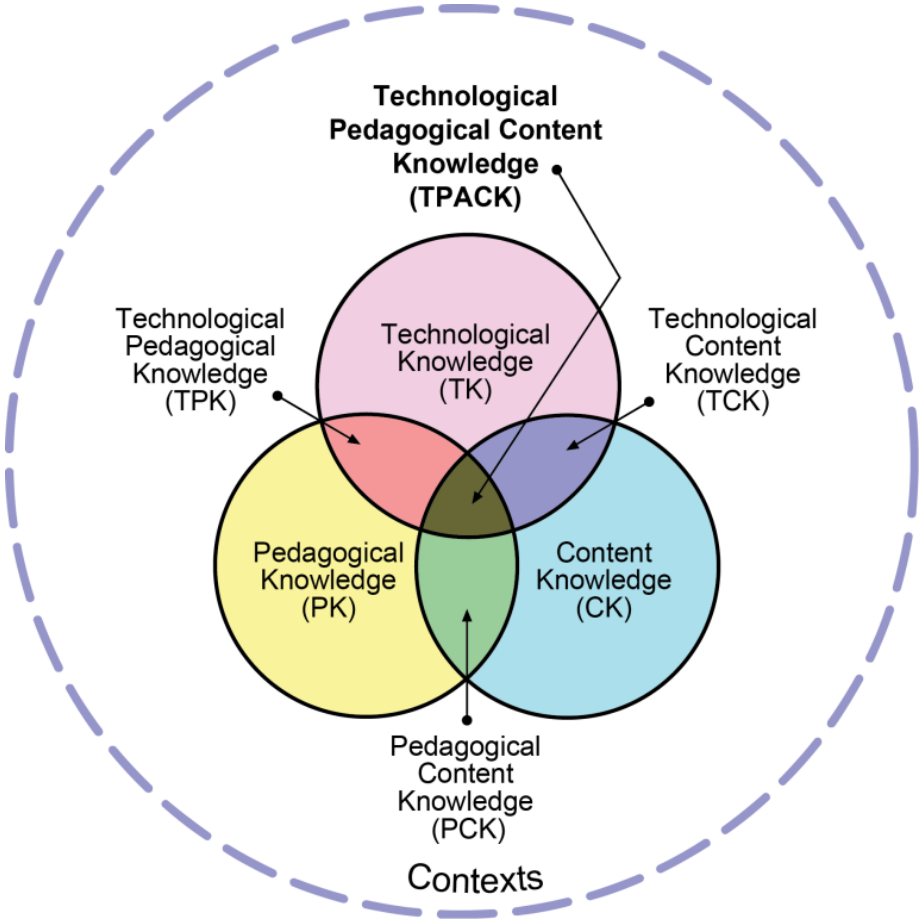
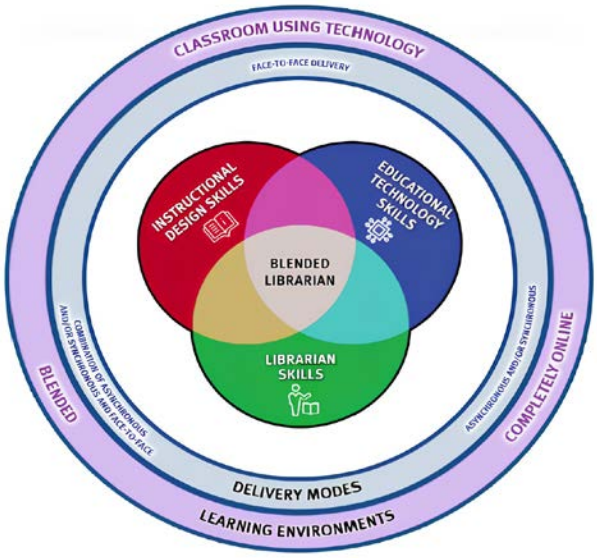
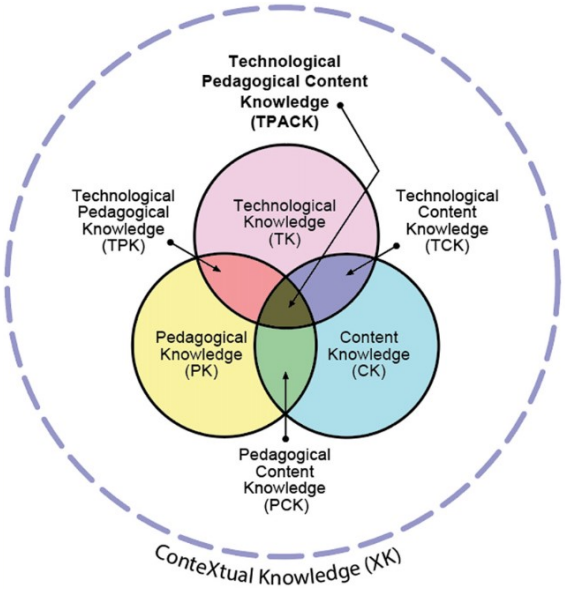


Figure 5.3 Technological Pedagogical Content Knowledge Model



McTavish & Robertson (2020), Figure 1, p. 19



Mishra (2019), Figure 1, p. 77

Figure 5.4 Models representing intersecting skills and knowledge within contexts

Note: Blended Librarians model and TPACK framework showing intersections of skills and knowledge in domains related to technology, pedagogy, and subject content. Left image adapted from "Figure 1. Blended librarian roles across learning modes" in "Canadian Academic Librarians as Online Teachers" by H. McTavish and L. Robertson, 2020, *Systemics, Cybernetics and Informatics*, *18*(6), p. 19. Copyright 2020 by International Institute of Informatics and Cybernetics. Right image adapted from "Figure 1. Revised version of the TPACK image" in "Considering Contextual Knowledge: The TPACK Diagram Gets an Upgrade," by P. Mishra, 2019, *Journal of Digital Learning in Teacher Education*, *35*(2), p. 77. Copyright 2019 by Taylor and Francis Publishing. Reprinted for educational purposes under the fair dealing provision in the *Copyright Act*.

Later updates to the TPACK framework (Mishra, 2019) and similar models (McTavish, 2019; McTavish & Robertson, 2020) have added more emphasis on the importance of contexts, as shown in the revised TPACK model shared previously in Chapter 2 and reproduced in Figure 5.5. However, rather than have the social and organizational aspects be external to the central part of the model where the actions and interactions between domains were depicted taking place, I have conceptualized a sociomaterial, practice-based perspective emphasizing materiality and intra-actions. In bringing a sociomaterial approach to the phenomenon, I added the social and organizational component as another equal contributor and exchanged the "ConteXtual knowledge" of Mishra's 2019 update for a tracing of the material actors and immaterial practices

throughout the interactions of the various other dimensions. As depicted in the modified TPAC-Sociomaterial (TPAC-SM) model shown in Figure 5.6, this configuration resembled a ball of multi-strand yarn where materials and immaterial practices have been prioritized instead of individual knowledge. By following some of the material and immaterial threads of practice in this chapter, I have made visible the complexity of the teaching practices and the labour they entailed. The left image in Figure 5.6 depicts the four domains of technology, pedagogy, evidence synthesis methods, and social/organizational factors. The strands of materiality and immaterial practices and contextual elements have threaded through each domain and across the intersections with the other three domains. These strands, or dimensions, of the intersecting domains have co-constituted the assemblage (represented by the dotted line encircling the phenomenon) of the online teaching practices of librarians about evidence synthesis methods.

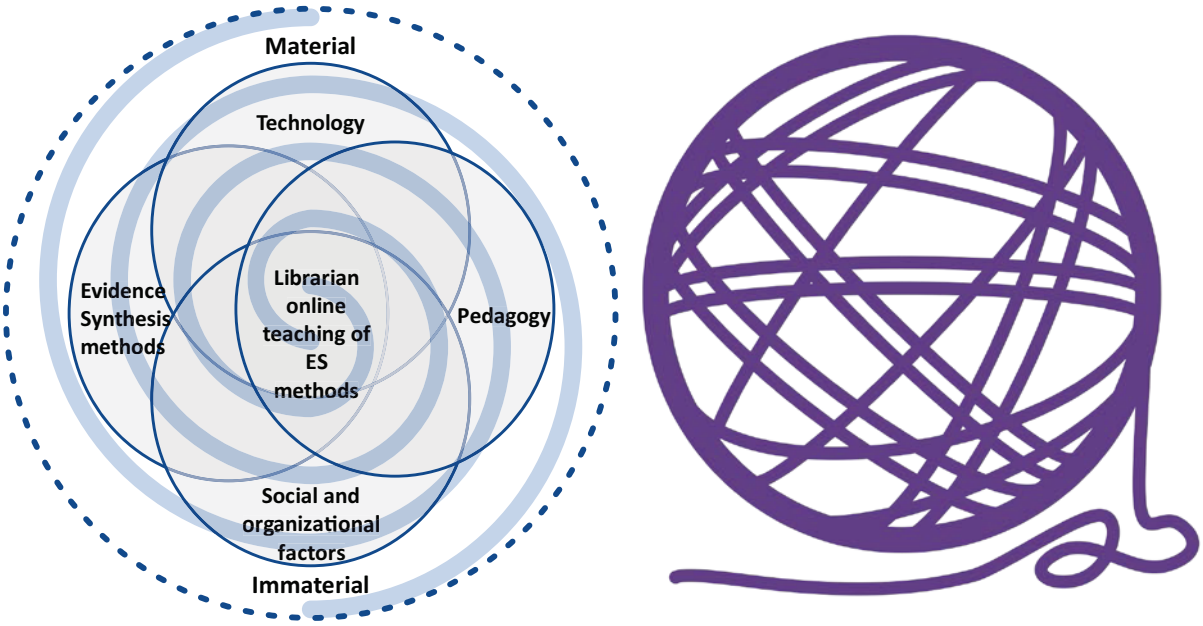


Figure 5.5 Modified TPAC-SM model with threads oriented to materiality and immateriality

As a step toward following the web of networks constituting the online teaching practices of academic health librarians in supporting evidence synthesis methods, I have flattened the Venn diagram into a matrix of technological (T), pedagogical (P), evidence synthesis methods content (C), and social or organizational (S) factors. While this matrix overly simplified the inter-

relationships and intra-actions between the various dimensions, it was a useful framework, helping to select individual threads as examples of the mediating and translational nature of the interactions between actors. Mirroring the indexing, charting, and mapping and interpretation of framework analysis (Goldsmith, 2021), the matrix aided in tracing the agency of the actors across and within networks.

In Figure 5.7, the material and immaterial dimensions of technological, pedagogical, evidence synthesis methods, and social/organizational have been listed along each axis, with the material actors depicted across the horizontal and immaterial practices shown vertically. While the actual assemblages may have included three or four (or more) domains, this table allowed focussing on dyads to illustrate their intra-actions and the ways that the agency of each impacted the others. This was a helpful way of flattening and untangling the "ball of yarn" effect of the model in Figure 5.6. The boxes for each domain of technology, pedagogy, evidence synthesis methods content, and social/organizational factors across the dimensions of materiality (horizontal) and immaterial practices (vertical) have been numbered from 1 to 24 to guide the description of each domain and dyad intra-action.

LIMES online: Material (being/things) → Immaterial ↓ (doing/practices)	(1)Technology (e.g. computer hardware and software, internet)	(2)Pedagogy (e.g. slides, handouts, worksheets)	(3)Evidence synthesis methods (e.g. systematic or scoping review publications)	(4)Social/Organizational (e.g. academic health libraries, universities, medical schools)
(5)Technological functions (e.g. software performance)	(6)Compatibility, cross-linking	(7)ICT: email, videoconferencing	(8)Review management software	(9)Booking software
(10)Pedagogical practices (e.g. teaching formats and modes such as large group or individual research consultation; synchronous or asynchronous)	(11)Synchronous; asynchronous; Interactivity & engagement	(12)Needs assessment; learning objectives; Syllabus; learning outcomes	(13)Scaffolded assignments and activities	(14)Supervisors, faculty, learners
(15)Evidence synthesis methodological practices (e.g. steps or process of conducting ES research)	(16)Running searches; database search functionality	(17)What and how much to cover (e.g. searching vs overall methods)	(18)Methodological guidance	(19)ES organizations, other methodologists
(20)Social/Organizational practices (e.g. library & research methods training in higher education & HPE)	(21)Co-teaching; software options; search interface options	(22)Administrative support; faculty buy-in; one-shot vs embedded	(23)Review team contributions	(24)Power, identity

Figure 5.6 Matrix of sociomaterial online teaching practices for evidence synthesis methods

The boxes at the diagonal intersection of the matrix showed how the material and immaterial aspects of each domain have been realized through examining the research data related to online instruction of evidence synthesis methods. For example, the material actors in the domain of technology (1) included the hardware (keyboard, screen(s), processors, memory, internet routers and fiber op connections, etc.) and software (browsers, electronic bibliographic databases, review management application, citation management system, word processing applications, PDF readers, and more). These material aspects were entangled with the immaterial aspects of the technology, most significantly the functioning of the hardware or software (5). For example, the speed of the internet connection impacted the function of the electronic bibliographic databases and whether the database, operating through the institutional proxy of the academic library, would time out while executing a multi-line search. Compatibility (6) of systems and software also exemplified how the material configurations of technology impacted function and interactions. A disruptive example of compatibility that has come up in academic libraries was the variable functioning of different citation management software options with Windows and Macintosh operating systems and word processing applications. The application-based plug-in for Microsoft Word that linked to Zotero generally worked seamlessly on either MacBooks or Windows, but the same has not been true for some other citation management software options.

Examples of material actors in the pedagogical domain (2) included the texts and files that made up the presentation slides, handouts, worksheets, and other instruction documentation while immaterial pedagogical practices (10) have included the selection of the instructional design and the approaches employed to teach the content, such as teaching synchronously or asynchronously. In other words, choosing learning objectives included in the syllabus or shared in the slides, using a pre-test to assess the needs and baseline knowledge of the learners going into the session, or completing an evaluation form were examples of the ways (12) that immaterial aspects of pedagogy were enacted through the materials exchanged between instructor and learner(s).

In the case of the content, evidence synthesis methods, the intersections between the practices of how to conduct evidence synthesis research (15) have been materialized through the methods guidance documents themselves (18). Handbooks such as those from Cochrane and JBI (Aromataris & Munn, 2020; Higgins et al., 2019), articles in research methods or subject-specific

journals (Munn, Peters, et al., 2018; Whittemore et al., 2014), and reporting standards such as PRISMA and the related extensions (Page et al., 2021; PRISMA, 2020; Rethlefsen et al., 2021) were examples of digital material texts that allowed local applications of the "complex trans-local phenomenon" of evidence synthesis methods (Nicolini, 2009, p. 1411). These methods guidance and reporting standards have provided a means of replication of the research practices across different contexts, locations, and topics when researchers produce material publications in the form of systematic reviews, scoping reviews, or other types of evidence synthesis manuscripts (3).

For the final box on the diagonal line, the immaterial and material aspects of the social and organizational actors in online teaching of evidence synthesis methods were assembled in the concepts of power and identity formation (24). This was demonstrated in the ways that the human actors, such as academic health sciences librarians, learners, supervisors, faculty, and other research methodologists have embodied and navigated their roles and positions within the institutions of higher education, HPE, and research methods training. This abstract illustration of assemblage can be traced more clearly by following the respective intersections between the material aspects of organizational practices that have related to this phenomenon. For example, the organizational side of setting up an online evidence synthesis consultation between a librarian and a learner was enabled through the technological affordances of booking software such as Microsoft Bookings or LibCal (9). And from the immaterial perspective, practices *with* technology allowed librarians to co-teach so that one librarian monitored the chat while the other presented the lecture or activity (21). Similarly, along the immaterial dimension of organizational practices and technology, I saw the institutional decisions regarding software subscriptions and configurations impacting what librarians did and how they interacted with digital technologies. Examples of this entanglement included the university's selection of a videoconferencing software for online teaching and meetings or the institutional configuration of library database search interfaces, both of which have been determined at the organization level, rather than by the individual librarian.

Meanwhile, pedagogical practices were embodied socially in the librarian, the learner, the learner's supervisor, and other methodological experts (14), while the immaterial pedagogical actions of social actors were seen in the presence or absence of administrative support for online

teaching within the organization, the invitations from faculty to guest lecture, and referrals to from research supervisors to librarians for personalized training through research consultations (22). The final dyad of evidence synthesis methods and social/organizational elements has been seen in the material existence of evidence synthesis organizations such as the Cochrane Collaboration and JBI (19). Similarly, other team members, such as statisticians or clinical experts (19), have been materially involved in the review process, enacting the immaterial practices that contributed to conducting the review (23), such as completing or advising on meta-analyses or study selection, respectively.

Additional intersections of domains included the ways that pedagogical material and texts can be shared via the technological affordances of email, videoconferencing software, learning management systems such as BrightSpace, and library websites (7). Meanwhile, the technology enabled various formats and approaches of teaching in online environments, such as permitting sharing of digital learning objects to facilitate asynchronous learning or the use of polling software or discussion boards for engagement and interactivity. Similarly, technological advances in review management software (8), such as Covidence, DistillerSR, and Rayyan, facilitated the enactment of methodological practices (15) to conduct evidence synthesis research. In parallel, the essential practices of evidence synthesis methods, such as running complex and comprehensive searches have been enabled by the functionality of the search interface (16) that mediated access to citation databases.

The material and immaterial intersections of evidence synthesis methods and pedagogy have been embodied through the scaffolding of assignments and the creation of authentic learning opportunities. And they have been enacted, respectively, in the form of the decisions about how much to cover in each session and what exact components of the review process would be taught. Content and pedagogy entanglements have most frequently been explored through research underpinned with positivist assumptions. Quantitative studies have sought to determine the effectiveness of various pedagogical approaches, such as strategies to teach evidence-based practice (Kyriakoulis et al., 2016), to change the knowledge and behaviours of learners. However, by layering on the dimensions of materiality and immateriality and considering technological and organizational factors, this research aimed to understand the nature of teaching practices by examining what was *done* in those encounters. Similar to how Mulcahy described a

study of accomplished geography teachers that focused on what they *do* in order to understand what geography teaching *is* (2011, p. 229), by tracing the material and immaterial aspects of online evidence synthesis instruction, I have made visible the complexity of these practices.

5.4 Library Guides as Networks in Librarian Online Teaching Practices of Evidence Synthesis Methods

In this section, I have expanded on the brief examples given above to illustrate the ways technological tools and digital material texts have been materially present within the other intersecting domains assembled to make up the online teaching practices of librarians supporting evidence synthesis methods. Some of the resources observed during data collection provided identifying information about the participants or their affiliated institutions. Therefore, like the measures taken to preserve the anonymity of the participants, the examples of resources and materials presented have been compiled or have not been attributed to specific participants. While unusual in qualitative research reports, the decentering of individual human participant perspectives aligned with the sociomaterial approach used in this doctoral study. Participants used and referenced resources created both within their own institutions as well as those produced externally, and those distinctions were not linked to the corresponding participants to avoid identification of the institutions or individual participating librarians.

To untangle the matrix of intersecting and overlapping domains, I used one of the heuristics described by Adams and Thompson to guide my selections by following the actors to "catch glimpses of objects in motion as they (dis)assemble with other (non)human actants and a multitude of practices related to [teaching] and being online" (2011, pp. 738–739). Following the collective actors of library evidence synthesis guides to trace their production, use, contents, and referenced materials highlighted the local and trans-local enactment of these common digital learning support tools to look closer at "what gets 'related' to what and how" (C. Adams & Thompson, 2011, p. 739). These library guides may have variously been called subject guides, research guides, LibGuides (Springshare, 2024b), systematic review guides, knowledge synthesis guides, or simply "guides". An example of the homepage of Dalhousie Libraries' Knowledge Synthesis Guide (hereafter referred to as the Dalhousie KS Guide) has been depicted in Figure 5.8 (from https://dal.ca.libguides.com/systematicreviews). The image was captured in January

2024 and shows a version of the Guide that was implemented during Fall 2021, around the time of the focus groups for this study.

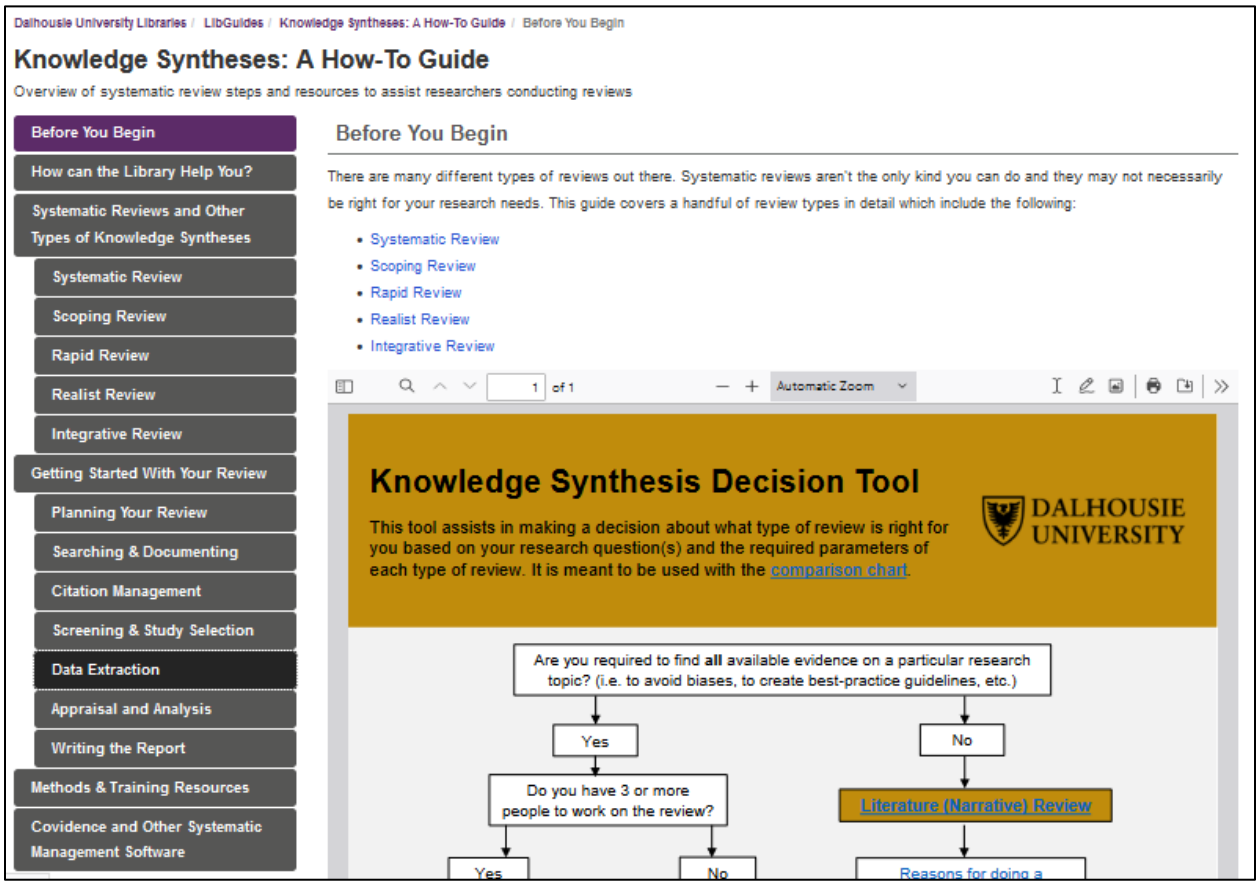


Figure 5.7 Home page of the Knowledge Syntheses: A How-To Guide from Dalhousie Libraries

In the following subsections I have provided examples of assemblages by tracing the intra-actions of the library guides with the other non-human and human actors across the domains described above in the modified TPACK-SM model (Figure 5.6) and sociomaterial matrix (Figure 5.7). Library guides co-constituted assemblages with other materials and technologies (Section 5.5.1); evidence synthesis methods (Section 5.5.2); organizational and social factors (Section 5.5.3); and pedagogical choices and practices (Section 5.5.4).

5.4.1 Tracing Assemblages of Technology (T) by Following the Library Guide Actors

Library guides have become ubiquitous in academic libraries as a form of digital learning object (DLO) that have hosted a range of library resources, including other DLO in various formats such as videos, handouts, worksheets, interactive online tutorials. As others have noted, a significant way that online technologies and material have contributed to teaching online has been through the presence and use of DLO (Mestre et al., 2011). In the context of teaching evidence synthesis methods, academic health sciences librarians have increasingly relied on these guides to provide a curated list of texts, digital learning objects, and links to external resources. Throughout data collection, librarian participants called on the guides and the material on them when teaching about evidence synthesis methods. Indeed, a participant in the first focus group, when discussing online evidence synthesis consultations, noted, "I usually like to refer to a reference guide or LibGuide, and start that off, just be like, 'Hey, here's a spot where you can find information.' And just let them know that exists" (P02, FG1). As mentioned in the literature review, a scan of systematic review library guides found that those within the sample analyzed served mainly as an information repository (Lee et al., 2021). However, librarian participants in this study also reported using library guides for a variety of purposes and in a range of ways. Library guides were used to push information and resources to learners, facilitating both self-directed learning for students and librarian teaching practices in a range of contexts, belying the depiction of the guides as a passive repository.

Library guides enabled access to other digital materials and technologies to support teaching evidence synthesis methods. For example, some libraries have used their evidence synthesis guide to host recordings of workshops, such as a workshop series from University of Manitoba mentioned by one participant. They noted referring students from their own (different) institution to review the recordings to gain an understanding of evidence synthesis methods. Since the time of the focus group, that guide and sets of recordings have been refreshed to include links to the YouTube hosted versions from the 2024 Systematic Review Workshop Series and recordings from Spring 2023 as well as additional text instructions and worksheets (see Appendix K for links to archived versions of the webpages). At the time of the first focus group in August 2021, the library of the participant who mentioned the University of Manitoba series did not have a

workshop series to offer students, nor did they have recordings created in-house, so this external resource on another institutional guide filled a gap in this librarian's teaching practices. Some of the other participants similarly mentioned referring learners to recordings of workshops posted to their own library guide for on-demand instruction beyond what could be accommodated by the online workshops offered by librarians.

> And so, […] the demand is way higher than what we were actually [able] to meet. But there was only so much capacity. So, we have recorded and […] the session that was recorded, was awesome. The […] two librarian instructors, had been doing it so many times. And they were just, …it's a beautiful, it's a beautiful thing. I'm not one of the instructors. But it's been awesome to be able to point people to it and say, "We're not offering another workshop for two months. But here, you can check out the one we did online." (P01 FG1)

On the other hand, another librarian instructor specifically chose not to post the recordings from their live workshops but provided alternative videos covering the topics from the workshops.

> The subject guide, like I say, we don't share the recordings that we did of those particular workshops, [my colleague] has done separate recordings that are just lecture based. So that's another tool that we have. (P03 FG1)

Similarly, some institutions have asynchronous courses or tutorial series that they use as back up and referral during synchronous classes.

> But of course, we have our detailed online course up - the asynchronous course that anybody can get to. So, we end up pointing a lot of people to that. So, when we're delivering the course, the class, I have might actually say, "And by the way, if this is something that's going way past you [it] is in Module Two and Three of the course. And here's the link, right, so that if they want to go away from whatever session we're in" […] You can't do very much in an hour, if that's all you've got. And so, I'm always pointing people back there to say, "This is where you go for the follow up". (P08 FG2)

While most participants relied heavily on their own library guide, several also referred to taking advantage of the material, videos, and tutorials posted by other institutions, especially when they

saw those as exemplary overviews of complex topics, such as searching grey literature. Two focus group participants commented on linking to or referencing the University of Toronto grey literature searching guide in their teaching practices. One participant also noted the ways that their library customized coverage of grey literature searching to suit the interdisciplinary style of their own knowledge synthesis guide.

> We also use the U of T's grey lit guide because it's [so good] why reinvent the wheel? So we will link out to that… we will within our other guides have some more specific links for grey lit, depending on [what's needed] that's a little bit more curated. (P09 FG2)

As of January 2024, the University of Toronto guide on searching the grey literature included: a definition of grey literature; links to resources listing grey literature sources, such as CADTH's "Grey Matters" tool; a 10-minute online interactive tutorial complete with quizzes; a downloadable templated worksheet for tracking sites searched and results; and step-wise instructions for the process of developing a search, and a thorough list of sources in various categories with technical tips on searching each one. See Appendix K for the archived guide link. Librarians especially referred to robust guides that included interactive components, hands on activities that learners could apply to their own projects, and sufficient details from which the librarian or learner could select those most relevant to a topic or an educational need.

5.4.2 Tracing Evidence Synthesis Methods Content (C) Through Assemblages with Library Guides

Evidence synthesis methods materials became noticeable through their absences in specific teaching contexts. This occurred, for example, during online workshops attended by learners from various disciplines. While my research questions and context were specific to teaching health sciences students, registration of open, online workshops was not restricted, and health librarians were challenged when students asked for examples in their fields. In such cases, academic health sciences librarians realized that their prepared resources and material did not adequately address the needs of these learners in terms of aligning with the research norms of non-health disciplines and any divergences in the standards for evidence synthesis methods. One

focus group participant noted the need to draw in evidence synthesis methods resources for other disciplines when teaching in both group and individual contexts.

> [W]hen we're doing [our workshop …] we're pointing people to our subject guide as well. But we have found, this spring, especially, that has been insufficient, because we've gotten more interdisciplinary and outside of the health fields, and the subject guide just doesn't reflect all of that. So, when I've been working with people this summer, after the actual sessions, doing the one on one, I've been pulling a lot from the resources that we linked to, in our session documents that just haven't made it to our subject guide. (P03 FG1)

This librarian went on to reflect on whether it was worthwhile to create and constantly maintain, update, and recreate all the tools or links on their own guide.

> I'm always referring people to other people's LibGuides. Again, we have not done much to beef ours up. And I mean, half the time it's due… should we even bother? Because there are so many other good LibGuides out there, that it's just easy enough to go, "This is a really good worksheet, you should use it." (P03 FG1)

In certain cases, directing learners to resources on other guides was a temporary solution, until the home institution has had a chance to customize it to their own guide. One participant noted, "I will direct people to that, because it's awesome. And we haven't had time to make our own versions with attribution yet. I love that decision flow [diagram]" (P04 FG1). This comment concerned re-using a decision flow chart produced by and posted on the guide for Unity Health in Toronto (https://guides.hsict.library.utoronto.ca/SMH/systematic/decisiontool). I have also adapted this flowchart for Dalhousie's KS Guide (https://dal.ca.libguides.com/ld.php?content_id=35944172), as have others for their own institutional guides, building off the Creative Commons BY-NC SA 4.0 license used on the original.

This type of reuse of posted material has been typical within the evidence synthesis librarian community, with worksheets, handouts, and sections of guides replicated and adapted with institutional branding and to suit the unique nature of library subscriptions. The standards for

evidence syntheses, particularly systematic reviews, require searching multiple sources (i.e., citation databases). Libraries have subscribed to databases such as MEDLINE, Embase, PsycINFO, and Cochrane Library through various vendors using different search interfaces, so multiple configurations have been possible. For example, on the section of the Dalhousie KS Guide on translating searches strategies between databases, we have had a video created in-house to show the process of adapting a search developed for MEDLINE through the Ovid interface into the Elsevier hosted interface for Embase because many other institutions have subscribed to Embase through Ovid. On the other hand, to show the translation from MEDLINE Ovid to search the Cochrane Library through the Wiley interface, for many years we linked to a tutorial created by librarians at the University of Toronto, since they already had a video that covered the necessary content and processes.

The library guides for supporting evidence synthesis methods commonly included all the steps of the review process beyond the search despite support from librarians centring around the process of creating a systematic search strategy. There have been many options of resources and guidance to reference for each step of planning and conducting evidence synthesis research. For example, to support learners on aspects such as question formulation, library guides included links to worksheets or handouts created internally by the library.

> We have a handout on our own knowledge synthesis guide. It's a graphic we created to talk about the kind of the iterative process of question formulation, and how it's tied into your background research and how you have to know the background to make sure that - I'm making a circle, because there's a circle in there. And how, you know, you have to make sure no one else has done it already. And so, I use that graphic when I'm teaching this to discuss kind of the iterative process of coming up with a question. (P07 FG2)

At this point in the focus group, another participant put the link to the handout into the chat, illustrating both the role of materials such as handouts in teaching evidence synthesis methods as well as the entanglement of materials with the videoconferencing software chat function that had facilitated sharing links with learners, or – in this case – fellow research participants. The handout itself served as a material prompt for the iterative practices of determining an appropriate research question to start drafting a protocol, looping from the prompting problem to

a preliminary search of the literature, refinement of the question, and development of potential selection criteria. This depiction of a circular or iterative process disrupted the conception of evidence synthesis research methods as a linear, step-wise procedure and emphasized the judgements and decisions required at each phase.

Another example of the way that library guides have been used to support the entirety of the review process was in the information-sharing nature noted by Lee et al. (2021). Information resources for methods guidance posted to the library guides were invoked in teaching practices beyond the passive sharing in the guides described by Lee and colleagues. For instance, one focus group participant referred to key explanatory articles by Munn et al. (2018; 2018) that distinguished types of reviews. While the articles were linked from the library guide, the librarian assigned them as readings in the course they are embedded within, and they also referenced the articles during individual consultations.

> I point them to those readings. [And] on our knowledge synthesis guide, we've got a lot more readings. And that's thanks to [a colleague] who keeps up on that. So, I will often refer them there to look for more readings. So those are the resources I'm usually sending them to, because we kind of use that guide as our kind of collective memory of good resources to share with people. (P07 FG2)

Library guides served as external sources of inspiration for methods resources to be cross-linked or reproduced and internal repositories for methods materials. Therefore, the library guides that the librarians referenced across formats of online teaching were integral to accessing digital methods texts and media regarding evidence synthesis methods.

5.4.3 Tracing Organizational Structures and Social Bodies (S) Through Assemblages with Library Guides

Referring to their colleague's efforts to keep their library guide up to date with valuable methods resources, Participant 07 expressed gratitude for the work such updating entailed. Similarly, another participant referenced the importance of maintaining the currency of their institutional guide. In the context of evidence synthesis consultations and accessing such resources as the

PRISMA-P reporting guideline for review protocols and other tools and texts, Participant 01 noted that a group from the library met regularly to refresh and revise the links on the guide.

> [T]hat's the value of the LibGuide is that's where we store all of that stuff. And we have a team here… our subject guide for systematic reviews is kept up to date by some really excellent smart people. And I just love that it's so useful for those consults. (P01 Interview)

Thus, the librarians illustrated the collegial effort to monitor the evidence synthesis organizations and published literature for good examples of reviews and methods papers. In addition, they talked about the way that the library guide could save time and effort by serving as an easily accessible repository to which all librarians could direct learners, regardless of the context of the instruction.

Another participant also commented on the work to maintain the guide at their institution and the value for all the librarians who support evidence synthesis. In response to a prompt about referring learners to their own or other institutional guides, this participant highlighted the need to customize instruction to the local context, while simultaneously drawing on the work done by others.

> [W]e use our own guide. And we actually have a small team that works on it every week; we have an hourly meeting every week to work on that guide and keep it up to date. And we're working top to bottom […] next week we're doing grey literature. So I'll add that Toronto guide if it's not there already. But the thing is that guide is our treasure chest for ourselves and for our users at the highest level and the lowest level, and because many of our resources are specific to either our programs, or to specific tools that we buy, [we] still need to have our own guide. (P08 FG2)

This quotation reflected how the focus groups for this research offered opportunities for knowledge sharing within the group of participants that had the potential to impact practices in their daily work. The participants and I gathered ideas from the resources mentioned by others, such as the University of Toronto guide regarding grey literature searching, and incorporated them into our library guides, teaching material, and interactions with learners in classes or

consultations. While the context of the focus group facilitated this knowledge transfer during data collection for this research, the library guides themselves have been agentic to librarians' knowledge and teaching. The dedicated labour to perform literature and environmental scans to update the guides, in addition to frequent cross-referencing of external guides when teaching, has meant that the library guides on evidence synthesis methods served an important role in maintaining methodologic expertise. Creating and updating library guides, has helped the academic health librarians responsible for the guides to stay up to date in an ever-changing methodological environment.

Another example of the sociological-methodological intersection with the technology and material of the library guide has been in use of the guide to help learners navigate the team dynamics of working on a review.

> [T]he other piece that we hang on that page is the piece about who is an author, because authorship is such a big deal. And the power differential between the faculty and the student is so great that we have in the past ended up with people who have done tons of work and not even being an author on the paper. And so we kind of emphasize that piece as well. (FG2 participant, redacted for confidentiality)

By providing guidance for learners about appropriate methods, review team expectations, and tips for engaging with librarians, the library guides have served as intermediaries in the assemblage of teaching about evidence synthesis methods in online environments.

While many of these assemblages arose from the focus groups where participants predominantly spoke about teaching classes and workshops, reference to methodological documents on library guides also came up during observations of research consultations and the subsequent interviews. Participants mentioned or demonstrated referring to their library guide for sections on topics such as grey literature or developing a protocol. Librarians directed learners to the textual methodological guidance, templates, and examples of protocols and reviews.

For example, when meeting with two graduate students in a follow up to online evidence synthesis workshops, a librarian participant (Participant 01) referenced the guidance available on the research guide for searching for grey literature while they were going over the draft protocol

that the students had created. The rest of the hour-long consultation was spent developing sections of the search strategy in MEDLINE through Ovid, with the learner sharing their screen and following the librarian's directions. At the end, they concluded with a reminder that the students should look through the grey literature guide as homework prior to meeting again. In this way, the librarian was able to put bounds on what could be covered during a single consultation while acknowledging the questions of the learners about another topic. By referring the learners to instructional resources on the library guide, the librarian was essentially transcending the temporal limits of the meeting time to assign asynchronous learning that for follow up at a subsequent meeting. The invocation of library guides and other education material for learning beyond the bounds of the teaching time has been described further in Section 6.3.3. In another observed research consultation, a different librarian shared their screen with the library guide page on PRISMA-S, which both linked to the source article (Rethlefsen et al., 2021) and presented a table replicating the items from the PRISMA-S checklist. As with the previously mentioned observation, this reference to the library guide served to signpost the student to resources that could be used throughout the review process.

Another moment in the same research consultation with Participant 01 showed the use of the library guide as a repository of resources and the cross-linking to guides from other institutions. As the student shared their screen to start building searches in the MEDLINE database through the Ovid search interface, the librarian directed them to open the library evidence synthesis guide, navigate to the section on searching, and find the box with links to search filter resources. As they had previously discussed using a filter to jumpstart the search component for the pediatric population, the librarian pointed them to the population search filters on a University of Alberta guide, https://guides.library.ualberta.ca/search-filters (University of Alberta Library, 2023). This search filter page, which I have also linked from the Dalhousie KS Guide, has a multitude of search strings for various population groups, geographic regions, and other concepts. By drawing from the evolving work shared by University of Alberta librarians, in the form of search strategies on Google Documents linked from the guide, librarians and other researchers alike can save time and effort. The University of Alberta search filters page has linked to search strategies with the syntax and index terms for various databases and interfaces, saving searchers time in translating the search.

The resources referred to in this research consultation are shown below in Figures 5.8 and 5.9

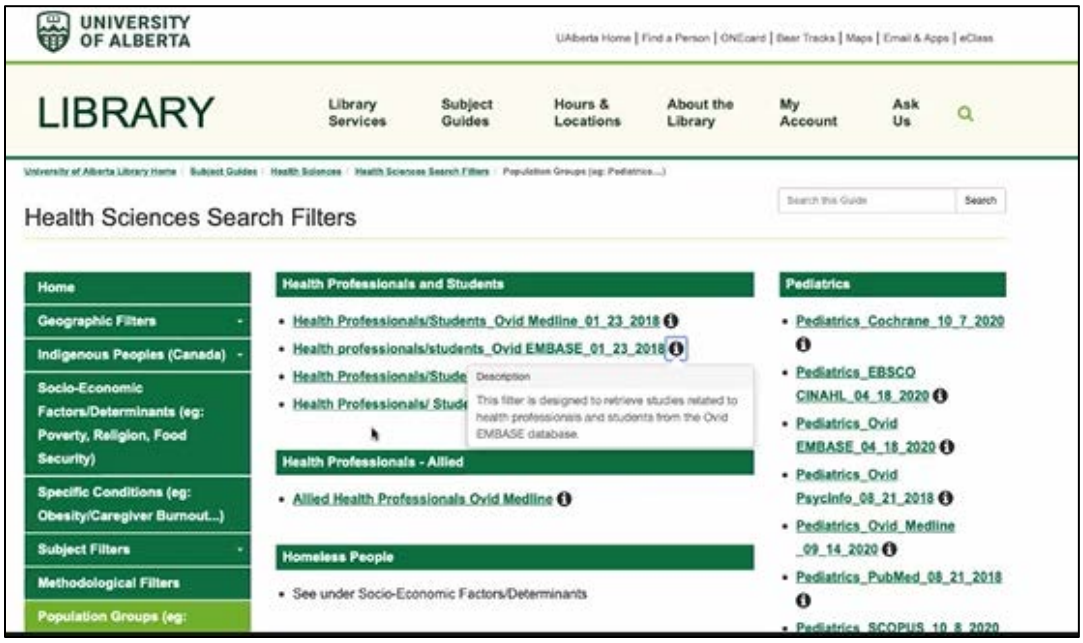


Figure 5.8 Screenshot of University of Alberta Search Filters Library Guide during research consultation with Librarian Participant 01, November 2021

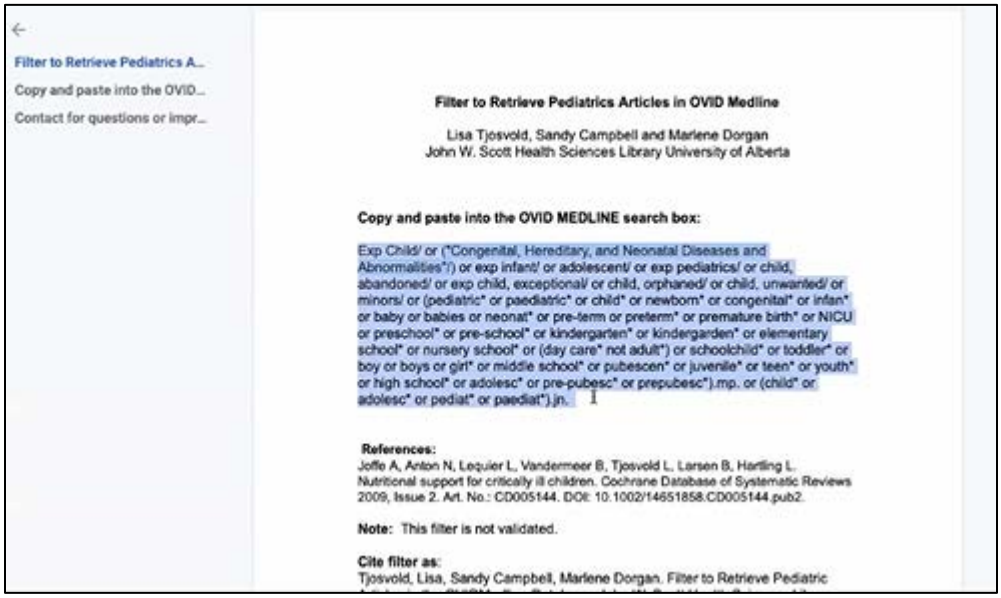


Figure 5.9 Screenshot of Google document "Pediatrics OVID MEDLINE_09_14_2016" during research consultation with Librarian Participant 01 in November 2021

5.4.4 Tracing Pedagogical (P) Materials and Immaterial Practices Through Assemblages with Library Guides

Just as the library guides have been shown to be entangled with other technologies and materials (T/M), methodological guidance content (C), and social or organizational dynamics (S), so too have they been intermediaries for pedagogical practices and materials (P). One participant highlighted this by noting that their library guide served the same purpose as a slide deck, both providing structure for a class and offering an enduring reference to which the learners can return as needed.

> And some of the classes I actually teach right off the LibGuide not even using slides anymore, just going, "Here's the LibGuide […], these are all the important pieces and we're gonna work through those." (P08 FG2)

This substitution of one type of technology for another during a class or workshop highlighted the role that the library guide has had in teaching encounters, enacting enduring assemblages that have supported the librarians' teaching as well as students' learning. Similar to Tummons' (2023) use of lecture slides as a starting point for an inquiry into the sociomaterial networks involved in the delivery of distributed medical education, the library guide has opened the door to see *what* librarians do when teaching evidence synthesis online.

There were several instances where library guide itself, or a component of it, served as a learning resource that was used independently or when following up from a class or a research consultation. This was the case with the University of Toronto guide regarding grey literature referenced in FG2 (P09). In another example, participants referenced sections of library guides with step-by-step instructions for using citation management software for removing duplicate records from the compiled citations from multiple databases.

> I'm part of the team that created a guide for that [duplicate removal]. We used to have a workshop. But we discovered that trying to teach that workshop online is really hard. Because there's a lot of times where you need to be seeing something and doing something. And we couldn't figure… I mean, not everyone has two screens, […] we just couldn't figure out how to translate that into the online environment. So, we changed the

> guide to be much more like a tutorial that takes you step by step through everything. (P07 Interview)

This example showed how the library guides acted as a solution to challenges of teaching a synchronous class online that did not translate easily from the version that had previously been taught in a computer lab or classroom. Thus, the library guide tutorial created a technological-pedagogical assemblage to address challenging processes within the methods of conducting reviews and to overcome accessibility limitations with the technological interfacing of online workshops. The library guide described by Participant 07 was changed from presenting information resources to becoming a teaching tool in itself and took the place of an in-person workshop or a synchronous online webinar.

Alternately, the instruction and guidance on a library guide replaced the need to develop teaching practices for additional content, as is the case for one librarian who during a consultation referred the learner to the library guide on Covidence, a systematic review management software (Covidence, 2024). During the subsequent interview the librarian noted that their library does not offer any workshops or other training on that software. Instead, learners were directed to the guide which hosted instructions for signing up through the institutional subscription and linked additional support such as the extensive tutorials and guides available from the company responsible for the software.

In other instances, the library guide served as a triage and pre-work prompt, allowing librarians to assume a more advanced awareness of evidence synthesis methods from learners by the time they meet for a research consultation.

> For my group in particular, I have a section on my LibGuide for them, which I don't think it's used very highly, but I really like that it's there because I can link it for people who email me and are like, “I’m doing a systematic review!” […] It links to the [Yale] videos. And then I actually have five questions that I pulled off of the Mayo Clinic's lib-blog. It's like five really simple yes/no questions. And if you answer “no” to any of the first four questions, you're not doing a systematic review. And it's a really nice […] so I tend to like send that… I can send the link to this block – basically it’s a box on LibGuide that I can send the link to the box and be like, “Before I meet with you, if you

> please watch this seven minute video" – I just use the first one like it's because I know I won't get them to go through more than one – […] and "look at those five questions. And *then* we can talk about if you're doing a systematic review or not." Which, when I send that link to people, it's been really helpful. I just have [a lot on the] guide, like [another participant] said, […] they don't go there on their own. But it's a good place that I could be like, "here's the link, click the link, do what I said". (P04 FG1)

By referring students to specific, actionable content on the library guide, the librarian turned the static, and potentially overwhelming, blocks of texts, images, and links into a pathway for learning about evidence synthesis methods. The librarian leveraged linked resources regarding the types of projects appropriately conducted as systematic reviews and how to perform a preliminary search of the literature on the topic to determine a reasonable scale for the review question. I have further elaborated on this participant's comments in Section 6.3.1 regarding teaching practices and librarian labour in online research consultations for evidence synthesis methods. In the context of the assemblages co-constituted by the library guides and the pedagogical practices, this and the other examples in this section have provided an account of the types of intra-actions typical in group and individual teaching sessions.

Tracing the primary actor of the library guide through the assemblages of online teaching of evidence synthesis methods has accounted for how teaching practices have been enacted through the domains of technological, pedagogical, content, and social materialities and immaterial actions. The examples from my findings revealed the ways that library evidence synthesis guides reciprocally mediated the teaching practices by simultaneously acting as repositories for self-directed learning resources, as active teaching tools, as collective memory banks for technological and methodological resources, and as labour-saving devices when shared intra- and inter-institutionally.

5.5 Discussion

Web-based library guides have been extensively studied in academic libraries, including those for evidence synthesis methods. As described in Chapter 2, in a content analysis of library guides supporting evidence synthesis methods, Lee and colleagues (2021) categorized the resources on a sample of guides collected in early 2018 and found a dearth of tools with educational content.

They defined *Tools (educational)*: "a resource that can be used to ease the systematic review process. For example, software to help with reference management, screening, critical appraisal, or data management. Tools will be coded as educational if they provided instructions about how to use the tool" (Lee et al., 2021, p. 67). These tools with educational content contrasted with the more prevalent resources coded as *Tools (information)* that only described or linked to software or tools for conducting reviews. The tone of disappointment is unmistakable when the authors concluded: "We had hoped to avoid reinventing the wheel as we developed our own instructional tools; however, what we found was that the wheel appears not to have been invented" (Lee et al., 2021, p. 75). The author team subsequently developed a skills-based guide on some of the aspects of conducting systematic reviews related to search: https://libguides.ucalgary.ca/SRskills.

Judging by the discussions reported in this chapter, many librarians have acted, consciously or not, on the conclusions and recommendations from the systematic review guide content analysis by Lee et al. (2021). The library guides and their contents described or used by participants in this study frequently included instructions along with the linked tools to aid in conducting systematic reviews or other evidence synthesis projects. The tools and software supporting evidence synthesis research have similarly proliferated since 2018. For example, in 2017 the WK Kellogg Library at Dalhousie University was an early institutional adopter of Covidence, a systematic review management software, and seven years later the Covidence Knowledge Base included instructions for 171 different institutional subscribers. To further use the Covidence Help page of the Dalhousie KS Guide (https://dal.ca.libguides.com/systematicreviews/CovidenceHelp) as a comparative example to the content analysis findings, this page has included a brief description of the review management software. The description has been followed by instructions to sign up through the institutional subscription, links to the Covidence Knowledge Base for more guidance on using the software, as well as customized handouts with step-by-step instructions on importing citations from commonly used library databases, and slides showing how to import full-text articles using Zotero, a citation management software recommended by our librarians. The combination of descriptive information and educational guidance has reflected a move towards learner-centred design of the library guides and the resources they contained.

Other librarians have extensively explored the design and use of library guides in the context of research guidance in academic libraries, including a comprehensive review of the literature that produced 31 best practices across the domains of design/organization/layout, navigation, content, accessibility, purpose, and external factors (Goodsett et al., 2020). Though many of the existing publications focused on usability for learners, including format and content, a content analysis of nearly 13 thousand guides showed that most guides do not follow published recommendations (Hennesy & Adams, 2021). The implications of this shortfall are unknown, as at least one recent case study demonstrated that even after a thoughtful implementation of best practices, including a thorough review and training workshop for guide creators, actual usage of guides did not increase (Brush, 2022).

Dalhousie Libraries' KS guide, like many contemporary library guides on evidence synthesis methods, has been designed to be learner- and reviewer-centered. That design has included more educational content as well as pages for each step of the review process and information describing different types of evidence syntheses. Inclusion of flow diagrams to help researchers decide the most appropriate review method for their project, such as the one created by Unity Health and discussed in Section 5.5.2, have added interactive components to the information content. Interestingly, aligned with Brush's findings of LibGuide usage decreasing following redesign to follow best practices, the usage statistics for the Dalhousie KS Guide have decreased since the revamp in 2021. Whereas the KS Guide was accessed over three thousand times per month, on average, in 2019 through 2021, the average monthly usage in 2022 and 2023 was just short of 900. These statistics provided an interesting, albeit superficial, insight into use, especially considering I have regularly used the guide in similar ways to those described by the participants in this study. I have included links to the guide in slides for classes and workshops, sent links to specific resources on the guide to learners via email and videoconference chat, as well used the guide as a training resource for new colleagues and library interns.

Reviewing the contradictory evidence from Dalhousie KS Guide usage statistics, the literature regarding library guide best practices, and the findings of this research suggested that current perspectives on the role and agency of evidence synthesis library guides have undervalued their importance to librarian teaching practices in support of evidence synthesis methods. For the librarians participating in this study, the evidence synthesis library guide functioned as a nexus

of their teaching practices, serving as a repository for links and tools while simultaneously providing a teaching platform and a structure for pedagogical practices. Meanwhile, the essential nature of the guide has come into being through visible and invisible librarian labour. That labour was made visible when participants made appreciative comments for efforts of the individuals or teams who created and maintained the guides. The existence and function of each library's guide was also entangled with those of other libraries. The practice of linking out to and reusing content and resources featured from library guides external to their own institution rendered the labour of creation invisible when it has been produced elsewhere, particularly in virtual environments (Cherry, 2016). The guides reflected the shared labour across multiple institutions of monitoring the environment and literature for new methodological guidance and studies, learning about emerging technology that can be used in conducting evidence syntheses, and determining appropriate approaches to teach individual and groups of learners in a variety of contexts. The established practices of borrowing, re-using, and linking to resources on other institutions' guides reflected the collaborative, sharing culture I have experienced in health libraries. However, the time required for those practices – and the continuing education they entailed – would be difficult to assess. It was not clear if such ongoing professional development was reflected in participants' accounting of the work time they spent supporting evidence synthesis methods, based on the responses to the participant characteristics questionnaire. Nonetheless, my findings suggested that librarians' methodological learning has been supported both by the frequently collaborative work of maintaining the guides and by using the methodological and technological contents linked on them in their teaching practices.

As mediators within the online teaching encounter, communication and research technologies, texts, and other media played active and reciprocal roles as actors in shaping (and being shaped by) the behaviours and actions of librarian instructors and learners. I conceptualized digital technologies, such as library guides, review management software, citation databases, and even electronic texts, as being material, in the sense that they were the result of software and hardware configured to various purposes (Haider & Sundin, 2023). Furthermore, I perceived these online tools and texts as having agency to impact the practices and actions of other actors with which they intra-acted in sociomaterial assemblages. For example, technological tools acted (or failed to act) in certain relational ways (i.e., in response to actions from other technology and human users) with those other human and non-human components, such as when librarians designed

library guides for asynchronous use by learners and also used the guides in the place of slides to structure teaching. These intra-actions produced outputs that were likewise entangled, such as the limitations of teaching workshops about deduplication in online environments inspiring the creation of step-by-step instructions (i.e. asynchronous teaching) that were then hosted on the library guide.

Other technology or textual actors could have been traced to shed light on the entangled material and immaterial nature of social, methodological, and pedagogical practices, in this research context, such as lecture slides (Tummons, 2023) or search interfaces (Haider & Sundin, 2019; Orlikowski & Scott, 2008). Technology such as videoconferencing software or texts such as reporting standards could also have been traced through the multiple domains and dimensions (i.e. TPAC-SM) of librarian teaching practices regarding evidence synthesis methods. However, library evidence synthesis guides were a particularly illuminating example in the context of the online teaching practices of librarians on this topic due to their prevalence and richness of intra-actions. This chapter has show how those intra-actions of library guides with materials and practices across the technological (T), pedagogical (P), methodological content (C), and social/organizational (S) domains co-constituted the practice assemblages of the TPAC-SM model. The assemblages involving library guides crossed over the multiple formats and contexts in which librarians performed this type of teaching: synchronous and asynchronous, individual and for groups, and even, though it is not the focus of this study, hybrid and in-person instruction. As shown in this chapter, library evidence synthesis guides are a uniquely "complex enactment" through which we can visualize those practices (Fenwick, 2010, p. 119).

5.6 Implications for Practice

As highlighted throughout this chapter, many implications for practice emerged by following the library guide actor in the context of online evidence synthesis methods instruction. Indeed, the findings of this chapter emphasized the important role of library guides in online teaching practices for systematic searching and evidence synthesis methods. Far from being static repositories of links and resources as has been suggested by content and user experience analyses (Barker & Hoffman, 2021; Lee et al., 2021), these guides have been active elements in librarians' teaching practices and were entangled with the other material and immaterial actors of

pedagogical approaches, teaching material, methodological guidance documents, communication and review management technologies, learners, library services, and intra- and inter-institutional communities of practice. But even as repositories, these library guides were collectively treasure troves of information regarding evidence synthesis methods and instructional resources regarding those methods and the tools to support conducting reviews. The links and resources were carefully curated and created by librarians for use during teaching as well as for students to reference outside of teaching encounters. Although my findings suggested that the guides used and referenced by the participating librarians in this study were more process- and learner-oriented than those analysed by Lee et al. (2021), guide creators may want to consider revisions and updates based on this agential understanding of the role of evidence synthesis guides in teaching. Librarians who create and maintain evidence synthesis guides may benefit from reflecting on the various ways that teachers and learners interact with guides to redesign parts or the whole of their evidence synthesis guide. The assemblages revealed in my findings highlighted the value of modeling the guide on the steps of the review process and including methodological resources *and* instruction, such as through multi-media digital learning objects (e.g. electronic handouts, video tutorials, online modules, etc.). Including guidance on how and when to select and use appropriate technologies and resources to support the research endeavour at each stage can help librarians and learners at common 'sticking points' such as searching the grey literature, using search filters, and deduplicating citation results. Revisions based on these findings could facilitate use by librarians during teaching and by learners both within and outside of teaching sessions.

From the observations regarding library guide updates comes another implication concerning practices and the labour of creating and maintaining guides and other digital learning resources related to systematic searching and additional steps of evidence synthesis methods. Librarians participating in the focus groups explicitly talked about how they would consider adding links or resources that other participants had mentioned to their own guides. Similarly, I have made changes to the Dalhousie KS Guide based on links or formatting modifications I learned about through the focus groups or observations. As the Dalhousie KS Guide revision implemented in 2021 had already modeled on the steps of conducting a review, the overall format has not been modified, but additional resources such as the grey literature resources from the University of Toronto guide have been linked since conducting this study. By using the library evidence

synthesis guides from other institutions both as inspiration and model for one's own guide and as teaching tools to which we can directly refer learners, librarians can amplify the collective effort of creating these digital learning objects. Further, the processes for updating and renewing the guides, as noted by several of the participants, suggested good practices: specifically, having a team responsible for the guide and having regular, scheduled times to review the content and update it as needed. Maintaining current awareness and ongoing appraisal of developments in methodological guidance, examples of different types of reviews, emerging technologies and tools, and externally produced instructional material has required substantial effort and time. Librarians already looked to their own and others' guides to keep up to date with changes and to see how others have presented the relevant methodological knowledge and skills. This practice can be integrated into a consistent review cycle to optimize the library guide for learners and teachers alike. The process of reviewing one's own guide and those of other institutions with a group of colleagues can serve the dual purpose of continuing professional development through a community of practice. As support for evidence synthesis methods has expanded beyond the health sciences, such communities of practice have led to opportunities to build capacity through interdisciplinary collaborations with teaching and research librarians for other disciplines.

5.7 Chapter Summary

I have conceptualized this chapter by using an adapted framework expanding on and modifying the technology, pedagogy, and content knowledge (TPACK) model along with sociomateriality, practice theories, and ANT into a matrix to elaborate the networks of material and immaterial intra-activity. Through this analytical process, I provided examples from the research context and findings to elaborate on key concepts of a new technological (T), pedagogical (P), evidence synthesis methods content (C) SocioMaterial model (TPAC-SM), including how librarians' online teaching practices for evidence synthesis methods fit within this framework. By using library evidence synthesis online guides as examples of the types of temporarily stabilized networks and fluctuating assemblages of actors involved in librarian teaching practices, those practices and the labour inherent in them became more visible. These findings revealed the ways that library evidence synthesis guides reciprocally mediated the teaching practices by simultaneously acting as repositories for self-directed learning resources, as active teaching tools, as collective memory banks for technological and methodological resources, and as labour-

saving devices when shared intra- and inter-institutionally. The next chapter further explored the ways that librarians leveraged the resources and links on library evidence synthesis guides to extend their teaching beyond the duration of direct contact with learners.

CHAPTER 6 ACCOUNT OF INVISIBLE LABOUR IN ONLINE EVIDENCE SYNTHESIS METHODS CONSULTATIONS

6.1 Chapter Overview

This chapter provides a composite accounting of research consultations between academic health sciences librarians and learners who are engaged in knowledge synthesis projects. By attending to the intra-actions of technologies, practices, pedagogies, methods, and people, I explored the invisible work of librarians when meeting online with learners who are working on evidence synthesis projects. In doing so, I have addressed the research question: What types of labour are revealed by following the threads of the social and material elements during the librarians' online teaching practices? The findings have been presented through a composite, performative accounting of the sociomaterial practices involved in online evidence synthesis research consultations, focusing on the intra-actions between materiality and labour. In the discussion, I have reflected on the affordances of the conceptual framework, particularly as described in Section 3.5.2 in relation to invisible labour in academic libraries. Finally, I have provided some implications for practice through reflexive consideration of how these findings have informed my own practices and have the potential to inform practices at other institutions and of other librarians. A version of this chapter has been previously published as an article in a special issue of the Canadian Journal of Academic Librarianship dedicated to the place of teaching in librarians' work (McNiff et al., 2023; Parker & Snelgrove-Clarke, 2023).

6.2 Making Work Visible in Online Research Consultations

If the work of information specialists involved in conducting the mediated searches of a knowledge synthesis project is often rendered invisible by lack of recognition, as Ross-White (2021) argued, then how much more unnoticed is the labour of academic health librarians when teaching the skills to learners to apply those search methods? The findings of this study provided new understandings of the complexity that librarians have navigated when bridging multiple elements, including: their own searching expertise, their approach to meeting the learning objectives of individual or groups of learners, the technologically-mediated environments of both online instruction and knowledge synthesis methods, and the academic and health research contexts surrounding all of these factors. This chapter aimed to describe the assemblages of

human and non-human actors that have been involved in the online teaching encounters between librarians and learners in order to illuminate the invisible labour, hidden power dynamics, and evolving sense of professional identity that have mediated the instruction assemblage.

In contrast to the situations when librarians conducted searches for knowledge synthesis projects, which included a range of roles and challenges (Campbell & Dorgan, 2015; Spencer & Eldredge, 2018), the role of librarians in instruction of evidence synthesis methods has not been explored in depth. Indeed, all the challenges and roles involved in participating in evidence synthesis research teams were still in play in the context of instruction, from expert searching and all that entails, to communication, and project management. The librarian aimed to provide the benefits of having information specialist expertise for the review including: the comprehensive search, the documentation included in the reporting, and potentially the quality of the review overall. Yet, when concerning a student review, these contributions have been mediated through another individual without the specialist training and years of experience. And in addition, the librarian had to determine the most appropriate and effective ways to convey the search methods skills and knowledge to the learner, who, in turn, integrated that understanding into their own projects and the corresponding research team dynamics.

The complexity of assemblages in the instruction of evidence synthesis methods, including, but not limited to the systematic search, cannot be overstated. From the moment the librarian has been contacted by the learner, and the moment the librarian let learners know that they *could* be contacted in relation to evidence synthesis project support, there are myriads of technologies, skills, materials, expectations, and interpersonal dynamics that came into play. The account offered in this chapter has given a glimpse into the online teaching practices of academic health sciences librarians during consultations with learners who are working on evidence synthesis projects.

6.3 Composite Accounts of Research Consultation Practices

To illustrate this complexity, I have presented a composite narrative or performative accounting of the encounters between academic health librarians and health professions learners working on a knowledge synthesis project as part of their academic program. This accounting was constructed from personal experience and the data drawn from the research through observations

of five librarians from five different institutions. The account has woven together observed practices, quotations from the librarians during subsequent interviews, and reflections on how the theoretical framework helps signify teaching practices of academic librarians when providing online support for learners engaged with evidence synthesis projects. These findings were based on typical research consultations between an individual learner and the librarians, though my experience and this doctoral research have shown that a similar range of elements and complexity have been involved in online group instructional sessions. The account aimed to capture the range of actors, both material and immaterial, that commonly occur throughout the instructional process. To move beyond representation to unpack the "black box" of the teaching practices, I followed the narrative through the sequence of practices; that is the activities, sayings, and doings of librarians and the other human and non-human actors as they took place in a situated place and time (Burm & MacLeod, 2020; Nicolini, 2012c). The performative accounting interpretation of the chronology of individual research consultations has been described in the following sub-sections: before the consultation, during the online research consultation, and beyond the research consultation.

6.3.1 Before the Consultation

While the starting point of an online evidence synthesis research consultation may have appeared to be the moment when the librarian received a request from a student, either via email or an online booking system, the impetus for the meeting was very much a part of the assemblage that impacted other aspects of subsequent interactions. The request for support did not come out of nowhere, although the librarian did not always explicitly know how the learner has become aware of the existence of the health sciences librarian with the ability and availability to respond to questions, provide guidance, and address uncertainty in the knowledge synthesis process. Through my observations and experience, I have seen instances where the librarian had worked with other students supervised by the same faculty member, who now regularly recommended that learners embarking on a systematic or scoping review set up an appointment with the librarian who liaises with the department. This was the situation in the case of a librarian (Participant 07) who had supported a review project on a similar topic in collaboration with the supervisor of the student requesting help. Or perhaps the librarian had an embedded role in a graduate-level course focused on knowledge synthesis and other research methods: teaching one

or more sessions throughout the duration of the course and working with the learners as they build their skills and work towards the course deliverables. Such was the scenario described by a librarian with 14 years' experience during a focus group discussion. In other cases, a learner may have been directed to, or incidentally come across, the library's knowledge synthesis research guide and clicked on the integrated scheduling widget that opened the LibCal booking system (Springshare, 2024a) for all available librarians, as described by the librarian participant who indicated they pick up two to four appointments per week from the pool of requests.

Each of these scenarios built on pre-existing relationships and technological affordances that enabled the learner to reach out to the librarian, initiating first (or subsequent) contact. Often that contact was via email, with a cursory request to help the learner in relation to the systematic review they are starting and need to complete before the end of their program, or sometimes before the end of the term. The email requests frequently omitted details regarding the topic of the research and may have requested a limited scope of assistance, such as help selecting search terms. Increasingly, since most libraries and librarians converted their research consultation services to online at the start of 2020, the requests have come in via online booking systems such as Microsoft Bookings or Springshare's LibCal, which had been integrated with librarians' work calendar and email as well as the institutionally supported videoconferencing software, such as Zoom or Microsoft Teams. When completing the request form the learner would have navigated through the digital booking system generating an electronic invitation sent to their own and the librarian's email and calendar. Typical questions in request forms or booking systems have included the type of support needed, the details of the learner and project, and preferred date and time. Figures 6.1 and 6.2 show examples of booking systems and some questions asked of the learner when booking a consultation at two different institutions with publicly accessible request forms for an individual librarian and for the evidence synthesis support service at Dalhousie University and University of Western Ontario, respectively.

To schedule a research consultation, the librarian participants in the study reported either negotiating a time to meet via email or, more frequently, the use of the online, integrated booking system. In some cases, the learner sent an initial message via email and was then immediately directed by the librarian to the booking system via a link either emailed to the learner or embedded on the library website or library research guide to which the students are

directed. Some of the librarians worked at institutions with a formal knowledge synthesis support service, which included an intake form as part of the initial booking process. I will return to these intake forms as I traced the information gathered as mediating actors before, during, and after the research consultation. All librarian participants who used an online booking system to schedule research consultations with students expressed appreciation for the system saving them time and effort in the scheduling process. They also noted the automated meeting invite decreased confusion about the final time selected or means to connect, with the meeting time and videoconferencing link sent to both the librarian's and learner's emails and entered automatically into their respective calendars. Thus, the materials (i.e., technology) used for booking replaced or reduced the administrative labour previously done by the librarian, which has been shown to often spill over into unpaid time (Clarke et al., 2022). This change in practice provided one example of the type of modification to existing practices that can result from *tactical tensions* arising in times of crisis such as when current or established practices are less feasible due to the volume of requests and time to respond by email (Orlikowski & Scott, 2021).

Conversely, the configuration of the online booking systems used by librarians at certain academic libraries could be a barrier to using the integrated software. One librarian noted that students at their institution did not tend to use Outlook calendar for organizing their schedules and that their library's consultation booking software was not easy to set up for availability at irregular hours (i.e., anything other than recurring availability at the same times and days of the week). In their case, coordination of the consultation time was confirmed over email by sending a link to the videoconference meeting. They noted that this additional administrative labour impacted their amount direct student contact time.

> [I]f […] I'm going to have office hours, or I'm going to set up this time that's the same every week, that's very easy to do. But if you want to go in and try to just pick and choose [available hours], it takes a really long time. […] Sometimes I wish I had a secretary who could do all of that. It's not very streamlined […] How much more time I could spend helping students if I didn't have to manage all of this? (P07 Interview)

Figures 6.1 and 6.2 shows examples of booking systems and intake forms on library sites.

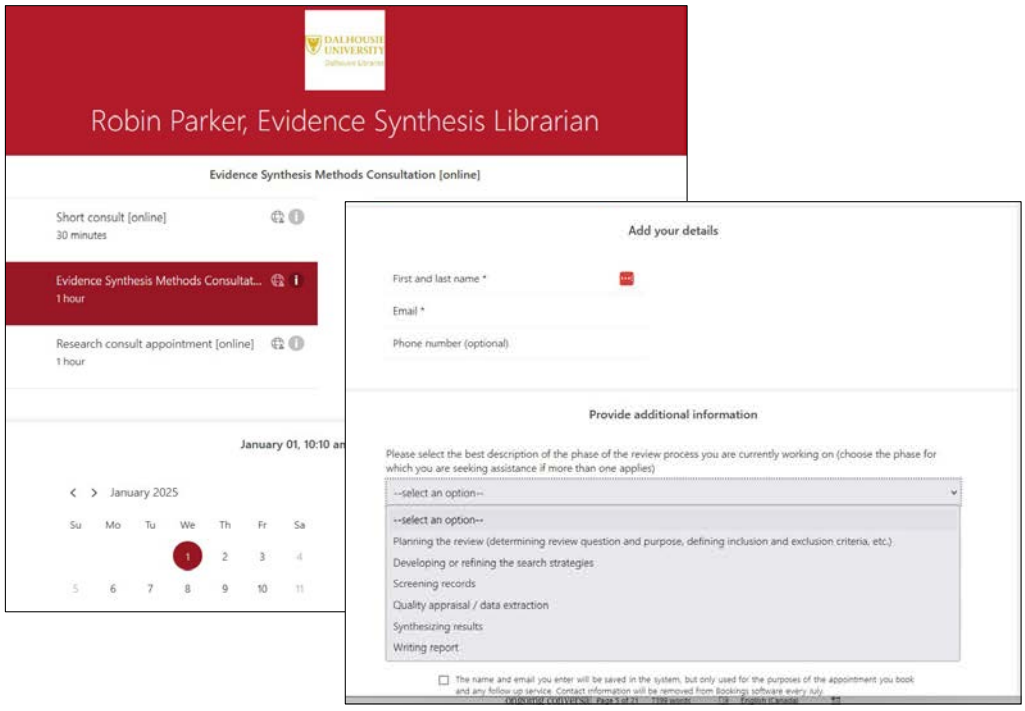


Figure 6.1 Booking page for Robin Parker with selection for online Evidence Synthesis Consult

Note: screenshot images taken from:

https://outlook.office365.com/owa/calendar/RobinParker@dalu.onmicrosoft.com/bookings/

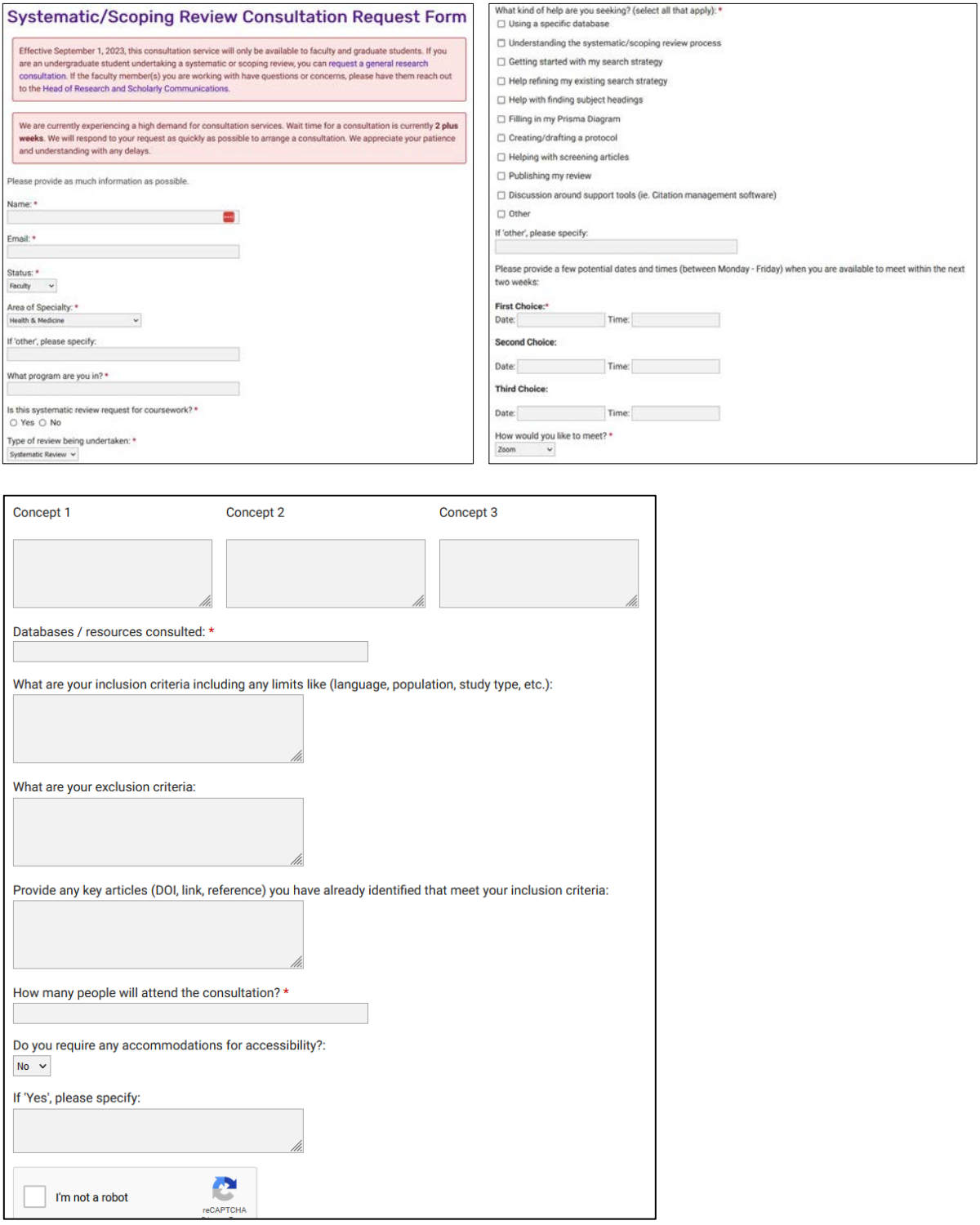


Figure 6.2 Systematic/scoping review consultation request form from University of Western Ontario Libraries

Note: Figure 6.2 Screenshot image taken from https://www.lib.uwo.ca/forms/systematicreview/consultation-course.php, accessed 2024-02-20.

In addition to facilitating the scheduling, librarian participants reflected on a range of information collected and administered through the booking system that allowed them to 1) do some exploratory work in preparation for the consultation; 2) assign pre-work to the learners in advance of the meeting; 3) track the number and some characteristics of the learners (such as program and academic status); and 4) refer to previous bookings as a reminder in the case of follow-up sessions with the same learner. Some libraries used intake systems that required more extensive details, such as a draft protocol or information about additional team members, while others used the initial mode of contact, either via the form or via email, to assign preliminary work to the learners. Examples of preliminary work included requesting that the learner formulate their research question according to the PICO or other format, assigning video tutorials covering searching in various health literature databases or covering the steps of the review process, identifying a few example papers that may meet the final inclusion criteria, and drafting a review protocol.

While librarian participants reflected on the benefits of having some information about the requester and their project in advance of the scheduled meeting, allowing the librarian to check for existing reviews or do an initial scope of the literature, they also noted that they generally were cautious about putting in work themselves before the first encounter with the researcher. Despite assigning pre-work and requesting information from students, the request for support did not always align with the actual project or reflect the students baseline knowledge accurately. When discussing the preparatory work they did and what they expected of requestors, one librarian commented during the interview that they had seen a lot of variation in the level of preparedness of students and other researchers. Even in the cases of researchers who had sent a protocol or research question, the librarian noted limiting the amount of work they put in prior to confirming project details directly.

> I won't do a lot before the first meeting, just because I don't want to trust my interpretation of their email or their contact to a lot of invested time. But […] I will do a little poking around. And then we'll meet and I'll generally get an assessment of where they are, what they need, how things are going. (P06 Interview)

Examples of resources sent to learners in advance of a meeting included a link to a set of questions about the type of review (for example, the website that evolved into the Right Review tool - https://rightreview.knowledgetranslation.net/), video tutorials on systematic searching (e.g. the Yale tutorial series - https://library.medicine.yale.edu/tutorials/subjects/systematic-searches) or tutorials on searching within specific databases (e.g. MEDLINE through Ovid, Embase, or CINAHL through EBSCOhost), and their own or another institution's research guide on knowledge synthesis methods or comprehensive searching (e.g., https://dal.ca.libguides.com/systematicreviews or https://guides.library.utoronto.ca/comprehensivesearching). Several librarians noted that the opportunity to assign pre-work allowed them to assume a baseline level of knowledge and competence going into the first research consult with a new student, ultimately saving time and effort during the meeting time with the student. Librarians phrased the request as an opportunity for the learner to gain an overview of the process they would be undertaking or, alternatively, as a review of the concepts if the learner had previous experiences with evidence synthesis projects.

Librarian participants described their typical responses to emails asking for review support which reflected the work they expected of students prior to meeting. In one example, also mentioned in Chapter 5, Participant 04 said they assigned pre-work and referred the requestor to several resources on the library's evidence synthesis guide. This reference to instructional material and teaching prompts on library guides exemplified their mediating role in online teaching of evidence synthesis methods as elaborated on in Chapter 5. Prior to scheduling an initial evidence synthesis consultation, another librarian reported requiring students to send a protocol if they had not met previously through a course or research consultation.

> I ask [the student] to send me a draft protocol. And I won't meet with them until I see something that's more than a research question and an email. And if I read it [and think]: "This is a really general question, or I feel like this has been done before", I might actually do some initial searches to see if reviews have been done. [… I]n which case, I'll reply to the student: "Here are five reviews that seem to be answering your question. Can you tell me how they're different?" […] I try to do that through email, just to save everyone time. [… Or if] there's nothing that's been done on [the student question], but there's still things that aren't clear to me, I might write back: "Can you

> clarify these things for me, before we even meet?", because sometimes students are so early in the process that they're not ready to meet with me. They think, "I'm supposed to do a systematic review, let me meet with a librarian right away." [But] there needs to be a conversation first. (P07 Interview)

These examples reflected the efforts to streamline the initial meeting by setting expectations of baseline knowledge and a shared understanding of essential methods for systematic reviews (or other evidence synthesis methodology). The preparatory work asked of the students – and that done by the librarian – was mediated by material including video tutorials, draft review protocols, and published reviews on the topic, but also by digital communications via email, scheduling and meeting software, and online learning tools such as the library guide.

6.3.2 During the Online Research Consultation

Based on informal conversations with colleagues across the country as well as my own experience and the responses from interviewees in the Spring of 2022, academic librarians have continued to hold many of their research consultations with learners for knowledge synthesis projects through videoconference. By the time of data collection in 2021 – 2022, librarians had adapted to using the videoconferencing software supported by their institution for their research consultations, generally either Zoom or Microsoft Teams. All the research consultation observations conducted as part of this research were held via Zoom (five observations of three librarians) or Teams (three observations of two librarians). Librarians expressed preferences for videoconferencing platforms, some of which did not align with the software supported at their institution. Regarding the choice of meeting platforms, librarians reported that Microsoft Teams could be less functional for people joining from outside the institution, such as residents working from hospitals. One librarian noted that offering the option of a Zoom call facilitated ease of use for the learner, though that also involved additional labour from the librarian to set up and allow screen sharing on both ends.

> So then I started offering on my LibCal: just asking whether they wanted a Microsoft Teams […] meeting or Zoom. And I'd say 50% were fine or would chose Zoom […]. So providing the option, I think, of something that they're more familiar with… it's just

> a little bit more awkward, because you always have to remember to add them as a co-host so that they can share their screen. (P02 Interview)

My experience has mirrored that of this participant; I have maintained a professional Zoom account with professional development funds for research purposes, but I have often sent link to a Zoom meeting through a Teams chat when the Teams connection or functionality on my own or the learner's computer has not been sufficient for the research consultation. This readiness to accommodate technological glitches and work around incompatible systems accounts for another way that librarians expended effort and financial costs on their own initiative to provide support on behalf of the institution, similar to what others have described in academia generally as well as libraries (Clarke et al., 2022; Gray, 2021). Similarly, the breakdowns and disruptions in the functioning of the material (technologies) of the research consultation, helped to make visible the labour of maintaining and navigating multiple videoconference software options. When asking the student to share their screen and entire desktop view, one observed librarian helped the student navigate their computer security permissions for Zoom to successfully proceed, as shown in Figure 6.3 and described in Table 6.1.

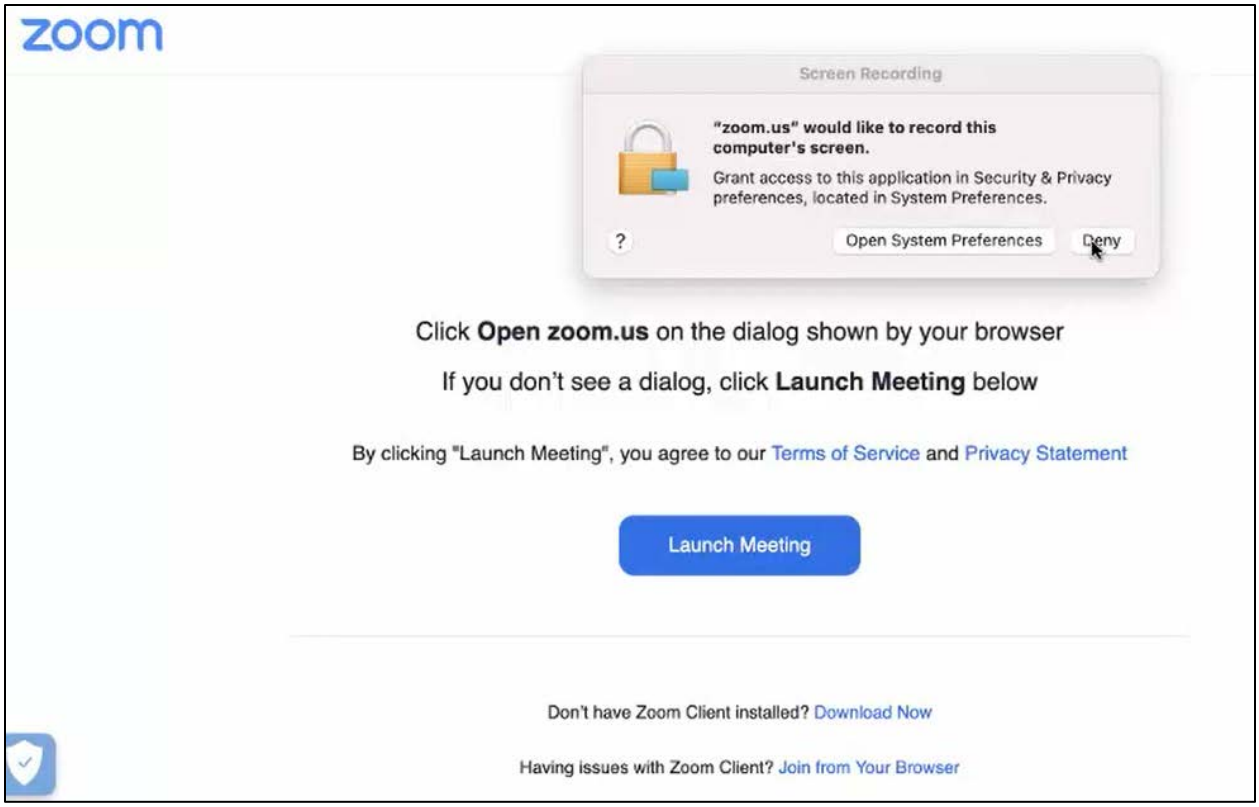


Figure 6.3 Student's shared screen with computer security notification for Zoom

Table 6.1 shows a note made while watching the recorded consultation, where I reflected on the actors present, actions taken, and some notes about the verbal instructions, along with the time reference from the video. This note demonstrated how I looked for the instances of breakdowns and disruptions in sociomaterial assemblages that offered opportunities to examine the taken for granted activities in online teaching practices.

Table 6.1 Example note from Nov 12, 2021 research consultation observation

Actors	**Actions**	**Discourse Notes**	**Time**
Librarian (in classroom), student (at home?), cameras, Zoom, security alert, shared screen, computer desktop with multiple open applications, browser window	Librarian getting student to share screen… pause while student navigates security alert from Zoom	Librarian provides directions on navigating to "share", mentions next material/tech to be accessed (word doc linked from library guide)	3:20 – 4:30

From the moment the librarian and student joined the call on the videoconferencing software, the research consultation has been customized to suit the needs of the learner (Hanneke, 2022). When it was a first meeting, the consultation usually started with either the librarian or the learner recapping the request. This opportunity to confirm a shared understanding of the starting point sometimes led to a course correction, for example, when the email or booking application included a request for support on a knowledge synthesis project and then the learner acknowledged that they actually needed help with a less formal literature search for an assignment or the literature review component of another study. While these types of information requests were not the focus of this research project, their inclusion in the observations reflected the blurred boundaries between the levels of help sought by learners; it is not uncommon for undergraduate or even graduate students to have an unclear understanding of the distinction between knowledge synthesis projects and other literature search needs. This type of (mis)alignment of purpose is explored further in the Chapter Seven.

In these initial and subsequent encounters, the librarian must have determined the level of understanding held by the learner(s), assessed what could be accomplished in the 30 to 60-minute encounter, and how to balance sharing conceptual knowledge about evidence synthesis methods and the goals of systematic searching with the technical skills. In one observed 30-minute consultation with Participant 06, that balance was reflected by approximately half the time spent discussing the overall objectives of the medical student, checking their baseline understanding of the project and the search, and reviewing the material that had been shared

prior to the start of the meeting. In this instance, the learner was picking up a project that had been started by another individual working with the same supervisor, and the librarian and learner referred to a previous draft of a search strategy that had been started by that previous student. The consultation then segued into demonstrating some specific skills related to navigating to the database (MEDLINE through Ovid) and looking up the appropriate Medical Subject terms (MeSH). The remainder of the meeting was spent ensuring the student saw how to combine MeSH and text word terms in the search history and addressing questions about other software to help facilitate the review process, including citation management software and Covidence, a review management software provided by the institution. The latter involved reference to, and showing of, a library guide with information on the software. In the follow up interview, this librarian noted that the library did not at that time provide training or workshops on the review management software. However, referral to the related library guide and the help resources provided by the company seemed to provide sufficient support for learners and provided material for subsequent self-directed learning on the part of the student. This demonstrated how maintenance of library guides and awareness of other educational and methodological material was one form of labour that mitigated the need for additional teaching encounters.

By sharing their screen, the librarian simultaneously viewed the library or database site and the student's video feed. and, likewise, the student was viewing the action on the librarian's screen directly through the videoconference interface. Decisions about how to balance the instructional session, including the volume and type of content, were frequently made on the fly, in response to often subtle indicators from the learner about their ability to take in more information. This consultation with Participant 06 consisted of a sequential split of time dedicated to conceptual and technical components, whereas some other observations involved more integrated shifting of focus back and forth between concepts related to evidence synthesis methods or search methods and the procedural and technical skills of applying those concepts to the search process. Librarian Participant 01, whose research consultations followed the latter model, noted in their interview that they gauged the capacity of the learner by having the student share their screen and actively apply the search guidance during the consultation. The balancing of learner objectives and abilities, along with the expectations for evidence synthesis methods has been explored further in Chapter 7 of this dissertation.

Watching the student navigate the database interface and conduct the search allowed real-time feedback about whether they understood the librarian's instructions. However, the affordances of technology did not always permit an easy sharing of screens in both directions. For example, I have noticed that the security settings for learners using Microsoft Teams on Mac computers (the brand of choice of many medical students and residents) led to challenges for learners sharing their screens, resulting in lost time in research consultations while troubleshooting the technology, such as checking and changing settings or exiting and rejoining the meeting. As a result of these technological barriers, the librarian reverted to sharing their screen and demonstrating the search skills, despite knowing that best practices recommended the learner "drive" the consultation. Indeed, this practice of allowing the learner to actively participate has been noted as an advantage of conducting research consultations through web-based videoconference software (Hanneke, 2022). This illustrated the sociomaterial tracing of how the technology employed enhanced or disrupted teaching practices, depending on the co-constitution of assemblages. The variety of assemblages of learner ability, purpose of the project, and allowances of technology in individual consultations and group instruction has been described in more detail in the following chapter.

In the case of evidence synthesis research consultations that built on previous encounters between the learner(s) and librarian, the meeting started by picking up where both parties had left off, either in a previous meeting, or via email. This included referring to a shared draft of a search or review protocol and addressing the questions raised by the learner preceding the meeting, often in the booking email or form. For librarians who used a personal booking link, learners would generally book subsequent meetings directly with them via the booking system. On the other hand, librarians working in systems with a shared booking system received a direct email to schedule a follow up meeting to ensure continuity, or the librarian assigned themselves to the meeting, if possible, when they recognized a learner's name with whom they had previously worked. In response to a clarification question about their centralized request system, one librarian noted that students requesting follow up help may email the librarian directly or "sometimes I'll see someone that I already helped pop up in the consultation forum, then I'll try to grab that one" (P05, interview). Continuity between librarians providing support was not guaranteed, but the librarian recognized that consistency could make the experience of the learner less disjointed than dealing with different teaching styles. These alternative means of

organizing follow-up with learners showed the mediating effect of the material, in the form of the booking software and its configuration, on the relationship between the learner and librarian as well as teaching practices and labour. For example, with the service-level booking system, a librarian must expend mental effort and/or check their own or the system records that tracked previous consultations to "claim" the consultation requests from a learner they have worked with previously. On the other hand, there were advantages to both the librarian and the learner when they could build off earlier consultations together, such as knowing what had been covered previously. Conversely, this librarian participant also noted the advantages of using a centralized booking system, which helped avoid prolonged delays in meeting the student if the librarian from an initial consultation was busy or away.

When the librarian and learner have previously met, either in a prior consultation or a group instruction session, the session can begin with a shared understanding of the background, such as the learner's research context, the topic of the project, and the intent of the research. Repeat meetings gave more opportunities for the learner to ensure comprehension of the key concepts, report on feedback from meetings with a supervisor or other team members, and scaffold their knowledge and skills with each successive consultation. Similarly, the librarian had the chance to check in on the learner's progress, provide feedback on search strategy drafts, add in reference to evidence synthesis methods documentation, such as PRISMA (Page et al., 2021) or PRISMA-S (Rethlefsen et al., 2021), and reinforce the conceptual linkages between the searching step of the evidence synthesis process and other stages, such as the research question formulation, screening based on inclusion and exclusion criteria, and the reporting of the review. Throughout my study librarians referenced methods texts and standards, demonstrating the interconnectedness of the steps of the review process. Although a librarian may have been assisting with the search development, they also drew on documents covering other aspects of the methods. Further findings have been reported in the next chapter regarding the entangled nature of the steps of the review process and the librarian's role in teaching methods beyond information retrieval.

If the initial meeting was restricted to conceptual instruction regarding the review question, the nature of systematic searching, and preliminary collection of search terms, in a subsequent meeting the librarian covered the searching skills to build the search for one or more topics in a single database and review the next steps of exporting citations and using of citation or review

management software. The librarian also pointed the learner to resources to help them understand how to translate the search from the first search interface into a database on a different platform. Given sufficient time, and if the learner had the capacity, the librarian demonstrated some steps of the conversion process as Participant 01 did during one observed research consultation when starting with MEDLINE through Ovid and moving to searching CINAHL through EbscoHost. For instance, the librarian directed the learner how to find the thesaurus of index terms in the new search interface, showing the CINAHL Heading term that corresponded with the MeSH term used in MEDLINE, and illustrated how the hierarchy of terms appeared in CINAHL and how the searcher could include the narrower terms, if applicable. To demonstrate the impact of "exploding" the index term to retrieve citations indexed with the more specific terms, the librarian showed the number of results, and reviewed the relevancy of the citations, both with and without the box selected to turn on the explode feature. The librarian also provided an example of the search syntax for searching across the title and abstract of the citations and described possible justifications for modifying the fields that were searched in a different interface (e.g. searching title and abstract only in CINAHL as opposed to title, abstract, and keyword fields in MEDLINE). In addition, the librarian illustrated testing the impact of modifications to the search, either to expand or focus the approach. This was often done by testing the retrieval of known "seed" papers that would meet the inclusion criteria, or by contrasting the retrieval of a broader set against a more precision set using the operator "NOT" to present the unique articles brought in by the more sensitive terms tested. The librarian explicitly pointed out that the search approach should be justified through testing the impact of changes and decisions, such as using a closer adjacency operator or a more precise search, should be documented (P01, Observation 2).

In cases where there was not enough time for the librarian to provide a demonstration across multiple search interfaces and as a reference for what has been shown during the meeting, if applicable, the learner was frequently directed to a combination of learning resources, such as: video tutorials, a page of an evidence synthesis library guide (either at the same institution or an external), or handouts linked from the guide or sent via email showing the search syntax across the commonly used search interfaces at the institution (for example, https://dal.ca.libguides.com/systematicreviews/searchstrategies#s-lib-ctab-16412193-3). If the student attended a workshop that covered the process of searching across multiple databases and

interfaces, they would be referred back to the recording posted to the library evidence synthesis guide and the handouts used in the group instruction session. Likewise, the librarian would remind the student that PRISMA-S, the guidelines for reporting search approaches and results, requires that the database and the interface be documented and reported in the final manuscript (Rethlefsen et al., 2021). In other words, through scaffolded steps, the librarian walked the student through the processes and decisions necessary to perform the systematic search.

6.3.3 Beyond the Consultation

Referring out to other digital learning objects and methodological guidance, such as the workshop material or PRISMA-S checklist, happened throughout the evidence synthesis methods consultation and extended the librarian's instructional impact beyond the time spent together. As with the library guides described in Chapter 5, librarians created, used, and repurposed video recordings and worksheets from workshops, instructional tip sheets and methods handbooks and articles linked on library evidence synthesis guides, and material from published reviews, protocols, and methodological articles. This repurposing required librarians to maintain, at minimum, a current awareness of what digital learning objects and methods resources could be found, when they are appropriate to reference, and how they could be accessed. Librarians needed to know whether the appropriate resources were stored in their own personal files, linked from their own or another institutional library guide, another website, or must be searched from within a bibliographic database or library catalogue.

In addition to using and referencing methods documents and other learning resources during the consultation, librarians concluded the 30 to 60-minute research consultation with directions for next steps, frequently by pointing the learner to the corresponding methodological documentation and additional tools to support their work. For example, when offering to review a draft of the search strategy, the librarian told the learner how they could capture their search drafts and final strategies from the database into a format that could be reviewed for feedback. For example, I have included on the Dalhousie Knowledge Synthesis Guide tips for saving search strategies as outputs from various search interfaces in formats that can be transferred to a Word document. However, during a research consultation observation, another librarian suggested the learner could email screenshots of their search in the database for the librarian to

review and confirm comprehension and application of what they had gone over in the consultation (P05 Observation 2).

My preference to avoid sending screenshots of searches has stemmed from the added labour required to test the search approach when terms or lines used in the search cannot be copied and pasted, and the fact that screenshots are not recommended for documentation in published reviews. On the other hand, I recognized that additional effort and instruction was needed to teach learners how to otherwise save their searches. When instructing the learner how to capture the search strategy directly from the search interface for feedback, the librarian also provided the learner with the tools to accurately generate a search history that could be included in the appendix of the final review, thus meeting the required reporting standards for transparent and comprehensive searches (Rethlefsen et al., 2021). During another observation, the librarian created an Ovid account within the database on behalf of the learner to save the search from the librarian's computer that they had worked on together during the consultation (P07 observation).

Finally, the librarian wrapped up the evidence synthesis methods consultation by informing the learner of how they could follow up for further assistance.

> I want a gift bag at the end for my researcher. I want them to have a search they can come back to or I want them to have a plan. And that, you know, where are they going to go next? What are they going to look at next? What is the next step? So that's […] an important part for me. (P01 Interview)

That continued support took place variously through booking in again using the online scheduling system, emailing the librarian directly with a request to meet again or with specific questions, or dropping in to the library's in-person or virtual reference support service (P01 Observation 1). In contrast to traditional reference consultations supporting other types of information needs, evidence synthesis methods consultations have frequently been part of ongoing engagements with the learner. As one participant noted, they would meet several times with a learner, covering one or a few parts of the advanced searching skills and knowledge at each encounter.

> So it's a lot of – I want to say short meetings, but it's more like 45 minutes with me – talk with me, go away and do something, then come back, and we'll talk about it. And I'll give you the next step. So I do a fair bit of that. And it's been really, really effective … in that you really can't cover everything in one meeting, it's never going to work. And it gives them a chance to process and think and engage with material. (P06 Interview)

This ongoing relationship with learners working with evidence synthesis methods, especially for their first review, was a common characteristic across the data collected for this study, showing the long-term mentoring in which librarians engaged. Participants clearly communicated that learners were presented with multiple means of virtual contact and follow up with librarians as they worked through the systematic search methods. This extension of the relationship and support beyond the initial consultation meeting reflected the significance of care and the recognition of the importance of the connection between learner and librarian. Interviews and observations, as well as my own teaching practices, emphasized that the learner left the research consultation with a clear plan of action and understanding of the next steps in the searching and review process. The librarians also stressed their availability for follow up through a range of modes of communication, which were frequently virtual and selected for accessibility and convenience.

6.4 Discussion

This composite account of the processes and practices of academic health librarians engaged in research consultation instruction with learners depicted the myriads of elements that co-constituted the encounter. With this description and in keeping with sociomaterial research approaches, I focussed on intra-actions between the materials used and technologies mediating the teaching consultation, thereby pulling the attention away from the individual experiences and perspectives of the librarians or learners. This approach has helped me consider the ways that the assemblages of human knowledge and skills came together with and through non-human mediators in the online research consultation (MacLeod & Ajjawi, 2020). It also added depth to the existing evaluation literature regarding both academic library research consultations generally (Stapleton et al., 2020) and virtually (Maddox & Stanfield, 2019), while contributing

an empirical base to the current conversation around online research consultations (Hanneke, 2022).

These findings supported what others have discussed in the context of librarianship and library instruction: consideration for, and care of, the learner's experience of the instruction and the technology adds significant burden to librarian work (Allison-Cassin, 2020; McLay Paterson & Eva, 2022b; K. P. Nicholson, 2022). I have illustrated the many ways that the technical skills and methodological knowledge of the librarian were mediated by the teaching approach, technological interface, and learner expectations. As Gray (2022) has described in the context of university work and the switch to digital teaching and research, the invisible affective labour of ensuring the experience of learning in the online environment has been significant and significantly gendered, much as librarian labour has been, in general.

Ross-White (2021) has argued that the contributions of information specialists in evidence synthesis research has frequently been taken for granted and these findings have extended that claim to the labour of academic librarians involved in teaching learners to search systematically. Similar to the emotional work described by Ross-White regarding navigating research team dynamics, I observed affective labour in gauging learners' often unstated objectives and determining their cognitive capacity for the conceptual and technical skills involved in systematic searching and evidence synthesis methods overall.

Furthermore, as was demonstrated by the methodological content of the research consultations, academic librarians strove to ensure learners could achieve a degree of searching and reporting rigour approaching that of an expert searcher, all in the span of a few hours of instruction. This involved drawing on extensive and often unrecognized labour to create, collect, and communicate asynchronous digital learning objects related to systematic searching and evidence synthesis methods as noted in Chapter 5 regarding library evidence synthesis guides. Similar to the manifesto set out by Huet and colleagues regarding the work of librarians working in digital humanities, academic health librarians supporting learners on evidence synthesis projects have lived in the hyphenated world of being a search expert, review technology mediator, teacher, and evidence synthesis methodologist (2019). This hyphenation of identity and roles has been explored further in the next chapter.

While the descriptions and evaluations of evidence synthesis methods workshops and courses reflected the pedagogical challenges of teaching this type of content (Hayden & Premji, 2022; Parker et al., 2018; Poole, 2021; Premji et al., 2021), in this chapter I have unpacked the complexities of delivering individualized instruction in an online environment and of conveying the highly conceptual and advanced technical processes of systematic searching. The literature on library research consultations has reflected the ongoing demand for the personalized, task-specific learning that occurs during individual instruction (Fournier & Sikora, 2015; Hanneke, 2022; Stapleton et al., 2020). Yet librarians have grappled with issues of burnout and competing priorities that have impacted the time and energy they could commit to supporting evidence synthesis methods in the face of increasing demand (Demetres et al., 2020; McKeown & Ross-White, 2019). A key step to understanding what has contributed to burnout has been unpacking the types of effort involved in supporting evidence synthesis research. As Clarke and colleagues (2022) observed, the trend to put value on library services, in general, has assessed library workers' contributions in terms of quantitative outputs, either of the library or the research institution, rendered much of the labour invisible. By conflating a range of types of labour into the single human resources expense category and only reporting counts of transactions, library workers and management have gained little insight into the quality of the effort required to provide services or to develop the practices enacted in library service delivery. Likewise, control over the conditions of work can impact feelings of burnout. Yet the selection and configuration of the booking system, videoconference platform, and even library databases, have mainly been determined at the university or library level, even though each has significant impacted how librarians and learners engaged, both with each other and with the training content.

6.5 Implications for Practice

Observing other academic health librarians provide evidence synthesis methods instruction throughout this study has fundamentally altered the ways I think about and conduct research consultations with learners. By attuning to the less obviously significant, seemingly banal elements of online instructional practices (Fenwick, 2014), I find I have been more mindful of the choices I made at each step of the encounter and the ways that non-human actors, such as Teams meeting software, the database search interface, and evidence synthesis standards and methods guidance, have impacted decisions and actions, in both positive and challenging ways.

This, in turn, has offered me the opportunity to consciously select practices among these assemblages, being more aware of possible effects on the learner and their navigation of new skills and knowledge.

In a *becoming* process of researching teaching practices in which I have also participated (Barad, 2003; Hultin, 2019), I have become more aware of the invisible parts of the labour that have gone into providing evidence methods instruction online. Similarly, I have noted the material disruptions that have impacted those efforts. Considering the entanglement of social, methodological, technological, and pedagogical choices has fundamentally altered my practices.

For example, I have been challenged in my default inclination to share my screen to demonstrate the search process in bibliographic database, based on the observation that librarians can more readily assess the comprehension of the learner if the latter actively constructed the searches and sharing their screen. However, when using Teams to mediate the individual research consultations with medical and other health students working on Mac computers or joining Teams as a guest, I have encountered technological barriers that make it challenging for the learner to share their screen. Sometimes the learner had been successful in adjusting their settings on the fly, logging out of Teams, and then rejoining the meeting to be able to share their screen or window, but in other instances, we had not been able to resolve the issue quickly. Therefore, while I would prefer to direct the searching while watching that they can navigate the interface and apply the instructions, technical limitations have sometimes disrupted that intention. Combined with a desire to avoid frustration and loss of time, the compatibility challenges between the videoconferencing software, the respective computers, and the users resulted in reverting to sharing my screen and providing the demonstration, while encouraging the learner to replicate the process in real time. This left me blind to whether they were actually able to reproduce the search we discussed, so I have shared search strings in the chat with the learner to ensure they could move forward and build on our collaborative efforts from the consultation meeting. The option to immediately share the interim or draft searches as outputs of the research consultation also reflected a novel development compared to working on disconnected screens during in-person consultations. In the latter scenario, the collaborative output of the search would need to be sent separately via email rather than intrinsic to the meeting. On the other hand, I have discovered that students joining virtual research consultations

on Teams as “guests” (for example, when using a health system email or on a mobile device), have not been able to later access the chat record. Therefore, I developed a practice of reminding the student to copy the relevant information from the chat to their project records prior to leaving the meeting. Each of these choices has had implications on the labour involved for both parties as well as potential impacts on learning and research outcomes. Changing my teaching practices because of this research has led me to ask each learner whether they preferred to watch a search demonstration or be guided through the search process. Offering an explicit choice to the student has allowed them agency in a different way, as I discovered from one learner who told me that performance anxiety when navigating a new search interface impaired their ability to learn.

This research has highlighted aspects of the invisible labour that academic health librarians contributed when supporting learners to apply rigorous methods in evidence synthesis projects via online, personalized instructional sessions. Thus, much as Lihosit suggested for law librarians in the context of legal research skills, I have simultaneously accounted for and unpacked the black box of teaching students evidence synthesis methods to make this work more visible (2014). Highlighting the complexity of these teaching practices has helped to understand the burnout reported regarding evidence synthesis support in health libraries (Demetres et al., 2020) and has aligned with the descriptions of invisible and unpaid work done in other areas of digital humanities and academic librarianship (Clarke et al., 2022; Logsdon et al., 2017). Academic libraries can minimize these inherent challenges by adopting and leveraging review software, responding to instruction librarian concerns regarding technical barriers presented by teaching and communication software options, and supporting professional development in both online pedagogy and evidence synthesis methods. Furthermore, experiencing the benefits of reflecting on my own and others’ teaching practices has emphasized the importance of having a reflexive community of practice at the intersection of teaching and evidence synthesis methods.

6.6 Chapter Summary

This account has shown how the levels of technological and pedagogical complexity in the online evidence synthesis research consultation interacted with the content expertise shared by the librarian in ways that have not been entirely within the librarian’s control. When librarians or learners, respectively, shared or discovered the booking link, met through a videoconference

platform, demonstrated or observed search techniques in various online databases, and recommended or followed searching and documenting practices, they interacted with dozens of material (e.g., technological and textual) actors while affecting and responding to numerous social constructs. The configurations of institutional systems and settings for educational, communication, and research technologies co-constituted assemblages with librarian expertise and teaching practices in ways that sometimes reduced and sometimes increased the labour required of librarians.

With this chapter, I have added to our knowledge concerning how, in the context of evidence synthesis methods, academic librarians contributed invisible labour through instructional practices and navigating organizational systems. I introduced the concept of the sometimes-competing identities of expert searcher and teacher which will be explored further in the next chapter. Librarians who delivered this type of teaching provided labour in the form of content expertise for the search and overall review methods, including staying aware of externally-produced educational resources and methodological guidance, while simultaneously remaining attuned to accommodating the learner's specific needs and adjusting practices in response to any limitations or disruptions from the teaching and review technologies. By walking the reader through the processes and introducing the social, technical, and material actors involved when librarians met virtually with learners in personalized research consultations, I have highlighted the complex dynamics and inter-relationships between the various influencing factors.

CHAPTER 7 WHY ARE WE DOING WHAT WE DO? PURPOSE AND IDENTITY IN REMOTE TEACHING FOR EVIDENCE SYNTHESIS METHODS

7.1 Chapter Overview

This chapter explores the importance of context to the sociomaterially-mediated and online teaching practices of librarians working with students on evidence synthesis projects. Specifically, the findings in this chapter have addressed the third research question: How do the social and material elements, in the context of academic health librarians teaching of evidence synthesis methods online, interact with each other through the teaching practices to produce these labours?

I will build on the findings reported in the previous chapters to show how disruptions to the performance of online teaching practices about evidence synthesis methods online have helped to illustrate the mutual *becoming* of librarians and learners. In this chapter, I focused on the breakdowns in the assemblages that occur during teaching and, through those disruptions, unpacking the explicit and tacit purposes of the instructional encounters and examining the sometimes-conflicting roles and identities of the librarian.

When librarians taught systematic searching and related methods to students, conflicts and tensions emerged in the relational roles of the various actors in the practice assemblage. For example, librarians have spent years of training, with considerable focus and effort, to develop expertise for comprehensive and systematic information retrieval. In the context of evidence synthesis research this expertise has been shown to increase the quality of conduct and reporting of the search and overall methods (Brunskill & Hanneke, 2023; Koffel, 2015; Meert et al., 2016; Rethlefsen et al., 2015). And yet, the objectives of a workshop, guest lecture, or research consultation taking place over a few hours or less have included helping learners to search comprehensively and systematically to independently complete evidence synthesis projects. This tension between the roles of the librarian as expert searcher and as teacher has added complexity to the process of determining what and how to teach to the novice researcher. The setting of instruction has compounded those tensions, as the online environment removed the teaching practices conceptually and physically from the physical space in which library instruction and research services have been traditionally situated.

The positive impacts of librarian involvement on search strategy comprehensiveness, number of sources searched, documentation of the search, and overall reporting in evidence synthesis research

have been well supported in the literature (Aamodt et al., 2019; Pawliuk et al., 2023; Ross-White, 2016). Similarly, academic librarians' development and performance of their identity as teachers has been thoroughly discussed and investigated (Cadogan et al., 2023; Drabinski, 2016; Hays & Studebaker, 2019; Nichols Hess, 2020; Sandy et al., 2023; Walter, 2008). Librarians have published details of the approaches used to teach evidence synthesis methods, including in online settings, along with examples of the implicated materials and technologies (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). However, although Hanneke (2018) has discussed these tensions, there has been little empirical evidence about how librarians have reconciled their competing roles as methodological experts on searching and teachers of the evidence synthesis research methods.

In this chapter, I aimed to address this gap by looking at how librarians performed to the expectations of expert searcher and teacher simultaneously in online evidence synthesis teaching sessions. By drawing out tensions and disruptions, I showed the relational agency of the contextual factors and the teaching practices. This demonstration has helped in understanding the constraints on the teaching librarian while also making visible the decisions and choices that may otherwise have been invisible or taken for granted.

7.2 Revisiting Sociomaterial Principles Regarding Context and Identity

In the nature of sociomaterial studies of practices, focusing on instances of disruption has helped to open the black box of what has been done during online teaching encounters (Nicolini, 2009). This heuristic revealed the various purposes of the teaching encounters in different contexts and the ways that sociomaterial practices contribute to the performativity of identity in relation to literature searching, teaching, and the library setting. As in the previous chapters, this heuristic fits with those described by Adams and Thompson and helped to orient analysis towards the agency of the material actors and immaterial practices observed in the research data (C. Adams & Thompson, 2011).

By using *agential cuts* (Barad, 2003; Haider & Sundin, 2023), which served to delineate moments of stability for analysis, and "studying breakdowns and accidents" (C. Adams & Thompson, 2011, p. 743). I used tools borrowed from ANT to "untangle tensions" (C. Adams & Thompson, 2011, p. 744). In other words, to address the third research question, I looked for both instances of stability (i.e., similar phenomena occurring across variable contexts) and disruptions, for example, when technology did not work as intended or the expectations of various actors did not align, to follow how conflicts of identity and purpose have been enacted in the teaching practices.

In doing so, I traced how the assemblages of teaching evidence synthesis methods online contributed to the *becoming* of librarian identity in the context of both instruction and research methods (Hultin, 2019; Mulcahy, 2011). Interpreting teaching practices through performativity has served to make visible the ways that academic health librarians enacted and responded to the various mediating actors and assemblages. I attended to materiality and immaterial practices to find accounts of disruptions to performance and tensions within identity across the data collected from participants through the focus groups, observations, and interviews.

7.3 Accounts of Disruptions, Tensions, and Stability Through Sociomaterial Practices and Performances

7.3.1 Tensions in Accounts of Purpose

The important role of information specialists in evidence synthesis has been well-established, particularly in the context of developing and documenting comprehensive searches to retrieve all eligible studies that address the research question (for example: Brunskill & Hanneke, 2023; Ibragimova & Fulbright, 2024; Logan, 2023; Pawliuk et al., 2023). However, even the standards and guidance recommendations for conducting reviews have not been clear about whether a librarian should be a full member of the research team or consulted regarding the search strategies (Higgins et al., 2019; Institute of Medicine, 2011). While the Institute of Medicine (2011) guidance has mentioned that information specialists should be included in the team composition and have the related standard: "2.1.3 Include expertise in searching for relevant evidence" (p. 53), the text is not explicit about who should develop and run electronic database searches. The section of the standards on searching is slightly more explicit and referenced a seminal paper (J. McGowan & Sampson, 2005) calling for the involvement of expert searchers.

> A librarian or other qualified information specialist with training or experience in conducting SRs should work with the SR team to design the search strategy to ensure appropriate translation of the research question into search concepts, correct choice of Boolean operators and line numbers, appropriate translation of the search strategy for each database, relevant subject headings, and appropriate application and spelling of terms. (Institute of Medicine, 2011, p. 86)

Nonetheless, the directive for the team to "work with" a librarian suggested the expert searcher may serve in a consultative capacity rather than integral to the team, though subsequent research has shown improved conduct and reporting when librarians were co-authors (Aamodt et al., 2019; Brunskill & Hanneke, 2023; Pawliuk et al., 2023; Rethlefsen et al., 2015).

When supporting learners, especially graduate and doctoral students or medical residents who might be considered early career researchers in their own rights, the consultive role of the librarian can be even less distinct. While graduate and postgraduate, and less frequently undergraduate, learners have produced publications and other scholarly outputs, that research may be completed as student projects done for the purpose of learning and academic credit towards a degree or course grade. Therefore, when meeting with a student about supporting a particular project, the librarian has needed to clarify the expectations and set boundaries (Hanneke, 2018). I observed this being explicitly discussed in one research consultation after the doctoral student commented on the relationship of the current review to their dissertation, where some of the included studies may be referenced, but the review project itself would not be part of their doctoral research. The librarian acknowledged there has sometimes been a lack of clarity regarding the librarian's role for PhD students' review projects, but that in that instance, since the student wanted to learn through doing the searches, the librarian would act as a guide (P07 Observation).

With that disclaimer and the student's expressed desire to learn how to search systematically, the librarian in this consultation went on to outline the plan for the meeting: going over the selection of databases to search, providing feedback on the draft protocol the student had previously shared, and developing a search in MEDLINE through Ovid. The librarian then identified ways that the learner could use parts of a search strategy that the librarian had previously developed for another project with the student's supervisor. Thus, while the learner would be refining and running the searches, the work was expedited by retrieving a file with a search (i.e., textual material) the librarian had previously created on a related topic. Although the librarian went on to guide the student through further customizing the search, providing the search from a previous project with the student's supervisor provided a launching point and established evidence of the existing relationship between the librarian and supervising faculty member. This was an example of balancing the opportunities for the student to learn through doing and the librarian's additional implicit objectives: to save time and effort while adding rigour in the search strategies through use of existing search resources. The role of the existing search strategy as a digital text (material) has been entangled with the purpose of the consultation, as it

both partially replaced some of the work the learner needed to do and served as an example and learning tool. Simultaneously, the librarian's search strategy had the agency to impact the methodological rigour by building from the librarian's expertise and prior labour in collaboration with the faculty member. This example demonstrated a relatively stable assemblage of purpose by showing what the learner and librarian intended to accomplish through the research consultation. The practices (how the learner and librarian intra-acted with each other and the relevant materials through doings, sayings, and actions) were also shown. For instance, the librarian's role as an expert searcher collaborating with the supervisor intra-acted with their role as a teacher with the student. This co-constitution showed how activities completed in their role as the expert searcher (i.e., developing a search strategy on a related topic) impacted and were impacted by the use of the search strategy during the teaching session.

On the other hand, there were other examples during observations when the understanding of the purpose, practice, and roles in the research consultation were shown to be less stable through the conversation between the learner and the librarian. In my own work with students, I have noticed that the distinction between research consultations concerning evidence synthesis projects and those meetings where library support has been sought for other types of projects has not always been clear. This lack of distinction was observed when searching skills have been applied to a variety of learner projects: systematic reviews, scoping reviews, rapid reviews, as well as general literature reviews that are part of a student's assignment, thesis, or dissertation. In my doctoral study, through the study information and consent letters provided to both the librarian participants and to learners (see Appendix C), librarian participants were specifically requested to identify research consultations that involved an evidence synthesis project for observation. Nonetheless, two of the eight observations pertained to search strategy development for students' literature review assignments or theses. In my own practice, I have observed that students will request support for an evidence synthesis project, as indicated through the type of booking system described in the previous chapter, but upon meeting, I have determined that the literature review in question would be part of another project rather than a stand-alone study. These scenarios were essentially the opposite from the one described above: in these cases, the students requested support for systematic searching, but the outputs of the searches would be only used to identify papers for a literature review or other assignment. During examples of these situations in my study, upon assessing the purpose of the support sought, I observed that librarians proceeded directly to guiding the learner through the process of determining search concepts, search terms, and identifying appropriate sources to search. The immediate focus on the

search strategy development in these cases was contrasted with establishment of a methodological baseline that characterized the other consultations, as described in Chapter 6.

In one of the observed consultations for a thesis literature review, there continued to be ambiguity regarding the purpose for the student, who had conflicting understandings of the literature review instructions for the assignment and from their supervisor. In this case, the student had follow-up questions about methodological and reporting guidance for a traditional literature review, given the initial searches conducted during the consultation yielded few, if any, relevant results to address their research question. After directing the learner to a section of the library website with tips on organizing and writing literature reviews, the librarian acknowledged that more subjective judgement was needed for those types of literature reviews compared to evidence syntheses following methodological guidance. The librarian reassured the student that other people also struggled more with the decisions about when enough literature has been reviewed for traditional literature reviews compared to systematic reviews. The clear methods and boundaries of systematic reviews can take out the guess work and set expectations for reporting that can be lacking in a literature review (P05 Observation 1). Resistance to a standard literature review because of uncertainty regarding expectations was also mentioned in an interview with another librarian who recounted meeting several times with a student. Although the librarian encouraged the student that using a less formal approach to review the literature would be more appropriate for the topic and purpose, the student was persisting with the systematic review approach for a very broad topic.

> In the end, after four hours [… the student said]: “I don't know how to do a literature review, whereas a scoping review or systematic review has a methodology.” (P02 Interview)

These scenarios illustrated that though these students were unlikely to end up doing evidence synthesis projects following specific methodological standards, their learning and the research consultation were nonetheless disrupted (and thereby made visible) by the uncertainty around appropriate methods for identifying, organizing, and reporting the literature in their reviews. Furthermore, in the observation with Participant 05, the student asked several questions related to the expectations of the program, for example, about the required length of the paper and format of the literature review assignment. While the librarian redirected the learner to their supervisor and program coordinator, these questions suggested that the learner may not have been clear about the role of the librarian in relation to the academic assignments and the organizational structure of their academic program. The questions asked during the research consultation suggested the student had misconceptions about the purpose of the

library research consultation. Indeed, the research consultation concluded with the librarian responding to the student asking about the types of questions or problems that would serve as triggers to contact the librarian or library. The librarian's response indicated that the library could best assist regarding searching and identifying relevant literature, and that frustration on the student's part (with database searching or identifying keywords to retrieve relevant literature) served as triggers to seek help (P05 Observation 1). The librarian reactions to students' confusion regarding appropriate methods and the role of librarian guidance in the context of literature reviews demonstrated both methodological expertise and the constant assessment and recalibration of teaching practices based on students' needs.

Likewise, librarians were not always clear cut with the purpose and scope of their group teaching sessions regarding evidence synthesis methods. Though more explicitly focused on evidence synthesis research than the last example, librarians' teaching groups of students sometimes had learning objectives mainly related to comprehensive and systematic searching, with occasional reference to the other methodological steps. In other cases, librarians referred to teaching that did not cover the logistics of searching in any detail at all and restricted the scope of the seminar or workshop to differentiating types of reviews and the overall process of evidence syntheses. For example, in text added to the FG2 Padlet discussion board, one librarian reflected on the workshop material prompts and commented on the potential confusion regarding the purpose and coverage of the workshop.

> I like how the searching component is put into context but wondered if it was clear that the searching was the only part that was being covered. Sometimes people don't seem to understand that librarians don't necessarily teach all the stages. (FG2 Discussion Board)

On the other hand, another librarian in the first focus group reported very different content in the online workshop taught at their institution.

> But our systematic review class that we teach doesn't do any searching. So, this is very, very different from what we do. But an advanced searching class is one of the things that at some point - when we all have time, ha! - are hoping to develop. (P04 FG1)

The librarian from FG1 continued their statement above by pointing out aspects of the prompting workshop material they felt would be useful to emphasize the conceptual understanding about developing systematic search strategies. "But there's some slides in here like slide 15, I think I would love to adapt for our searching class. But as far as what we're currently teaching, this is very, very

different" (P04 Focus Group 1). The slide referenced included a figure to represent considerations regarding various terms to describe a search concept when developing a systematic search strategy as shown below in Figure 7.1.

Figure 7.1 Slide 15 from University of Kings College London workshop material

Note: Workshop material from "LIBR261 Search Techniques for Systematic Reviews" CC BY -NC-SA. Accessed March 11, 2021 (Libraries and Collections King's College London, 2024).

This slide presented the process of building a comprehensive search strategy from a conceptual perspective, depicting the elements that the searcher considers, but not the technical process of *doing* the search. In contrast, in a tutorial made around the time that I was conducting interviews in May 2022, I recorded and narrated the process of building an initial search for an evidence synthesis project. Figure 7.2 shows a screenshot of the video with a partially constructed search strategy in MEDLINE through Ovid, along with the closed captioning of the audio where I described my thinking as I came up with alternate search terms and phrases and explained how to effectively capture variations using adjacency operators (R. Parker, personal communication, 26 February, 2024). This

teaching process mirrored the “Interview to the Double” technique that has been used in sociomaterial research data collection to encourage the research participant to vocalize the minute decisions and actions in their everyday practices (Fenwick & Nimmo, 2015; Lloyd, 2014; Nicolini, 2009). While this has been used as a research strategy to illustrate procedures that have multiple complex technical and conceptual dimensions (Hill, 2017; Nicolini & Roe, 2014), my research has demonstrated that such minute descriptions of actions and decisions have also been used as a teaching strategy.

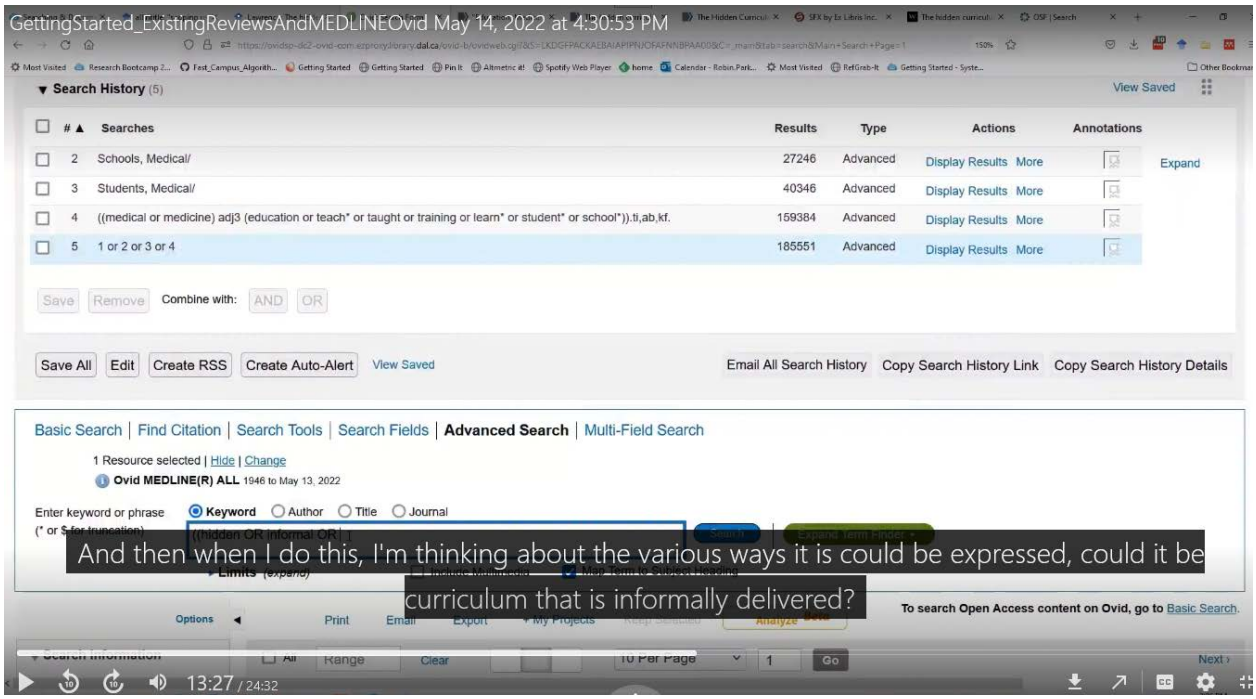


Figure 7.2 Screen capture of video tutorial showing MEDLINE (Ovid) search strategy and closed captioning of audio

Note: Closed captioning text: “And then when I do this, I’m thinking about the various ways it [hidden curriculum] could be expressed[;] could it be curriculum that is informally delivered?”

These two approaches of teaching the same part of the systematic search process illustrated different performative accounts of the knowledge and skills for developing search concepts into search strategies. The workshop slide showed a more conceptual approach, while the video tutorial captured the technical process of working in the citation database (MEDLINE) through a particular search interface (Ovid). This was a related illustration, at a more granular level, of the tensions seen in workshops teaching the searching step in detail and sessions teaching the overall process of evidence synthesis methods, as described in the previous example. Thus, by stepping back (to the level of the objectives and the spatial and temporal specifics of the workshops) and focusing in (on the practices used to communicate one part of the searching process), the tensions made visible in the teaching

practices have shown their intra-actions and connections through the sociomaterial teaching practices (Barad, 2003; Nicolini, 2009). That is not to say that a workshop more focused on the steps of searching was necessarily more technical or procedural, although that was sometimes the case. Rather, as Nicolini (2009) said: "By zooming out […] we can start building an appreciation of how local practices participate in larger configurations and how they enter as elements, ingredients, or resources in other activities" (p. 1409). Thus, the conceptual presentation of identifying alternate search terms was one of several strategies used to teach this topic in a workshop that focused on searching, but that also discussed how and why the systematic search was important to the other steps of the review process. As illustrated by the workshop outlines described in the literature in Chapter 2, librarians frequently aimed to balance these entangled conceptual, procedural, technical, and methodological objectives (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021). Indeed, in the asynchronous online module series I created for learners at Dalhousie between 2020 and 2022, the first two modules covered 1) the various types of evidence synthesis methods and 2) the common steps of conducting systematic and scoping reviews when using Covidence review management software. I did not develop a module on the advanced searching skills needed for comprehensive and systematic searching until 2022, although most of the online research consultations with students in those years focused on search strategy development and documentation. When seen through the lens of the tensions arising from balancing conceptual knowledge and technical skills, I can account for this discrepancy by understanding implicit assumptions that live demonstrations, or performances, in research consultations would provide more authentic, and therefore, more effective learning of the specialized skills for systematic searching.

Teaching about the use of existing search filters provided another opportunity for an agential cut to highlight commonalities and divergences in practice. These previously developed search strategies help to identify literature pertaining to a particular methodology (such as randomized controlled trials; see Glanville et al., 2020), population group (such as children; see Leclercq et al., 2013), or topic area (such as adverse events from medical devices; see Golder et al., 2019). They have often interchangeably been referred to as search filters or search hedges, although some have made distinctions between these terms (S. Campbell, 2016). Search filters may be validated (i.e., been tested for sensitivity and precision against an independent set of citations) or simply developed without an assessment of their performance. An example of a frequently used and validated study methods filter is the Cochrane Sensitive RCT filter (Higgins et al., 2019), which has been recommended for use in systematic reviews of intervention effectiveness. Search filters have the potential to expedite the

overall search development and have been used during teaching how to search systematically, either in workshop settings or in the context of research consultations regarding specific projects. For example, when a learner wanted to identify retrospective and prospective studies for a systematic review of an intervention, the librarian talked about *why* it was desirable to use a validated search filter to help retrieve randomized controlled trials, and conversely, why modifying such a search filter to identify other prospective and retrospective study designs came with risks, so caution was advised. In a consultation with a medical student regarding a systematic review with this type of study design criteria, Participant 05 described this challenge. They noted the variety of terms, like "follow up", "prospective", and "retrospective" could all be used to describe the desired study types, and all terms would need to be identified as both keywords and index terms to search in the database, just like other concepts of the search question (P05 Observation 2).

In this instance, use of one or more study-type filters would not decrease the technical or intellectual labour of developing the search strategy, as the validated search filters would not encompass all the study designs of interest for this project. To the contrary, adapting or developing a study design search filter required advanced comprehension regarding the potential impact of variations in the search terms and approach. The librarian in this observation succinctly described the advantages and disadvantages of adapting study design filters for purposes other than that for which the filter had been developed. They culminated in advising the student to avoid using the study design concept in the search and supported the student's suggestion to screen citations for eligible prospective and retrospective studies.

In contrast, the observation of a different librarian who was meeting with two doctoral students regarding the search for their systematic review protocol demonstrated a different approach to a similar problem. When pulling inspiration from available population-type search hedges to retrieve articles regarding a specific age range of children, this librarian referred the learners to several sources and walked them through how the available search filters could be modified, combined and adapted to fit their purpose. In the same scenario described in Chapter 5 regarding the reference to the University of Alberta pediatric/child search filter, the librarian also helped the students navigate to the Special Ovid Filters for MEDLINE function under the Limits option in the Ovid search interface. From there, the librarian directed the student who was sharing their screen to navigate to a URL listed for more information to see the terms assembled for the Ovid Child filter. As shown in Figure 7.3, they then modified the Special Ovid Filter for MEDLINE pertaining to Children by copying it into the search

box and deleting both the terms that were irrelevant to the desired age range of one to ten years old and the relevant index (MeSH) terms that they had already added to the search history.

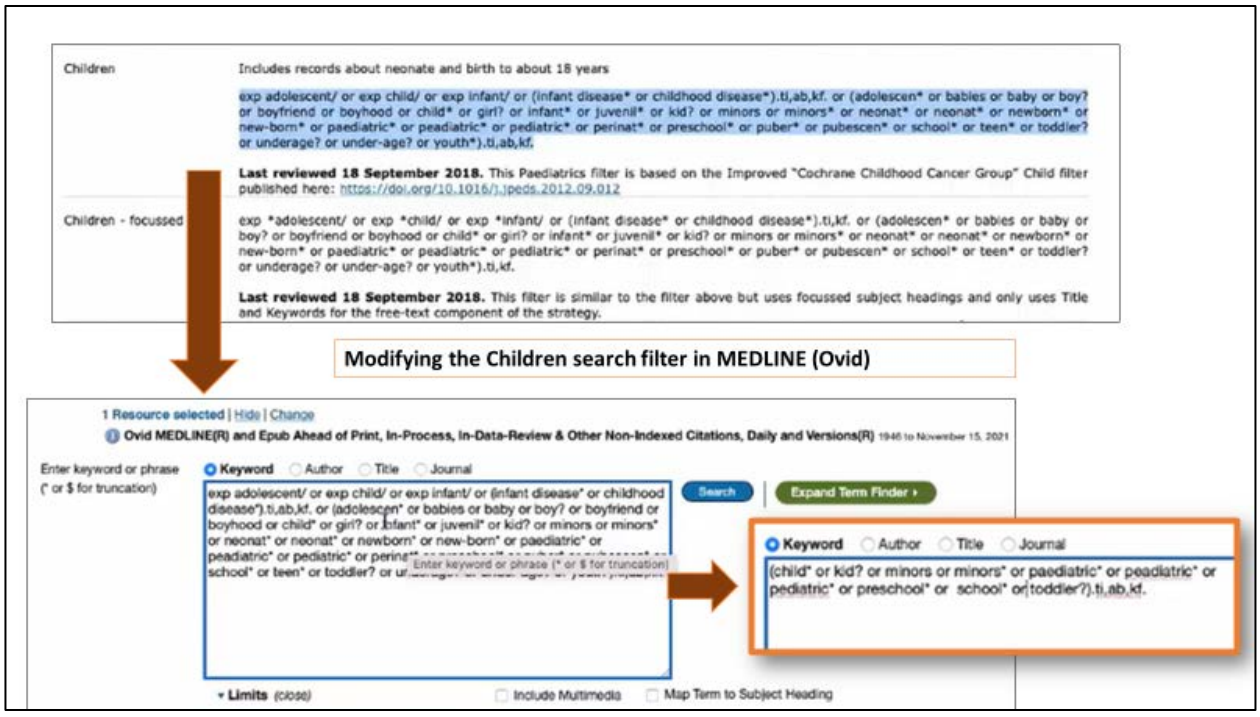


Figure 7.3 Details of the Special Ovid Filter for MEDLINE for Children and Children – focussed, retrieved from Ovid Help, with modifications in search conducted November 16, 2021.

Note: Link to Special Ovid Filter for MEDLINE:
https://ospguides.ovid.com/OSPguides/medline.htm#limits

Thus, like the examples from the workshop and tutorial regarding search term identification, librarians alternatively chose to take a more conceptual and descriptive approach to teaching about using and altering search filters or decided to walk the student through applying the principles in action. These choices were based on the co-constitution of the librarians' teaching style (stemming from their identity as a teacher – or not), the complexity of the methodological skill or concept (drawing on their expertise in their role as a methodologist), and how they performed their teaching practices in relation to the allowances of the educational and research technologies.

In some ways, the tension between the technical skills and conceptual knowledge related to systematic search and evidence synthesis methods were like the tensions between procedural skills and medical knowledge in clinical care. Rowell (2015) provided an example in the context of medicine: the skills and tools to suture a particular type of incision in such a way to minimize risk of infection and improve wound healing were only as important as the expertise behind the decision to use that

procedure to address a given health condition in the first place. Both types of knowledge and skills were entangled with the materiality of the body, tools, and technology of medical care (Rowell, 2015). Similarly, the ability to run title, abstract, and keyword searches, in combination with appropriately matched index terms, using the correct syntax and Boolean operators will only aid in the retrieval of relevant citations that can yield data to help answer a review question if that question has been suitably broken into searchable concepts with sufficient terms identified to capture the studies that addresses those concepts. Where sutures, needles, and flesh may be the pertinent materials to trace in the clinical example (Rowell, 2015), the software and database selected, keyboards and computer screens, and lists of terms from search filters, published reviews, indexes, and relevant studies have been some of the many material and digital actors involved in the search processes for evidence synthesis research.

In balancing the methodological standards of conducting reviews, which themselves have been constructed of social and organizational expectations based on scientific practices, and the abilities and expectations of the learner or learners on the other side of the screen, librarians have often been faced with the tensions between the procedural/technical and conceptual/methodological learning objectives. Librarians have integrated these objectives into a single research consultation or workshop, as already described, or referred to both types of objectives through scaffolded sessions. An example of the latter occurred with Participant 01 in a meeting with graduate students who had attended a library workshop or had been in a class taught by a librarian for a research course. The students arrived at the consultation with a prepared protocol, which was then reviewed with the librarian prior to starting to get into the logistics of the search development. This was one of two observed instances with PhD students where the librarians started the sessions by reviewing the protocol which the learners had previously drafted. In the observation of Participant 01, the learner shared their screen with the protocol displayed through the discussion, while in Participant 06's session, the librarian and learner were each independently viewing copies of the protocol. From a sociomaterial perspective, these two approaches had different implications for what was observed during the online research consultation and the difference may have impacted the interactions between the parties. One observation about the latter session was that the learner appeared to be more analog based, with a posture suggesting they were taking notes by writing on paper (out of view from the camera) and pulling out a printed copy of the PRISMA checklist when discussing reporting and conduct guidelines. Since they were not physically looking at the same screen, this librarian and learner depended more on other modes of communication to confirm understanding, such as more verbal confirmations. These differences in

how teaching practices were performed through the mediating technologies and materials depended on the actions of both the librarian and the learner(s) in a given consultation or teaching session.

The importance of documenting decisions regarding the search approach represented the intra-actions between the technicalities of conducting the search, on the one hand, and the concepts derived from methodological guidance, on the other. For example, librarian Participant 01 noted that an objective during a session was "answering the question of why are you making the [searching technique] choice?; and making it as transparent" as possible. They went on to reflect on the emphasis they placed during teaching practices.

> We're trying to make this process transparent […] eventually to the reader who will read the systematic review, so that it's transparent and reproducible. And so, one of the [things] I talk a lot about in my consults is the importance of documenting what you're doing. And even if it's never going to make it into a methods section, […] there's […] the affective or the emotional piece of feeling that competency and also just that you remember and that it's a big deal, I think. So, I will often speak of both the importance of journaling your choices and your questions, … (P01 Interview)

In referencing the need for understandable and reproducible search strategy documentation, the librarian showed how decisions regarding the searching practices were captured for future reference, whether for personal use or in a subsequent publication. Documentation of the thoughts and logic that go into a comprehensive and systematic search provided an example of Barad's agential cut: stabilizing immaterial actors in the practice for future reference and use in other contexts (Barad, 2003; Haider & Sundin, 2023). In the case of evidence syntheses, that documentation provided validity to the research methods while the search itself produced the material (citation records in digital files) that became the subject of study in the review. Therefore, having sufficient literacy and transparency regarding the searching decisions and implications became entangled with doing the review. In this way the documentation of the search process, through the PRISMA-S checklist (Rethlefson et al., 2021) or a search narrative (Bethel et al., 2021) made the local enactment of the search into a trans-local stabilization (Moura & Bispo, 2020; Nicolini, 2009; Patel et al., 2022). Standards, such as PRISMA-S, have aimed to make the conduct and reporting of systematic searches consistent and organized. Fenwick (2010) has similarly described the use of standards in education.

> The purpose of standard-setting practices could thus be described as an attempt to order practice at a distance. Standards aspire to ensure consistency and comparability in the everyday conduct that occurs at diverse locations in which a whole constellation of relations meet and weave together in particular ways to constitute practice. (Fenwick, 2010, p. 119)

While the standards Fenwick referenced related to educational practices and PRISMA guidelines are for (reporting) evidence synthesis research, using PRISMA standards in teaching systematic searching draws together methodological knowledge (how to *do* the systematic search) and attempts to standardize the expected outcomes of the teaching (how to *know* the systematic search was *done*).

Another example of the real-world complexity of decision making around searching occurred when a librarian commented in the first focus group about the need for "messy examples" in workshops. They felt that by illustrating decision making when it was not straight forward could aid in the understanding of the iterative nature of developing a search strategy.

> I do like how they actually go into examples and demonstrate it a little bit more, because sometimes I find that people teach it to cleanly where they're like, "these are your concepts." This is a simple, oversimplified way of how you could search it, but not actually show them what the search would look like line by line, and how you would build it up. […] I like to show people that […] it's like an iterative process and things aren't clean. […] I'll choose something where there's not a MeSH associated with it. So, then you look how to search [for] a MeSH term, and there's no word for it. How do I get around this? Or what do I need to do? And just show that iterative process, because I find that examples are sometimes way too clean and when people actually have to go and do it they're having troubles with it. So just how to navigate that is something I like to teach. (P02 FG1)

An account of this disruption to the searching process occurred in an observed research consultation where Participant 02 aimed to help three doctoral students to refine their research question and corresponding search approach on a very broad topic. The learners were assigned completing a type of rapid review over the span of a single term. In light of the compressed timeline, the librarian illustrated the challenge of reviewing a topic like *management of the opioid epidemic by various stakeholders/practitioners.* They showed how a broad search on the topic was conceptually challenging to design and conduct, since *management* was a vague term that had many synonyms or entailed many specific strategies. Similarly, including multiple health professional groups further

complicated the search development. The resulting large retrieval would not have been feasible to screen in a short timeframe. One way the librarian demonstrated these challenges was by looking at the search strategy used in a related review that looked at the role of a single type of practitioner. The librarian observed that the very broad search approach used in that publication resulted in over ten thousand records to screen. The librarian then proceeded to show the options of related MeSH terms and presented alternate ways to narrow the question and the search to be manageable for the learners' objectives. Thus, by highlighting the complexity of the processes by which one would arrive at a comprehensive and systematic search, the librarian also demonstrated the interconnected nature of the search and other steps of the review, such as defining the review question and the impact on overall feasibility. The librarian used a variety of materials and teaching practices related to the searching process to navigate and attempt to adjust the expectations of the review team in relation to the overall methods for their review project.

While learners came to librarians with ideas or questions about the search, the librarian frequently redirected the learning in response to gaps in understanding or mismatches between learner assumptions and methodologic expectations. For example, the learners did not always realize that the librarian could assist them to make choices regarding the technologies to use in the process of searching and managing the other steps of the review. In one observation with a medical student who was picking up a systematic review started previously by another student, the list of sources to search included PubMed. However, during their conversation, the librarian clarified why searching MEDLINE through the Ovid search interface would be a better option than using PubMed due to improved feasibility for a novice reviewer to create a more robust search. They went on to explain why MEDLINE (Ovid) would suffice without additionally searching PubMed. Because the PubMed and Ovid are search interfaces that draw from the same underlying database (MEDLINE), the coverage would be the same, but the student could have more control over how the search functions through Ovid. The librarian compared the automated term mapping that took place with default searches in PubMed to the hidden algorithms of searching through Google, thereby decreasing the control and transparency of the search (P05 Observation 2).

By invoking the black box of the Google search algorithm (Orlikowski, 2007), the librarian pointed out the need for both control and transparency in the search and other aspects of the methods for evidence syntheses. Likewise, by highlighting the amount of skill and understanding required to apply that type of control to the search in PubMed, the librarian acknowledged the constraints on student

learning. With limited time and energy available to a student working on an evidence synthesis project as part of, or in addition to, a full academic workload, the extra cognitive demand of learning the technicalities of another search interface may be unrealistic.

While the librarians may have recognized that learners were acquiring many new skills related to searching and evidence synthesis methods, learners also were responding to the expectations set by supervisors, faculty, and course or program curricula. These expectations could include conflicting demands to complete the entire comprehensive review in a relatively short amount of time, from a few weeks to a term or two. The earlier example of three PhD candidates completing a rapid review over the duration of a single course, with another research method to follow, demonstrated how the expectations of learners and supervisors did not always align with the methodological rigour of standards for conducting evidence syntheses. Similarly, librarians and other review methodologists recognized that comprehensive knowledge syntheses require a diverse team (Institute of Medicine, 2011) and usually over a year of work (Bullers et al., 2018). However, the students faced pressure to complete their projects in the scope of one course, including learning all of the skills and knowledge that would normally be contributed by multiple different individuals on the review team (Choi et al., 2019).

These expectations that learners will become researchers through their work on evidence synthesis projects have implications for the role of the librarian as both teacher of research methods and as a methodologist with expertise in searching. In the next section I have provided additional examples of when performing these roles simultaneously can lead to tensions in the sociomaterial teaching practices.

7.3.2 Disruptions to Identity in Performativity Accounts

The contexts in which librarians teach online may be through either or both library services models (e.g. reference and information services, instructional service teams, evidence synthesis support service) and subject liaison responsibilities (such as embedded librarian, guest lectures, and individual research consultations). The range of contexts has been demonstrated by the results of surveys of academic health sciences libraries that showed the impact of shifting reference services and research support to online delivery during the COVID-19 pandemic (Charbonneau & Vardell, 2022a, 2022b). The various library service and organizational contexts, along with online environment itself, have potential agential influences on the librarian's sense of self as a teacher, service provider, and expert

searcher due to expectations of librarians to perform their work responsibilities, including online teaching for evidence synthesis support. A few studies have explored context and professional identity formation for librarians (D. Hicks, 2014; Pierson, 2023), including for health sciences librarians (Linton, 2016), contributing to the larger body of literature considering the personal qualities and individual characteristics of teachers. For example Azadbakht (2021) analysed teaching librarians and McArdle & Coutts (2003) studied teachers in higher education more generally. The latter paper posited that "good teachers" model core qualities of strength, confidence, balance, ballast, and value maturity to be resilient, action-oriented, flexible, and inclusive (McArdle & Coutts, 2003). Meanwhile, Azadbakht (2021) highlighted the role of personas for teaching librarians and drew on the literature related to teaching as performing to help explain the themes of exhibiting expertise, authenticity, adaptability, and rapport during teaching. These concepts of performativity (Hector, 2023) and multiple identities (Cadogan et al., 2023) for teaching librarians has been further developed in articles in the recent special issue of the *Canadian Journal of Academic Librarianship*.

The online teaching of the entangled and intra-active aspects of evidence synthesis methods, review technology, searching skills, and research data management (i.e. search documentation) have taken place within the context of online education, academic libraries, and evidence synthesis research. These intersecting and overlapping contexts have led to librarians juggling several competing identities. Librarians who have taught evidence synthesis methods, including systematic searching, may have identified simultaneously as a teacher and as a review methodologist. Meanwhile, librarians who have provided liaison support to specific schools and departments and provided research support through their library reference or information desk service may variously have aligned more strongly with either a teacher or service provider identity. Furthermore, some librarians with roles specializing in evidence synthesis research may have aided review teams though an evidence synthesis support service. These librarians may therefore have considered their researcher or methodologist identity foremost alongside a responsibility as a service provider. Library researchers and practitioners have studied and commented on these types of parallel and competing identities in librarianship and other specific domains of academic library work with significant technological components such as digital humanities (Huet et al., 2019; Pierson et al., 2019), and online and blended teaching (Amparo, 2020; Corrall, 2010; McTavish, 2019; McTavish & Robertson, 2020). But aside from tangential mentions in commentaries (Hanneke, 2018, 2022), the role of professional identity has not been explored in the context of teaching evidence synthesis, either in-person or online.

While identity formation or ‘identity play’ (Stanko et al., 2022) were not the focus of the research questions or interview prompts, throughout data analysis I noted the significance of the librarians’ perception of their work and themselves in the context of their organizations and in relation to evidence synthesis methods. The intra-actions between participants’ professional identities and their online teaching practices were noticed particularly through instances of disruptions, such as breakdowns in technologically mediated work, or tensions, including between self-perceived skills and observed performance of expertise.

As an example of the latter type of tension, in the invitation to reflect on their identities offered to librarian participants in the participant characteristics survey, one librarian acknowledged their approach to technology and identity as a technology librarian, linked with their own preferences for learning, negatively impacted their teacher identity and practices around evidence synthesis instruction. The librarian noted that in balancing the abstract conceptual aspects of evidence synthesis teaching with the technical skills, they were likely to allow students to figure things out, since that was this librarian’s own preference, though they felt that meant they were not well-suited to teaching. Thus, the inclination to leave technical skills out of their teaching affected the librarian’s identity as a teacher. Nonetheless, this librarian also noted during their interview an expectation in their library that librarians teach.

> Everyone who is a librarian is expected to provide a level of instruction, but not necessarily on evidence synthesis. I don't think that particular thing is teased out. It's just… any kind of instruction or consultation support is expected as part of the job. (P05 Interview)

Even in the absence of specific expectations regarding evidence syntheses, the responsibilities of health sciences librarians at their institution included teaching evidence synthesis through research consultations. This was demonstrated by the questions on the research consultation intake form shared by the same librarian participant during their videoconferenced interview. The form allowed those making the request to upload files such as research protocols or search strategies. This example demonstrated that meeting the expectation to teach students, either individually or in groups, about systematic searching and evidence synthesis methods did not require the librarian to identify as a teacher or an expert in the methods. Nonetheless, during online research consultations, I observed them drawing on expertise in teaching and demonstrating knowledge related to the evidence synthesis methods, much of which they did by navigating technologies for teaching, searching, and conducting reviews as well as their sophisticated explanations previously described of abstract concepts such as

the advantages and disadvantages of using PubMed or Ovid to search MEDLINE and when and how to use as study design search filter to limit search results to a desired type of study.

In considering the sometimes-conflicting goals of the teaching encounter, librarians also must address the inherent pressure regarding their own roles and identities. For example, if the role of the librarian as search expert was paramount to them, then their emphasis was on the learned and acquired expertise regarding the organization of information, the functioning of the bibliographic databases, and the means to develop and test sophisticated search strategies. That expertise has been extremely relevant in the context of evidence syntheses, given the importance of a systematic and comprehensive search approach. A relatively junior librarian participant in the first focus group referenced this tension when describing their realization that they may have done more of the search development for the student than intended while demonstrating how to search systematically and comprehensively.

> I have the problem when I'm starting to screenshare where I'll do things like take their problem or research question and start working on it. And then I have the problem of sometimes walking away from a research consult and [thinking], "I just wrote their search for them, or I just did a lot of it for them." I try and build up the concepts really comprehensively: I'll take their words, I'll show them how to translate it to MeSH, and then I'll show how I might have built it up, like "talking therapy adjacency [another word]" […] especially because it's sometimes hard to get them to think of all the words that they could use for things. […] And then basically I've written out their search for them. And it's a problem I have. I'm having so many students lately where I walk away having done their work. (P02 FG1)

The allowances of screensharing through the videoconferencing software enabled the performance of the librarian's searching expertise via demonstrating the identification of index and text words phrases in this account. Simultaneously, this practice of demonstrating and performing the search methods created tension between the librarian's expert searching identity and their teacher identity. In final comments on the participant characteristics questionnaire, this librarian acknowledged their junior status and reflected that they were sympathetic to the learning required of students, so their performance of the search may have reflected their own stage of development as a search expert.

In response to the comment above, a librarian with more experience acknowledged the challenge and described how they have asked students to share the screen through the videoconferencing software

instead and then provided directions to the student. While the librarian noted that this approach could be awkward, it accomplished their goal of having the student actively apply the searching skills being taught. Thus, the searching practices were performed and enacted by the student instead of the librarian.

> One of the things I've done is when I'm working online now, is they share their screen. I do not share my screen except for very rare cases. And so we struggle through sometimes you know: me saying, "no, it's the other your other left," […] but in the end, they've got it on their computer and their hands have constructed the thing. (P01 FG1)

This participant's comment reflected less tension between the expert searching and teacher identities. Various factors may have contributed to the stability of their professional identity, including their personal teaching philosophy, described in their response to the participant characteristics survey as curious and playful, and their additional years of experience. Similar to the way this participant integrated demonstrating the abstract concepts and procedural techniques of searching, as noted in the previous section, Participant 01's teaching practices exemplified a duality of identities rather than a dualism, suggesting practices where one can be both an expert searcher *and* a good teacher (Feldman & Worline, 2016).

The knowledge and abilities of librarians as information specialists in evidence syntheses have gone beyond the search, as demonstrated by the 18 roles for librarians in systematic reviews identified in Spencer and Eldridge's review (2018). The competencies for systematic searching, documentation, citation management, and more do not readily translate over to health professions trainees who may only be to completing a single systematic search in their academic or clinical career. Therefore, the role of the academic librarian as a teacher has been essential for assessing the most relevant aspects of the achieving the searching- and methods-related learning objectives. Determining the aptitude of the learner(s) for the skills needed to execute systematic searches, evaluating the uptake and integration of new technical skills and conceptual knowledge, and providing feedback on the progress and outcomes of the learning all fit into the librarian's teaching role.

The outcomes of searching and teaching practices have been different depending on context and performativity. For example, during collaboration on evidence syntheses, the behavioural outcomes (i.e., competencies) of how the librarian performed the search were central. However, in the academic setting, teaching the student to become a researcher or an informed reader of research could have been

just as important as the search output. This duality parallelled discussions within HPE regarding competency-based education and professional identity formation for clinicians (Sternszus et al., 2023). Sternszus and colleagues proposed integrating professional identity formation into competency-based education to balance standardization and individualization, as well as allow for a more holistic assessment (2023, p. 512). Librarians have capitalized on their role as search expert coach to observe how each learner has integrated the behaviours *and* the conceptual knowledge that affected the process of conducting the review while recognizing that their impact as teachers have included more expansive outcomes regarding research literacy, including search strategy literacy. The student's ability to critically understand and interpret search strategies and other methods in published evidence syntheses would translate into broader competencies relevant to various aspects of their developing professional roles and identities.

During a research consultation, the labour of assessing the learning to inform the teaching practices was exemplified when the librarian explicitly or implicitly assessed how well the learner has taken in the information and skills shared (Hanneke, 2022). One librarian described watching the learner through the shared screen as the student navigated the search interface and built the search strategy to observe if the learner has taken in the directions provided.

> I am trying to […] work within a context: Have I met with this researcher before? […] How much are they absorbing? What is the feedback I'm getting? Are they getting it? Do I have evidence that they're understanding what I'm saying? And it's like, "yeah, yeah, let's just let's keep going, I want to absorb more," or is it: "I didn't really get that, can you show me?" Or if they asked me a question that shows that maybe they didn't get something that I thought they had got earlier. (P01 Interview)

Framing teaching through scaffolding of learning was mentioned by multiple participants, during interviews, observations, and the focus groups, and was taken into consideration in the context of both individual research consultations and group instruction sessions. This aligned with the program descriptions in the literature, some of which explicitly mentioned scaffolding of learning in the design and assignments (Hayden & Premji, 2022; Riesen et al., 2024). The librarian participants reflected on the need to gauge learners' cognitive capacity and adjust the instructional delivery accordingly. The same interviewee described this process in reference to the learners from the observed research consultation.

> …[H]ow much can we convey? [...] How much can somebody absorb within the hour, whatever amount of time we've got together? As I'm making those choices […] Those researchers I had worked with a couple of times, I think I met with them three or four times in total. And they were, I found that they were quite sophisticated and what they were able to absorb and take on, so I will include more information, and perhaps that increase that kind of cognitive load. (P01 Interview)

Several librarians noted that individual consults worked best when the student came in with some baseline knowledge and the librarian can build on their previous efforts, as has been described in previous chapters. Nonetheless, the librarian participants were realistic about what could be achieved in a single consultation or workshop and aimed to provide the most impact during that time as possible.

> [I like to start by] reframing the question, showing them how they can build up their search strategy. And then then being able to walk away [with] a mini-search strategy… have like maybe two concepts and then and then them walking away and having to build up their third concept by themselves or, and expanding on and testing it. So that's usually the best-case scenario. And […] they're never fully satisfied. It's one consult, but still, that they can walk away with a lot of the first steps and knowing kind of having that confidence of like, I feel okay, trying this on my own. (P02 Interview)

This comment linked to the decisions about what content was taught and choices to prioritize time spent on teaching searching over the other steps and components of the review process. One participant was explicit regarding the librarians' role with systematics searching and pointed out that the knowledge and skills for other aspects of the review methods could be acquired elsewhere, from other experts. When asked about how the librarians at their institution who supported evidence syntheses engaged with other parts of the methods and general methodological instruction, this librarian made it clear why they prioritized teaching searching.

> [W]e need to draw a line between our expertise and what we can provide, and being actual methodologists. [Librarians] could absolutely perform that role. We know what we need to know to be methodologists. We could do a systematic review. We know how the whole thing works. But there are, let's say, 10 people other than us, who also know how to do the methodology, and we are the only [ones] who can do the searching part of it. So, when it

> comes to consultation, and instruction and collaboration, while we will talk about those other pieces, and we'll give some advice as things come up, […] we do take care more and more, to draw the line to say, "Yes, we know these things, and we can help you where you need them… we can point you towards resources, […] we'll do our best to help you. But you need to know that the reason we are involved in this is because this [systematic searching] piece has only a handful of people in the [region] who can do it. And there are other methodologists, but there's only a few of us. So we're trying to be really, really careful […], we want to help you but five hours is probably not enough to do searching, let alone everything else […] that's involved in a review. So, let's focus on this piece that you need us for, that no one else can give you." (P06 interview)

In setting boundaries for librarian support, this comment was made in the format of a declaration to researchers, suggesting it is a type of script the librarian has had reason to perform in response to requests for teaching or collaboration. Scripting their negotiations of the support they could provide was another instance of performing the duality of their professional identity as expert searcher and teacher.

As alluded to by this participant and others, such as the librarian in FG1 who had not yet had time to develop an advanced searching workshop for learners at their institution, librarians faced constraints and prioritized teaching and support efforts to align with their professional activities. Another librarian noted that there was not enough time to convert all material from synchronous teaching into asynchronous digital learning objects: "You are either teaching systematic reviews, doing systematic reviews, and – when there are only [a limited number] of you – you don't have time to update the subject guide yet, on that [resource]" (P03 FG1).

Librarians also responded to their perceptions of the pressure students were dealing with to complete intensive programs and research projects, often on top of other curricular and extra-curricular demands. In the participant characteristics survey, when given the chance to reflect on their identity and sense of self, several librarian participants commented on the importance of being effective in their teaching practices, to make the most of the time in workshops, classes, or consultations. Strategies they considered effective varied and conflicted, reflecting the personal and contextual mediators of librarian perspectives on teaching, both in general, and regarding evidence synthesis methods. One librarian, who had worked with health sciences students for 14 years, emphasized alternating demonstrating concepts and hands-on activities along with recording live sessions so that

the videos could be closed captioned and accessed later. On the other hand, another librarian with the same number of years of experience unequivocally declared that teaching searching with hands on activities in online settings does not work and that teaching searching should be done in person with active, hands-on learning, including guidance and correction from the librarian present in the room. Similarly, this librarian had strong opinions on the appropriate tone and content when teaching classes and workshops, prioritizing what they had identified as best teaching practices over humor and personalized connection, strategies that another librarian identified as being essential to engaging with and connecting to learners. The similarities, such as prioritizing active learning, and the differences, such as how to best engage students' attention during online teaching, illustrated the ways teaching practices were shaped by the identities and performances of the sociomaterial actors in teaching practices.

7.4 Discussion

The findings in this chapter have explored the tensions in teaching practices and identities of librarians, in response to various contextual factors as well as their own preferences and experiences. The contextually mediated nature of teaching identity has been explored by others. For example, in a recent article in the special issue on teaching in academic libraries, Sandy and colleagues noted "accomplished teachers are not born; they construct their identities and practices based on the teaching context" (2023, p. 9). Some of that context has been the expectations of the librarians based on the types and levels of service offered to researchers through their libraries. The literature on evidence synthesis support services in libraries has emphasized the integrated nature of teaching about systematic searching and evidence synthesis methods, with many of the reported service models explicitly including consultations, workshops, and asynchronous online learning toolkits (S. Campbell & Dorgan, 2015; McKeown & Ross-White, 2019; Patil et al., 2020; Riesen et al., 2024; L. Yang et al., 2020). In this study, I did not ask about job titles and other descriptors of their work, nor did I ask librarians about the types and levels of service at their libraries. However, I did ask how much time they spend supporting evidence synthesis research through consultations, teaching, and providing feedback, as well as how much time they were expected to spend on evidence synthesis support. As noted in Chapter 5, five of the ten respondents reported evidence synthesis support as part of their explicit work responsibilities, with three additional librarians noting job descriptions that included general teaching and reference, under the mandate of which they have taught systematic searching. In

general, the responses about expectations and actual time spent supporting or teaching evidence synthesis aligned for those for whom the work was explicitly in their role.

Given the significance of context, additional description of the structures of Canadian academic health libraries helps to situate the findings in this chapter. The structure of the health libraries across the institutions in which librarian participants worked varied. Some universities have separate physical spaces for health sciences library collections and services, like at my workplace, the WK Kellogg Health Sciences Library at Dalhousie University. Other academic libraries have co-located staff, materials, and library services dedicated to health sciences with those supporting other disciplines, such as life, physical, and applied sciences. Similarly, some academic health libraries have provided services to one or more affiliated hospital libraries, in addition to having a presence on the academic campus. In contrast, institutions such as Dalhousie have looser connections to clinical support. The academic health sciences library has been administered by the university while the libraries directly supporting clinical practice in the regions have been managed by the provincial or regional health authority (Dingwall & Fyfe, 2015, 2016). While these distinctions are beyond the scope of this project, the degree of overlap between clinical and academic health sciences libraries has meant that different types of researchers, such as clinical scientists and residents, working from different physical locations may request support through their respective health libraries. For example, hospital-based academic libraries have mainly supported researchers and learners in the clinical context (e.g. medical residents, students doing clinical rotations, health care professionals) (Dingwall & Fyfe, 2015, 2016). On the other hand, students working on academic projects prior to their clinical rotations or those for whom clinical practice has taken place in contexts other than the regional hospitals (for example, learners in pharmacy, physiotherapy, occupational therapy, and dentistry) have been more likely to seek assistance and instruction from academic health librarians affiliated through the on-campus libraries. Furthermore, as noted by Cisney and colleagues (2022) in a recent survey of academic health sciences libraries, the organization of affiliated clinical libraries has impacted the resources and services libraries have been able to offer. Providing collections and services to clinical staff may have meant less capacity and lower priority for teaching students. Institutions supporting both academic and clinical research may have less time and resources available for supporting evidence synthesis research, in general. From another angle, providing support, including for evidence synthesis projects, to clinicians who work at hospitals and rarely, if ever, come on campus, may change the perspective and preferences of librarians regarding online teaching, for both individual and group instruction.

Though no data was collected regarding the particular configurations of participating librarians' institutions, the physical and logistical arrangements of the libraries may have had implications on the teaching and research culture, technological options, and organizational support. Similarly, while I asked librarians about how evidence synthesis support was included (or not) in their job descriptions or responsibilities, I did not ask about the broader labour arrangements in their workplaces. Subsequent conversations with colleagues across Canada have brought to light the significance to teaching and evidence synthesis support of the variations in faculty or staff status, differences in research (more generally) and service expectations for professional roles, and impact of the size and scope of the academic settings (for example, number of students, range of graduate and professional programs). Some reflections of these differences and the impact on evidence synthesis support have been revealed by a 2022 survey of Canadian library workers across all disciplines in academic and research libraries (Premji et al., 2024). Future research could explore the relationships between variations in labour arrangements and institutional factors in consideration of the tensions across teaching practices and professional identities revealed by this research.

The tensions between the librarians' roles as expert searcher and as teacher of systematic searching noted in this research have also been reflected in the literature on these respective roles, particularly in the absence of literature addressing both topics together. On one hand, in the specific domain of systematic searching, Cooper and others have done extensive work to understand the characteristics of effective search strategies for evidence syntheses (Cooper et al., 2020), to develop a literature search assessment rubric (Cooper, Varley-Campbell, et al., 2018), and to define the process of searching (Cooper, Booth, et al., 2018). Along with reporting standards for searches (Rethlefsen et al., 2021), these guidelines and resources have reflected the end goals of outputs and behaviours for searching, but did not provide in-depth insight into how librarians could assist health sciences students in achieving these goals. On the other hand, the inclusion criteria for Hirt and colleagues' (2020) scoping review of educational interventions for literature searching required outcome assessment through objective evaluation and none of the 14 included interventions focused on systematic searching for evidence syntheses. The studies included in the scoping review addressed many of the skills and processes noted in the systematic searching literature, but had inconsistent reporting of the implementation details, such as the expertise of the instructors (reported by three of 14 studies). The literature on learning advanced searching skills noted in Section 2.6.4 focused on information professional graduate training rather than health sciences or health professionals (C. L. Smith, 2015, 2017; C. L. Smith & Roseberry, 2013; Tucker, 2016, 2019). The disconnection in the literature

between available evaluations of the search processes and outcomes and available evaluations of teaching those processes to health sciences students leaves little dual guidance for librarians to reconcile their respective roles as expert searchers and teachers of systematic searching.

Though many of the practices described throughout this study pertained as much to teaching in any setting, including in-person and hybrid, as well as online, an important tension arose with the remote teaching and the librarian identity. As Pierson and colleagues have noted, overall in librarian identity, there is a significant link with "library-as-place" which has been disrupted when either or both the librarian and learner(s) were outside the library and, in fact, away from campus (Pierson et al., 2019). If the library and the university have been the *places* of learning, the option to accomplish the teaching and research actions of a librarian from elsewhere has challenged the purpose of those institutions. Orlikowski and Scott (2021) discussed three types of tensions that can arise, especially during crisis, and may generate pressure to change practices: pragmatic, tactical, and existential. The conditions under which these respective tensions have been created included when established practices "encounter practical difficulties in practice", "become infeasible in practice", and "no longer make sense in practice" and in turn lead to modifications, repurposing, and displacement, respectively (Orlikowski & Scott, 2021, p. 4). The accelerated shift to online teaching in 2020 provided the conditions for tactical tensions when teaching in person was not feasible. At the same time, the demand librarians have experienced to support evidence synthesis research has compounded the pragmatic and existential tensions. Requests from students and course instructors led to practical challenges in teaching advanced searching skills to learners in the context of limited contact time and remote instruction. Questions about whether it made sense for students to gain sufficient searching competencies to independently create systematic searches, in addition to completing the rest of the evidence synthesis project, have impacted the learning objectives and teaching approaches librarians selected. Librarians' teaching practices have been subject to tensions between aspects of professional identity and the circumstances of teaching systematic searching and other aspects evidence synthesis methods through online means.

Practice theories helped to understand that the resolution of tensions in teaching practices and the stabilization of librarian professional identity can benefit from avoiding dualistic conceptions in favour of co-constituting the pedagogical choices and the librarian's perceived role in teaching evidence synthesis methods. Feldman and Worline described the three principles underpinning practice theory as "(1) the consequentiality of everyday actions in producing the structural contours of social life, (2)

the relationality of mutual constitution, and (3) a questioning of the presumption of separateness indicated by dichotomies or dualisms in favor of a presumption of dualities, which are inseparable in practice" (2016, p. 310). From this conceptualization, online teaching practices can be seen as being co-constituted by the factors arising from: 1) the teaching context; 2) the librarian's professional identity; 3) the learners' responses to the training; 4) affordances from the material available to support teaching and research. For example, teaching practices were differently co-constituted during an invited guest lecture for a course versus providing personalized support through an online research consultation with one or more students. The activities and actions of librarians were informed by their perceptions of themselves as expert searchers or methodologists, service providers, and/or teachers, and were further mediated by what they could infer of the students' understanding. Additionally, as was reported in Chapters 5 and 6, technology, such as Covidence review management software, and multi-media digital learning objects, such as library guides and web-based tutorials, were relationally agentic with the potential to extend synchronous teaching to asynchronous learning.

The literature describing interventions to teach knowledge synthesis methods has also touched on the tension between procedural skills and conceptual understandings of how and why to apply those more technical skills. In the conclusions of their review of face-to-face instructional programs, Premji and colleagues (2021) highlighted the inclusion of applied and authentic learning activities in the reported interventions, emphasizing the opportunities for students to acquire the complex skills and knowledge required to conduct reviews systematically. They went on to note: "students also need to be taught the conceptual underpinnings of the various KS steps, and of the implications of the specific choices that they make, so that they understand the importance of resolving issues based on methodological principles" (Premji et al., 2021, p. 133). Whether online or in-person, teaching evidence synthesis methods has meant balancing the time allocated and instructional approaches for both procedural skills and conceptual knowledge.

These procedural skills and conceptual knowledge for systematic searching and evidence synthesis methods were reflected in the 18 possible roles for librarians that were described in the literature review by Spencer and Eldredge (2018) and operationalized by Townsend and colleagues (Townsend et al., 2017). The competency framework Townsend et al. (2017) proposed, based on an adaptation of Miller's Framework for Clinical Assessment (Miller, 1990), included both cognitive and behavioural dimensions for six domains of competencies. These competencies included: systematic review foundations; process management and communication; research methodology; comprehensive

searching; data management; and reporting (Townsend et al., 2017). In recognition of the roles that librarians performed on research teams as collaborators and co-authors as well as teaching and advising on evidence syntheses, this competency framework gave equal consideration to applying the individual behaviours in these six domains through doing them and through showing them (i.e., teaching) (Townsend et al., 2017, p. 270). However, it was not clear whether students being taught were intended to achieve a librarian's level of competence when shown those behavioural and cognitive dimensions. Furthermore, the absence of any known competencies for health sciences students regarding systematic reviews methods or other evidence synthesis methods has meant that librarians lacked established guidance regarding the learning objectives when teaching systematic searching or evidence synthesis methods more generally. The contextual, situated, and material factors described in this chapter must be navigated for each teaching encounter and each student or group of students.

7.5 Implications for Practice

This chapter pointed to some of the important considerations of context when deciding what to teach regarding systematic searching and evidence synthesis methods overall as well as how to go about teaching the processes and content depending on those contextual factors. Several specific recommendations for individual librarian teaching practices, institutional policies and services, and future research followed from these reflections.

Resolving some of the tensions created by ambiguity or contradictions in expectations, of both the librarian's teaching and what the students should learn or achieve, would help librarians plan which teaching practices would be most appropriate for a given situation. There is a role for advocating with faculty supervisors about appropriate methodological expectations for learners. Librarians could: 1) seek explicit learning outcomes for evidence synthesis projects assigned as course or program deliverables; 2) clarify the research methods competencies required to meet the conduct and reporting standards for an evidence synthesis publication; and 3) suggest alternate projects (e.g., systematized reviews, literature reviews with explicit methods, or review protocols) and/or sources of expertise (e.g. collaboration with librarians, library interns, or LIS graduate students). These recommendations would help faculty supervisors *and* students to disambiguate appropriate methodological and pedagogical expectations, given the affordances of available material (for example, supportive technologies) and the temporal limitations.

Related to the previous recommendation, this research has identified the need for future explorations of a systematic searching literacy framework or competencies. Such a framework would help guide appropriate levels and strategies for teaching depending on the learner's needs and the purposes of the proposed project. Reporting standards for systematic searches (PRISMA-S) have been created to guide the minimum conduct and reporting in the context of completed, published reviews (Rethlefsen et al., 2021) and systems have been developed to assist with improving searches created by librarians through the Peer Review of Electronic Search Strategies (PRESS) (Sampson et al., 2009; Sampson & McGowan, 2006). The direct application of PRISMA-S or PRESS in the context of student projects and assignments would not be appropriate since deadlines limit the feasibility of realistic expert searching learning objectives. Therefore, establishing a range of objectives or competencies for learner outcomes when working on evidence synthesis projects could guide decisions regarding teaching.

Librarians and library administration can explicitly also seek to align their professional identities and institutional service levels, respectively, to avoid the tensions that can add to burnout and conflicts between values and roles. Demetres and colleagues (2020) noted that burnout related to evidence synthesis support may be correlated with having less time allocated to focusing on that type of work, with respondents to their survey with the lowest burnout rates dedicating 80% to 100% of their time to evidence synthesis support. As reported in Chapter 5, participants in this study reported between 7% and 50% of their work time for both expected and actual evidence synthesis support. These allocations were lower amounts of time than the higher threshold set by Demetres et al. (2020). The invisibility of efforts for ongoing professional learning regarding materials, methods, technologies, and pedagogies for teaching evidence synthesis methods online may further contribute to burnout (Demetres et al., 2020; Popowich, 2019; Winterman & Asher, 2021). This type of taken for granted labour may have even more impact for those who identify as either a teacher *or* a methodologist, without integration of the duality or multiplicity of professional identities.

7.6 Chapter Summary

Disruptions to the purpose of the teaching and the identity of the librarian intersect and overlap, as shown in this chapter. To explore the research question of how the social and material elements interacted with each other through teaching practices to produce labour, I examined the precursor questions of "What do we teach?" and "Why do we choose to teach those concepts?". Addressing these questions revealed tensions between teaching technical searching skills and covering more

conceptual objectives related to evidence synthesis methods. While academic librarians may simultaneously see themselves as service providers (through the library reference service), expert searchers (J. McGowan & Sampson, 2005), and teachers (Greenwood, 2023) these identities can come into conflict when determining the purpose of teaching evidence synthesis methods to students. Furthermore, other sociomaterial actors, such as the technological platforms for communicating online and the expectations of the librarians, learners, and others shaped choices about how and what we teach regarding evidence synthesis methods. These choices are made in the context of the professional identity and contextual factors regarding the librarians' roles in teaching and evidence synthesis methods support.

CHAPTER 8 CONCLUSIONS

8.1 Chapter Overview

This dissertation described how I used a sociomaterial lens, informed by Actor Network Theory (ANT) and practice theories, to conduct a focused, digitally mediated ethnographic study examining the online teaching practices of academic health librarians. This study specifically focussed on online teaching to support learners who are conducting evidence syntheses. The three empirical chapters reporting the findings of the study addressing the corresponding three research questions:

1) What are the social and material elements affecting academic health librarians' online teaching practices regarding evidence synthesis methods?

2) What types of labour are revealed by following the threads of these social and material elements during the librarians' online teaching practices?; and

3) How do these social and material elements interact with each other through the teaching practices to produce these labours?

In this final chapter of the dissertation, I have highlighted the main contributions of this work and presented the strengths of the study approach as well as the limitations. Finally, I have described some implications for practice and future research, followed by concluding comments.

8.2 Study Contributions

This study added to what we know about the material, immaterial, and contextual factors that have impacted academic health librarians' online teaching practices in relation to systematic searching and evidence synthesis methods. As illustrated by tracing the assemblages with the library evidence synthesis guides in Chapter Five, I have shown how library guides acted as a nexus for the material and immaterial practices of online instruction. Librarians used the linked resources on the library guides, such as webinar recordings, review management tools, and methodological guidance, in a variety of ways to take their teaching beyond the temporal and spatial bounds of their direct contact with learners during online teaching. Likewise, the library guides helped librarians build and maintain their expertise in both systematic searching and the overall and interrelated methodological steps of conducting evidence synthesis research. The agency of library guides included acting as both a

resource repository and knowledge sharing tools actively used in online pedagogical practices. By drawing from and sharing the content and instructional material on multiple institutional library evidence synthesis guides, librarians engaged in both remote and local communities of practice and managed the labour demands needed to create and maintain these guides.

In addition to the library guides, the academic health librarian participants in this study used, taught, and maintained expertise in many types of digital tools, texts, and multi-media artefacts. The librarian participants and students with whom they worked co-constituted the online teaching practices with these various materials and technologies. The sociomaterial intra-actions of the human and non-human actors were amplified by the online setting for both the teaching and research processes of evidence synthesis methods. In Chapter Six, through the composite account describing online evidence synthesis research consultations, I illuminated the invisible labour involved in these teaching practices and pointed to some of the effort saving impacts and workload implications of technological affordances and constraints, respectively. Although tools such as online meeting booking software, library guides, and videoconferencing software facilitated administrative tasks, instructional and methodological content sharing, and communication, they also had the potential to create barriers depending on organizational configurations of each technological selection. Negotiating the barriers resulting from misalignment of technological configurations, academic or methodological expectations, and librarian teaching capacity added labour to the online teaching practices.

My research findings further highlighted how organizational and other contextual factors contributed to tensions and conflicts in deciding what and how to teach online regarding systematic searching and evidence synthesis methods, as described in Chapter Seven. Librarians employed informal and observational means of assessing the needs of learners in groups and individual teaching to balance the volume and type of content regarding searching and other steps of the review process as well as the pedagogical approaches to teaching. The participating librarians demonstrated and explicitly addressed how they integrated their time and effort with learners to demonstrate skills and concepts, including through active and authentic learning. These online teaching practices played out in workshops, in other types of group instruction, and during personalized research consultations. The findings also illustrated how academic health librarians were mindful regarding their roles as teachers, search experts, and methodological advisors. These identities were entangled and inseparable in the context of the online teaching of systematic searching and evidence synthesis methods. The ways these integrated identities helped librarians navigate their roles in supporting learners with evidence

synthesis methods suggested it would not be possible to completely separate the individual meanings, competencies, and materiality (Lloyd, 2017, 2021) that made up the librarian teaching practices.

In addressing the research questions, this project has (re)assembled the actors and mediators in the sociomaterial practices of academic health librarians' online teaching regarding evidence synthesis methods. Through a lens using relationality and agential realism, I have shown how those actors were entangled such that the situated online and academic context of the instruction, the learner and teacher objectives, the identities of the librarian, and the evolving methodological and technological affordances acted on each other in the process of becoming the teaching practices. This entangled view can be understood using a framework developed from TPACK (Mishra, 2019; Mishra & Koehler, 2006) to highlight the materiality (M) and the immaterial practices threaded through the domains of technology (T), pedagogy (P), evidence synthesis methods content (C), and the social (S) or organizational factors. Through this TPAC-SM conceptual model I have proposed that individual- and institutional-level decisions regarding evidence synthesis teaching and support should consider the various factors and dimensions shown in Figure 8.1. I have expanded some specific implications for practice and research in Sections 8.6 and 8.7, respectively.

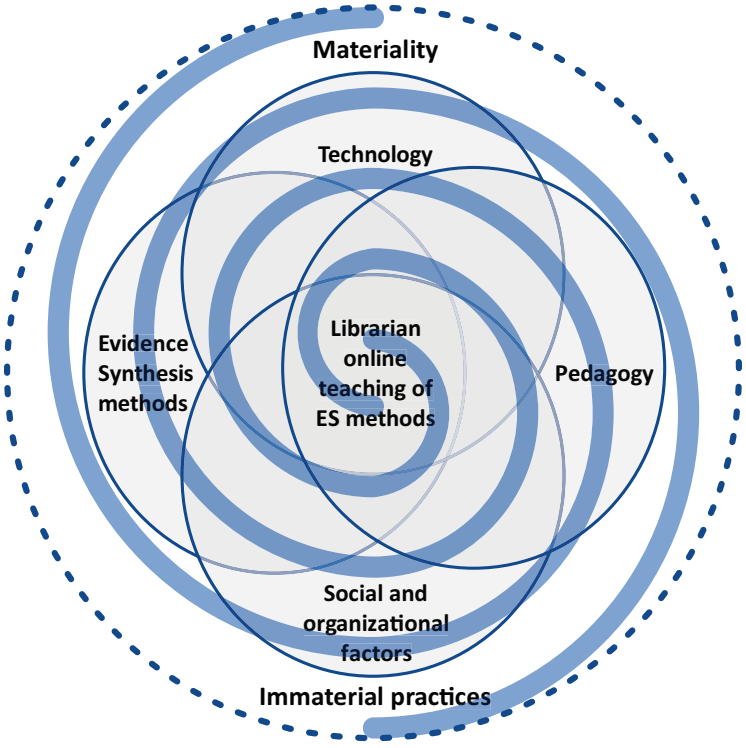


Figure 8.1 TPAC-SM model for understanding the entangled material and immaterial actors in librarians' online teaching practices for evidence synthesis methods

In relation to the expertise that librarians have offered regarding expert searching and evidence synthesis methodologies, there have been threats and opportunities related to ongoing developments in automation and AI, increased student demand for support, and other institutional factors. By unpacking the practices, competencies, and professional identities underlying the skills and knowledge librarians have shared with students, this research has demonstrated the complex, frequently invisible, nature of this work. In other words, this practice theory-informed study unpacked how these online teaching practices made meaning, formed identity, and produced order through assemblages of sociomaterial actors including librarians, learners, technologies, review methodologies, and other human and nonhuman elements (Nicolini, 2012c, p. 7).

While evidence synthesis methods have the most robust and established history in the context of health and biomedicine, the concepts of evidence-based or evidence-informed practice (underpinned by evidence syntheses) have spread beyond health sciences. In a similar fashion to the way that evidence syntheses within subdomains of biomedicine have been mapped and the involvement of librarians has been documented, scholars have reported on the production of systematic reviews and other synthesis methods outside of health sciences, including the involvement of librarians (Kogut et al., 2019; Lê et al., 2023; Premji et al., 2022). An indication of this expansion of methods-driven evidence synthesis research beyond health has been the funding program for Knowledge Synthesis grants through the Social Sciences and Humanities Research Council (SSHRC) in Canada since 2015 (Government of Canada, 2015) and the 2010 Tri-Agency Partnership on Knowledge Syntheses on the Environment funding opportunity (Government of Canada, 2013). These funding streams reflecting the need for the labour of supporting evidence synthesis methods, and the teaching practices implicated in that support, should not be considered the sole purview of academic health librarians. Librarians across disciplines have expressed their desire to understand and build capacity to support both evidence synthesis methods and the related teaching practices to support students (Premji et al., 2024).

Comparable to the contributions of the Cochrane Collaboration and JBI, as evidence synthesis methods have spread beyond the fields of health, other organizations have been developed to support the application of methods to other disciplines. The Evidence Synthesis International (ESI) organization has acknowledged the emergence of such groups as Campbell Collaboration, which has supported reviews in social sciences, the Centre for Environmental Evidence, and others in the ESI position statement (Gough et al., 2020). These organizations have adapted and promoted synthesis

methods appropriate to the evidence and questions of interest in their fields. These groups have also included academic librarians and other information specialists who have assisted in disseminating the adapted methods to disciplinary researchers (Riegelman & Kocher, 2018). While this dissertation focused on teaching evidence synthesis methods in health contexts, there has been the need to better understand academic librarians' labour to support evidence synthesis research across disciplines. A needs assessment survey conducted on behalf of the Canadian Academic and Research Libraries (CARL) reported responses from 137 Canadian library workers from various disciplines regarding the evidence synthesis support they provided (Premji et al., 2024). The majority of respondents to the cross-sectional survey indicated they provided research consultations (n = 114; 83%) and other forms of educational support (n = 81; 59%). These results indicated that supporting evidence synthesis research has affected liaison and research support librarians across many disciplines. Therefore, the implications of this research go beyond health sciences libraries services and the labour and teaching practices of academic health librarians.

Indeed, in exploring challenges (J. Nicholson et al., 2017) and burnout (Demetres et al., 2020) amongst academic librarians who support systematic reviews, scholars have made note of the interpersonal aspects of involvement on evidence synthesis teams and identifying as a reference librarian (a title synonymous to public services librarian and a position likely to have extensive teaching responsibilities). These communication and organizational factors have been significant contributors to overwhelm, reflecting labour outputs that have not often been acknowledged. Furthermore, Demetres and colleagues (2020) found that consistent use of digital review support tools such as Covidence, Distiller, or Rayyan had a lower association with burnout, while those who occasionally used such tools reported the highest amount of burnout. This correlation suggested that comfort with the technological tools was helpful, but librarians must have had opportunities to build familiarity to avoid adding to their feelings of burnout. While not focused on the aspects of interpersonal communications and technology aspects of teaching evidence synthesis methods per se, these insights from Demetres and colleagues' (2020) study supported my findings on the interrelated nature of labour, technology, and the complexity of the sociomaterial teaching practices involved with online teaching of evidence synthesis methods.

Online teaching also has been linked to workload and labour concerns. For instance, in a paper describing the implementation of virtual instruction in one course at one institution, Budhai and Williams (2021) emphasized the importance of maintaining relationships and student engagement,

reflecting emotional labour made more challenging by the online format of instruction delivery. They reported online instruction using Teams, drawing on exercises, the chat function, and recording of the sessions increased accessibility for learners, while adding labour for the instructing librarian, similar my findings. This report on early adaptations in 2020 also emphasized the burden of adjusting to changing technological options such as changing software for videoconferenced instruction from Zoom or BlackBoard Collaborate to Teams, following institutional adoption of the latter (Budhai & Williams, 2021, p. 210). Other authors have reporting survey investigations of the shift to virtual library services during the pandemic have noted volume of requests as well as the types of content in instruction and research support (Charbonneau & Vardell, 2022a) and the technologies used for online reference (Strahan & Blake, 2023). Neither these studies nor the reports of online evidence synthesis workshops described in Chapter 2 (Fuller et al., 2021; Hayden & Premji, 2022; Poole, 2021) provided substantial insights into online teaching practices and the labour required to teach evidence synthesis methods online.

The processes and work of conducting evidence syntheses have changed and continues to evolve in response to assistive and disruptive technologies such as systematic review management software, machine learning, and artificial intelligence (AI), as described regarding the research problem in Chapter 1. As librarians, students, and other researchers strive to maintain currency in the emerging technologies and their implications for evidence synthesis methods, the labour of this continuing education and the work to subsequently teach others needs to be acknowledged. While aspects of completing reviews can be facilitated and expedited by AI, it is important to understand how the technology impacts the process and rigour of conducting research. To this end, methodologists have published investigations regarding the time- and effort-saving affects of automation on systematic reviews, with 123 studies included in a scoping review published in July 2024 (Tóth et al., 2024). The work of tracking automation innovations and communicating their affordances and liabilities to students who are conducting evidence syntheses is not necessarily the sole responsibility of academic librarians. Nevertheless, my experience and the findings of this study have suggested that librarians incorporate existing and emerging search and review technologies into their teaching practices, the material they reference, and their competencies regarding evidence synthesis methodologies. So long as humans, be they students or other researchers, have roles in conducting evidence syntheses, they will need to learn how to implement the technologies that can assist in research, and librarians have leveraged their role supporting evidence synthesis methods to provide guidance, coaching, and teaching about applicable technologies, including AI and machine learning.

By using a relational research approach and considering the contributions and intra-actions of materiality, this doctoral study has added understanding of what occurs during online teaching encounters. Drawing on the reciprocal roles of contributing factors, this research has shown how teaching practices cross the sociomaterial domains of technologies, evidence synthesis methodological texts and resources, educational approaches, and the organizational contexts and expectations in academic libraries, higher education, and HPE.

8.3 Strengths of the Research Approach

The research approach used for this study led to several strengths, mainly stemming from the integration of the theoretical and conceptual frameworks through all aspects of the study. For instance, the ethnomethodology strategy of including multiple types of data collection methods brought rich data to the study, allowing for 'thick description' of the accounts of online teaching practices (Trundle & Phillips, 2023; Varpio et al., 2020). Using naturalistic observations allowed me to see practices and materials that might otherwise not be noticeable. Insights from watching other librarians in research consultations revealed things that may not be apparent from watching recorded webinars or reviewing documents such as handouts and slide decks. These considerations directly impacted my understanding of online teaching practices. For example, I noticed the search interface configurations were different between library websites and the resulting impacts on how librarians show search steps of searching. Combining my embedded and embodied experience within the research context with a deep familiarity with the literature related to systematic searching and teaching evidence synthesis methods allowed for rich and practical insights into the labour and practices of online teaching of evidence synthesis methods. The emic research approach of studying teaching practices from an insider perspective facilitated immersive and ongoing consideration of the data, findings, and implications that could not have been accomplished to the same degree from an outsider perspective.

As noted, the theoretical framework based on sociomateriality, ANT, and practice theories was thoroughly integrated throughout all steps of the research process, from conceptualization to data collection, analysis, and writing (Jackson & Mazzei, 2022; Varpio et al., 2019). For example, the questions and prompts for the interviews and focus groups were designed around the research questions and theoretical framework to focus on materiality and teaching practices. Furthermore, the methods for data collection through online videoconference software allowed for recording the data in audio and visual digital formats. The recordings had reciprocal benefits for the other data collection

methods employed, such as replaying selections of the observed research consultations during the interviews. The digital audio and visual data were supplemented by textual data from the focus group chat, Padlet discussion board, transcriptions of the audio, observation memos, and documents and resources shared through videoconference chat function of the focus groups, observations, and interviews. The ability to rewatch the video recordings added opportunities to refer to the visual data in the analysis and writing phase, supplementing the memos made during the observations and adding nuance as I continued to understand the implications of the theoretical framework and become a sociomaterial researcher (Hultin, 2019). The immersion with the data, theoretical framework, and emic perspective facilitated the process of analysis through writing and thinking with the relevant theories (Jackson & Mazzei, 2013, 2022).

The sociomaterial perspective added other strengths to this research through the consideration of texts and other materials as actors with the agency to contribute to the analysis and understanding of practices. Whereas qualitative research using a humanist lens achieves rigour through sufficient participant numbers to achieve theoretical sufficiency and thematic saturation, the inclusion of materials and materiality contributed to the rigour of this study. Given the materiality and practice-based work of academic librarians, sociomaterial approaches have had surprisingly little uptake in library and information science research, especially related to teaching. This work joins that of Gourlay (2015), Haider and Sundin (2023), and Lloyd (2014) to bring perspectives that elevate the agency of non-human actors in information literacy and library studies. Similar to the approach used by Schreiber (2017, 2019) to employ ANT to interrogate online tutorials and e-learning objects, my research perspective integrated the tools and technologies used in academic libraries as parts of the assemblages of librarians' teaching practices.

8.4 Limitations

While the collection of data through online means improved accessibility and feasibility, it also led to a limitation of the sociomaterial approach used for this study. The frame of the field for observation permitted by collecting data online did not allow for a completely situated understanding of the physical space and actions. For instance, during observations of research consultations, I was not able to see what other material or technologies the librarian or learner were engaged with beyond what was shared on the screen. Similarly, the embodied and physical setting and material of the working environment could only minimally be observed. Nonetheless, even with that limitation, I was able to

get some sense of the material and surroundings of the librarians, who were all observed working from spaces in their residences or workplaces. Examples of the local environment being communicated through the online medium included when one librarian vocalized an apology for a baby crying in the background or when another had obvious frustration with accessing a document from an institutional webpage that required additional security clearance due to being located off campus. Although neither of those incidents happened in the field of view through the videoconference software, they were part of the sociomaterial assemblage and embodied nature of the online teaching practices. Doing observations in person and sitting in the room while a librarian met with a learner over Zoom or Teams would undoubtedly provide different sociomaterial insights. However, given public health and travel restrictions at the time of data collection during the COVID-19 pandemic, the opportunity to observe and record through the videoconferencing software allowed me to collect rich data for my analysis and replicated the conditions during remote teaching. Asking librarian participants during interviews about their teaching and work practices that did not appear onscreen, as well as my professional and teaching experience, allowed insights beyond what could be seen through the shared screen.

The complexity of exploring librarians' teaching practices and identities through a sociomaterial lens, drawing on related theories of ANT and practice theories, added an opacity to what many feel to be a very practical problem. As noted, the theoretical framework has not been extensively used in academic or health library research. Therefore, application to the challenges librarians experience in their teaching practices and the administration of library services may not be obvious or direct. Indeed, although I attempted to briefly describe the basic elements of a sociomaterial perspective at the start of each data collection session, one librarian participant who attended my conference presentation related to the conceptual framework told me afterwards that only at that point did they finally understand the purpose and role of the theoretical basis of the study. This disparity may have been due to working in a field that does not have strong theoretical traditions. While this discrepancy could potentially hamper translation of the findings into practice, it has also been an opportunity to introduce a theoretical framework that can help understand and communicate the complexity of librarian labour and teaching practices. I have attempted to address the challenge presented by the theoretical framing through summarizing my findings into specific and actionable implications for practice and policy.

That the participating librarians may not have fully understood or embraced the intent of the research was noticed also during data collection and analysis. For example, during the focus groups, some of the librarians were inclined to evaluate the content and approach of the workshop materials, either

against other examples or against perceived best practices for teaching. Although the materials were intended to serve as a prompt for reflection regarding one's own teaching practices, I may not have made this distinction sufficiently clear. Similarly, the use of research consultation recording selections to prompt reflection during the interviews, as inspired by video reflexive ethnography, did not consistently elicit rich discussion of the practices observed. While the selection of the clips contributed to the overall data analysis, their use during the interviews did not clearly enhance the reflections of the librarians, who frequently tended to judge their own performances against perceptions of best practices and assumptions of efficacy.

Nonetheless, the multiple sources of data from human and non-human actors and the approach of thinking with theory allowed my interpretation and analysis to integrate the theoretical framework. The triangulation of data sources along with my extended immersion with both the teaching practices of interest and the theoretical framework mitigated the impact of the theory disconnect for participants during the data collection stage. The observed breakdowns and tensions during the research process demonstrated some of the ruptures that were similarly seen through the data analysis. In other words, the research process replicated the findings of tension between librarian roles and areas of expertise as practitioner, teacher, researcher, and expert searcher.

Furthermore, as has been noted, the literature related to health sciences librarian teaching has often been in the context of EBP and a positivist, biomedical research paradigm. Many researchers and practitioners in this environment have valued evidence of effectiveness and finding *the* right answer for a problem due to the immersion of academic health librarians in the positivist assumptions of evidence-based practice and the neoliberal Return on Investment (ROI) challenges to academic libraries (K. P. Nicholson, 2019). Scholars have noted that much of the work around the value of libraries has centred on metrics and quantifying impact on objectively measured outcomes for learners and researchers (Allison-Cassin, 2020; Clarke et al., 2022; Gann & Pratt, 2013). This study did not aim to provide answers to questions of effectiveness or value, and perhaps raised more questions than it answered, as has been common with qualitative research. However, in generating more questions, this research also provided possible avenues of inquiry to pursue in future studies, including quantitative and metric-based studies.

This research did not aim to be, nor was it, generalizable from the findings from data based on the 12 contributing librarian perspectives (myself and the 11 participating librarians). It was a reflection of practices at a particular point in time and within the context of Canadian academic libraries, as is

appropriate for studies based on practice theories (Nicolini, 2012c). The rapid and diverse technological and methodological changes will likely continue altering online teaching practices and evidence synthesis methods in both disruptive and productive ways not predicted by this research. Although the TPAC-SM model has provided prompts regarding the types of intra-acting actors to be considered, it can not be prescriptive of actions or practices due to dynamic contextual influences. Suggestions for how the findings may inform practice, policy, and research regarding academic libraries, evidence synthesis support, and training information specialists follow in the next sections.

8.6 Implications for Practice and Policy

Making visible the invisible and affective labour of librarians when teaching and supporting evidence synthesis research has numerous implications for practice in academic libraries, in health disciplines and beyond. Many university libraries have developed and implemented, or are developing and implementing, comprehensive evidence synthesis support services for which an understanding of the material contributors and immaterial labour will be beneficial. This study has made visible the labour required to build and maintain the necessary methodological, pedagogical, and technological considerations to teach and support evidence synthesis methods in libraries. Teaching systematic searching and evidence synthesis methods requires specialized expertise in multiple interdependent domains of review methods, technological literacy and skills, and online (and in-person) pedagogies. Therefore, acknowledgement of the inherent labour and sociomaterial relationality, both visible and invisible will help to resource evidence synthesis support appropriately. For example, teaching groups online in synchronous settings benefit from co-teaching to monitor chat and to help troubleshoot teaching and research technologies affecting human resource decision. Similarly, institutional discretion regarding technologies such as videoconference tools, online class and appointment booking options, digital platforms for sharing educational resources, review and citation management software, and online search interfaces can increase or expediate the labour involved in online teaching practices regarding evidence synthesis methods. Alternately, improved recognition of the implicated resources can help librarians and library administrators manage workloads and researcher expectations in the face of constrained human, technological, and time resources. The findings as well as the literature underlying this research have highlighted the high demand and growing expectation for evidence synthesis support at a variety of levels from librarians in academic libraries. The potential for academic health librarians to help build capacity for high quality evidence synthesis is currently both under recognized or unacknowledged and simultaneously not optimized to have the most significant

impact. In the context of building inclusive, healthy workplaces in universities and libraries, valuing the efforts and contributions of academic health librarians is more important than ever.

For individual teaching librarians, while the situated nature of the findings does not offer a formula for designing online instruction regarding evidence synthesis methods, the research does provide empirical validation of anecdotal reports that building capacity to support evidence synthesis is time and effort intensive. In fact, the sociomaterial and contextual dependencies of teaching practices precluded a standardized approach, as librarians must account for the specific affordances of the technology available at their institution and more generally, the needs and abilities of the learner(s), and the variable methodological expectations for evidence syntheses. Nonetheless, by highlighting the significance of the multiple domains of technological, pedagogical, methodological, and social/organizational factors, along with the material and immaterial dimensions of online teaching practices, the findings provided valuable insight into the necessary considerations when developing competencies and professional identities related to supporting evidence synthesis research.

The related competencies and identities for digitally mediated teaching (both online and in-person) of evidence synthesis methods have further implications for graduate and continuing education programs for information professionals. As professional associations and LIS graduate programs strive to develop relevant training for new and practicing librarians to address emerging areas of work, this study has shown potential focus areas. The entangled considerations in the domains of information and communication technologies, pedagogical approaches, review methodologies, and social/organizational factors align with multiple areas of research identified by the Association of Library and Information Sciences Education (ALISE). Existing curricula and research has been based on topics within areas including: Human-Computer Interaction & Design (HCID), Information Organization & Retrieval (IOR), Information Services, Information Practices, Information Technologies, and Sociocultural Perspectives. Topics included in these areas were invoked by the sociomaterial assemblages in my research findings, including, but not limited to: user interfaces (HCID), interactive information retrieval (IOR), academic libraries (Info Services) (Spiteri, 2016). The competencies and knowledge needed to support and *teach* systematic searching and evidence synthesis methods do not fall clearly into one area of research and are rarely taught in a single course in LIS graduate programs. Yet the entanglement across ALISE research areas and LIS curricula reflects how teaching evidence synthesis research practices can help information professional become better practitioners due to the intersections with so many areas of practice. Conceptualizing knowledge

through a practice lens and an integrated onto-epistemology of *relational becoming* encourages seeing the practices throughout my findings as "ways of knowing shared with others" through the activities of searching and conducting evidence synthesis research (Nicolini, 2012b, p. 5).

8.7 Implications for Research

There are many possible avenues for future research suggested by the findings of this study. For example, as I had initially considered earlier in my doctoral studies journey, a realist approach to evaluate and synthesize teaching evidence synthesis methods could produce insights as to what aspects of the context particularly impact the effectiveness of the teaching. By taking a closer look at the existing program evaluations through the lens of the factors identified in this study we might determine what parts of the interventions work for whom, and to what purposes. If we know that any intervention is going to be helpful to some end, then determining the mechanisms at play and the contexts in which they best apply would be helpful to those designing instructional interventions. For example, the TPAC-SM model could be operationalized into a rubric to inventory the elements used in group or individual teaching sessions. By correlating learning outcomes with the quantity, nature, and relationality of the actors involved when teaching evidence synthesis methods through technology, future research could build on my findings to identify stable configurations. Where this doctoral research has made visible local practices that could be effective in other settings, such as online co-teaching and sharing the responsibility of regular updates to library guides, future research could measure the impact of these assemblages on learner and librarian outcomes.

Another possible direction would be more in-depth study of the embodied practices of online teaching for librarians, following the trend towards more research on embodied pedagogies in higher education noted in a recent systematic review (Hegna & Ørbæk, 2021). As noted, due to the limitation of collecting data remotely, I did not fully account for the embodied, physical aspects of the labour and practices involved in teaching evidence synthesis methods. As online, hybrid, and in-person teaching formats and the accompanying educational technologies continue to evolve, investigations of how bodies, material, and spaces intra-act will provide additional insight into labour and practices.

The tensions in librarian professional identities suggested further exploration of librarians' identities as researchers, both in evidence synthesis research and in primary research. Others have made similar suggestions in the context of other emerging roles within academic libraries, such as research data management.

> Do RDM's view themselves as librarians, technologists, researchers, or a mix of the three. The important research question is: what are the consequences of the RDM's professional allegiance to, for example, service delivery, development, and career prospects for RDM managers. (Andrikopoulou et al., 2022, p. 361).

Whereas this doctoral research project did not set out explicitly to explore librarians' professional, research, or teaching identities, the findings suggested that these topics are central to understanding the role of academic librarians in supporting evidence synthesis research at their respective institutions. Future research could add to what we know about why and how disciplinary researchers collaborate with librarians (Logan, 2023), the perceptions of librarians as researchers (Babb, 2021), and the research practices of librarians. Through these various avenues of inquiry, we could examine the implications of academic librarians' identifying as variously or simultaneously as service providers, administrators of library services and resources, teachers, technologists, or researchers. As noted in Chapter Seven, further exploration of the relationships between organizational factors, such as labour relations in academic settings, and professional identity could also help to situate differences in teaching practices and librarian work.

From a quantitative perspective, scholars have detailed the amount of time information specialists spent on each co-authored comprehensive review project to be between two and over 200 hours. In Bullers and colleagues' study (2018), the instructional component was a small fraction of the hours, likely due to the focus of the study on librarians as co-investigators. No known studies have quantified the amount of time academic librarians spend teaching or consulting on evidence synthesis methods when they are not full collaborators. Nor have any studies attempted to measure the amount of labour involved in developing the searching and teaching expertise (i.e., professional development) to provide evidence synthesis support for students and other researchers. The findings from this dissertation suggested failing to account for these types of work done by academic health librarians has been a significant oversight that has implications for workload and burnout.

8.8 Concluding Comments

Conducting this research and writing this dissertation has been a deeply personal experience, in large part due to the entanglement of the topic with my own professional identity as a librarian, teacher, and researcher. There have been countless "meta-moments" in my own journey to becoming a sociomaterial researcher when researching how I, in my professional role, can and have contributed to

learners becoming evidence synthesis researchers, more skilled searchers, and evidence-informed practitioners. The challenges that led to the research problems I have investigated arose directly from experiences I have every week, if not every day, in my job as the Evidence Synthesis Librarian at Dalhousie Libraries. I regularly have felt the tensions of purpose and identity described in this dissertation as I have striven to do interesting and rewarding work, support health sciences students in their learning journeys towards becoming health professionals and researchers, and contribute to the library's impact on the broader institution and community. Supporting and teaching systematic searching and evidence synthesis methods has allowed me to do all those things in ways that have brought me great satisfaction, but not without moments of conflict, questioning, and frustration. As this research made clear the entanglement of the many barriers and facilitators across the domains of technology, pedagogy, methods, and organizational structures, I have felt validated in both the joy and strife I experience in my work and teaching practices. Furthermore, my involvement with evidence synthesis methods organizations, such as Cochrane, where information specialists are viewed as essential contributors, but within the constrained domain of searching, has highlighted the implications for the invisible work of librarians to build evidence synthesis capacity in new and future health researchers. Observations from interactions at Cochrane Colloquia and other professional and research conferences I have attended since 2011 have informed my views of the social and organizational contributors to librarians' teaching practices and labour to support evidence synthesis research in HPE.

Having the opportunity to think deeply about the online teaching practices of librarians like myself when supporting evidence synthesis research has been incredibly rewarding. This research process and the findings have brought me rich insights that I have carried with me into conversations with learners as well as with local, national, and international groups of librarians, researchers, and educators. Many of these discussions have been with others who have similarly entangled identities crossing over and between groups and professions. For example, throughout 2023 and 2024 I have attended and contributed to multiple meetings of health professions educators, evidence synthesis researchers, clinicians, and librarians for both interprofessional and intra-professional discussions about increasing research capacity for rigorous and impactful evidence syntheses. Every one of those meetings has raised concerns about the rapid expansion of methods, within and beyond health sciences, including the challenges of keeping up with appropriate emerging methodological guidance and the development of supportive and disruptive technologies for conducting reviews. Academic health sciences librarians have been far from the only group grappling with these challenges, but my research has suggested we may be uniquely positioned and equipped to help point out connections, contribute to capacity

building initiatives, reduce research waste by helping learners align research questions and review methods, and more.

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APPENDIX A: RESEARCH ETHICS BOARD APPROVAL

Final Ethics Amendment Approval Text from Email

REB # 2021-5642 Amendment Approval
ethics@dal.ca <ethics@dal.ca>
Fri 6/3/2022 3:11 PM
To: Robin Parker <Robin.Parker@Dal.Ca>;Mike Smit <Mike.Smit@Dal.Ca>
Cc: Research Ethics <ethics@dal.ca>
Social Sciences & Humanities Research Ethics Board
Amendment Approval
June 03, 2022
Robin Parker
University Libraries\Library (Kellogg)
Dear Robin,
REB #: 2021-5642
Project Title: Librarian instruction of methods for evidence synthesis: A digital sociomaterial ethnographic study
The Social Sciences & Humanities Research Ethics Board has reviewed your amendment request and has approved this amendment request effective today, June 03, 2022.
Sincerely,
Dr. Karen Foster, Chair

Original Ethics Approval Text from Email

REB # 2021-5642 Letter of Approval
ethics@dal.ca <ethics@dal.ca>
Fri 2021-06-11 10:45 AM
To: Robin Parker <Robin.Parker@Dal.Ca>
Cc: Mike Smit <Mike.Smit@Dal.Ca>; Annie Laroche <annie.laroche@Dal.Ca>; Caroline Sequeira <Caroline.Sequeira@Dal.Ca>; Research Ethics <ethics@dal.ca>
Social Sciences & Humanities Research Ethics Board
Letter of Approval
June 11, 2021
Robin Parker
University Libraries\Library (Kellogg)
Dear Robin,
REB #: 2021-5642
Project Title: Librarian instruction of methods for evidence synthesis: A digital sociomaterial ethnographic study
Effective Date: June 11, 2021
Expiry Date: June 11, 2022
The Social Sciences & Humanities Research Ethics Board has reviewed your application for research involving humans and found the proposed research to be in accordance with the Tri-Council Policy

Statement on *Ethical Conduct for Research Involving Humans.* This approval will be in effect for 12 months as indicated above. This approval is subject to the conditions listed below which constitute your on-going responsibilities with respect to the ethical conduct of this research.

Effective March 16, 2020: Notwithstanding this approval, any research conducted during the COVID-19 public health emergency must comply with federal and provincial public health advice as well as directives from Dalhousie University (and/or other facilities or jurisdic□ons where the research will occur) regarding preventing the spread of COVID-19.

Sincerely,

Dr. Karen Foster, Chair

FUNDED

APPENDIX B: RECRUITMENT INSTRUMENTS AND MESSAGES

I. Study invitation letter to librarians

Subject: Invitation to participate in research study – librarian instruction of methods for evidence syntheses

Dear colleagues,

I'd like to invite you to participate in my doctoral research studying the teaching practices of Canadian academic health librarians who support learners with review projects. I'm conducting an ethnographic study with a focus on the social and material/technical factors that influence the online instruction of evidence synthesis methods. This includes, but is not limited to, teaching comprehensive searching. The findings will be published as part of my doctoral work and may also contribute to conversations about continuing professional education regarding review support in academic libraries or generate recommendations for technological support related to evidence synthesis methods instruction.

This research has been reviewed and approved by the Research Ethics Board at Dalhousie University and is part of my doctoral studies which are funded in part by the Killam Trust.

You are invited to participate in any of the online data collection methods used for this study: focus groups, observation of evidence synthesis instruction, and individual interviews. Participation is open to any academic librarian who provides evidence synthesis methods instruction (including, but not limited to, comprehensive searching instruction) to health professions trainees (e.g. learners in programs of any level for medicine, nursing, dentistry, physical therapy, occupational therapy, nutrition, psychology, etc.). If you provide individual and/or group evidence synthesis methods instruction to any of these types of learners at least once per month, you may choose to participate in all or any of the means of contributing data.

Participation in this study is completely voluntary and can be withdrawn at any time and for any reason prior to data analysis (up to one month after any given collection of data). In the event that you choose to withdraw from the study, all personal information and responses you have provided will be destroyed.

To learn more about this study and confirm that you meet the screening criteria, please complete the form at this link. You are also encouraged to forward this message to other librarians who may be interested. I will be in touch with eligible participants to provide additional information and schedule next steps.

Please also feel free to contact me (robin.parker@dal.ca or 902-401-2541) or Research Ethics, Dalhousie University at (902) 494-1462, or email: ethics@dal.ca (and reference REB file # 2021-5642) if you have any questions about this study.

Thank you for your time and consideration,

Robin Parker

Robin Parker, MLIS, PhD(c) [she/her]
Evidence Synthesis & Information Services Librarian

Robin.Parker@Dal.Ca

DALHOUSIE LIBRARIES | W.K. Kellogg Health Sciences Library
Cross-Appointed: Dept. of Community Health & Epidemiology
Doctoral Candidate and Killam Scholar, Interdisciplinary PhD, Faculty of Graduate Studies

DALHOUSIE UNIVERSITY

http://libraries.dal.ca/Kellogg

Dalhousie University is located in Mi'kma'ki, the traditional and unceded territory of the Mi'kmaq. We are all Treaty people.

II. Study invitation letter to learners

Subject: Invitation to participate in research study – librarian instruction of methods for evidence syntheses

Hello,

I am writing seeking consent to observe the upcoming online research consultation you booked with [librarian] on [date] at [time]. Attached to this email is a consent form with more details about the study, including what is involved in the research, what you will be asked to do, and about any benefit, risk, inconvenience, or discomfort you might experience. Can you please let [librarian] know if this is okay with you? I'll formally ask for your consent at the beginning of your meeting with [librarian]. **Participation in this study will in no way impact the support you may receive from your librarian.**

My name is Robin Parker. I am an Evidence Synthesis Librarian at Dalhousie University, and at the same time I'm a doctoral student trying to better understand the online instructional practices of Canadian academic librarians. I'm focusing on librarians who support health sciences learners working on evidence synthesis projects, trying to understand the elements that influence librarians' work with learners and evidence synthesis methods. The findings from the study may help inform future librarian training and continuing education, or generate recommendations for technological support related to evidence synthesis methods instruction.

This research has been reviewed and approved by the Research Ethics Board at Dalhousie University and is part of my doctoral studies which are funded in part by the Killam Trust.

At this point, [librarian] hasn't told me anything about you, which is why you got this letter from them and not directly from me. Participation in this study is completely voluntary and can be withdrawn at any time up to 2 weeks after the research consultation observation. At the start of the session, you will be given the opportunity to confirm your consent and ask any questions you may have about the research. **Participation in this study will in no way impact the support you may receive from your librarian.** In the event that you choose to withdraw from the study after data has been collected, all personal information and observations about the session will be destroyed.

Please also feel free to contact me (robin.parker@dal.ca or 902-401-2541) or Research Ethics, Dalhousie University at (902) 494-1462, or email: ethics@dal.ca (and reference REB file # 2021-5642 if you have any questions about this study.

Thank you for your time and consideration,

Robin Parker

Robin Parker, MLIS, PhD(c) [she/her]
Evidence Synthesis & Information Services Librarian

Robin.Parker@Dal.Ca

DALHOUSIE LIBRARIES | W.K. Kellogg Health Sciences Library
Cross-Appointed: Dept. of Community Health & Epidemiology
Doctoral Candidate and Killam Scholar, Interdisciplinary PhD, Faculty of Graduate Studies

DALHOUSIE UNIVERSITY

http://libraries.dal.ca/Kellogg

Dalhousie University is located in Mi'kma'ki, the traditional and unceded territory of the Mi'kmaq. We are all Treaty people.

III. Knowledge Synthesis Interest Group member meeting recruitment script

"As most of you know, I'm Robin Parker and you may also know that I'm working on my PhD at Dalhousie. I'm looking at the work we do as academic health librarians to support learners who are doing review projects. Specifically, I'm using qualitative methods to study the social and material factors that come into play when we teach knowledge synthesis methods in online settings. So, I'm interested in how various technologies and texts, social pressures and relationships influence our online teaching of comprehensive searching and the other steps of the review process. Through this research, I'm hoping to shine a light on some of the invisible parts of the work we do to teach about knowledge synthesis methods, especially when teaching remotely.

This research has been reviewed and approved by Ethics at Dalhousie.

You're invited to participate in the online focus groups, observations of online teaching, or individual interviews through Zoom. Don't worry, you don't have to agree to do all three. I'm adding a link to the chat where you can read a bit more about my study and answer a few screening questions to see if you meet eligibility, which mostly involves teaching about reviews the learners in health programs. If you do, I'll send you the detailed consent letter with all the info and next steps. Thanks, everyone!"

[Add to chat: "Recruitment and screening for - https://forms.office.com/r/1bWbKQmd9r. Please also feel free to contact me (robin.parker@dal.ca or 902-401-2541) or Research Ethics, Dalhousie University at (902) 494-1462, or email: ethics@dal.ca (and reference REB file # 2021-5642) if you have any questions about this study."]

APPENDIX C: LIBRARIAN INSTRUCTION OF METHODS FOR EVIDENCE SYNTHESES STUDY RECRUITMENT SCREENING FORM

(See form: https://forms.office.com/r/1bWbKQmd9r)

Section 1: Research project description

This ethnographic research is being conducted as part of Robin Parker's Doctoral research. The project uses a sociomaterial lens to focus on librarian experiences and practices when teaching evidence synthesis methods in online environments. The research consists of multiple data collection methods, including focus groups reflecting on online workshop material, observations of remote evidence synthesis consultations, and follow-up interviews.

Section 2: Screening questions

1. I work in a Canadian library affiliated with an academic centre that trains learners in medicine, nursing, and/or other health professions.
    a. Yes – go to next question
    b. No – go to next section
2. I support evidence synthesis projects at my institution by providing individual and/or group instruction to learners.
    a. Yes – go to next question
    b. No – go to next section
3. I provide online individual and/or group instruction related to evidence synthesis projects at least once per month, on average.
    a. Yes – go to next question
    b. No – go to next section
4. I am interested and willing to participate in this English-language research project.
    a. Yes – go to next question
    b. No – go to next section
5. Please indicate your interest in the ways you can participate [Likert scale]:
    a. Focus group reflecting on material from an online workshop (asynchronous discussion board) [Summer 2021] > Interested / Not interested / Unsure
    b. Focus group reflecting on material from an online workshop (synchronous Zoom group call) [Summer 2021] > Interested / Not interested / Unsure
    c. Having your remote synthesis methods consultation observed [Summer/Fall 2021] > Interested / Not interested / Unsure
    d. Online interview to follow up on observations [Fall 2021/Winter 2022] > Interested / Not interested / Unsure
6. Please provide your full name below
7. Please provide your email address below
8. Please confirm your email address below

Section 3: Please recommend other librarians who may be interested in participating in this research.

Please provide the names and/or contact information for any colleagues who may meet the criteria and be interested in participating in this research.

Section 4: Thank you for your interest in my research.

If you meet the criteria for participation, you will be contacted with the consent letter and further information.

APPENDIX D: LIBRARIAN CONSENT FORM LETTER

DALHOUSIE UNIVERSITY

CONSENT FORM

Project title: Librarian instruction of methods for evidence synthesis: A digital sociomaterial ethnographic study

Lead researcher: Robin Parker, Dalhousie University, robin.parker@dal.ca

Other researchers
Dr. Mike Smit [PhD supervisor], School of Information Management, Faculty of Management, Dalhousie University, mike.smit@dal.ca
Dr. Jill Hayden, Department of Community Health & Epidemiology, Faculty of Medicine, Dalhousie University, jhayden@dal.ca
Dr. Anna MacLeod, Division of Medical Education, Faculty of Medicine, Dalhousie University, anna.macleod@dal.ca
Dr. Erna Snelgrove-Clarke, School of Nursing, Faculty of Health Sciences, Queen's University, erna.snelgroveclarke@queensu.ca

Funding provided by: This research is part of Robin Parker's doctoral studies, which are funded, in part, by the Killam Scholarship Trust.

LIMES Consent Letter V2.0

Introduction
We invite you to take part in an ethnographic study being conducted by, Robin Parker, who is a Doctoral candidate in the Interdisciplinary program at Dalhousie University. This study is part of Robin's doctoral research exploring the online teaching experiences and practices of academic health librarians when supporting learners working on evidence synthesis projects. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on your employment, professional standing, or studies if you decide not to participate in the research. The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.
You should discuss any questions you have about this study with Robin Parker. If you have questions later, please contact Robin Parker, robin.parker@dal.ca. Please ask as many questions as you like.

Purpose and Outline of the Research Study
The purpose of this ethnographic study is to explore academic librarians' experiences and practices teaching online when helping health sciences learners with evidence synthesis methods. This study will explore the networks of technology, texts, material objects, as well as social and organizational influences involved in academic health librarians' online instruction of evidence synthesis methods. This methods instruction includes, but is not limited to, training regarding comprehensive search skills for evidence synthesis projects, such as systematic and scoping reviews. Data collected via focus

groups, observations of teaching, and interviews with librarians who provide this type of instruction will be analyzed. The goal of this research is to better understand how different social and material elements are important to the process of teaching synthesis methods to learners and to illuminate the invisible work of academic librarians when teaching evidence synthesis methods online.

Who Can Take Part in the Research Study
You may participate in this study if you are an academic librarian who supports learners in medicine and/or other health professions (such as nursing, dentistry, pharmacy, physical therapy, occupational therapy, etc.) AND you provide online individual (i.e. research consultation) or group instruction related to evidence syntheses (including, but not limited to, comprehensive searching) at least once a month, on average. The number of years teaching ES methods is not a screening criterion; any amount of experience is welcome. Participation in this study is limited to librarians working at Canadian institutions and the learners they instruct in ES methods.

What You Will Be Asked to Do
This research includes multiple forms of data collection and you may choose to participate in any, all, or none of the methods. These methods include the following:

1) Online synchronous or asynchronous focus groups with discussion (text-based and/or group discussion on Zoom). You will be given access to a discussion board on padlet.com where material from an online comprehensive searching workshop will be shared and prompting questions will be posted. Questions will ask you to reflect on the materials posted and your own experience teaching evidence synthesis methods online. You will be given the opportunity to participate in one of two focus groups:
    a. One focus group will be completely asynchronous and the online discussion forums will be open for the two weeks when you can respond at whatever time is convenient. Prompts/reminders will be sent out to encourage participation. Participants in this group will be given the opportunity to participate in a follow up, videoconferenced (Zoom) discussion.
    b. A second focus group will include access to an identical online asynchronous discussion forum for viewing the workshop material (for three days) as well as a synchronous, videoconferenced focus group discussion of approximately one hour using the same questions. Participants in this group will also have the opportunity to post in the discussion forum for 48 hours after the focus group.
2) Observations of online research consultation involving ES methods instruction. After confirming with the librarian participant that the session is in support of a student-led ES project (not a librarian-conducted ES search for a faculty or staff project), the researcher (RP) will ask that a copy of the student consent letter be forwarded to the learner. If they do not object, RP will join during the online, remote research consultation and will confirm formal consent, then observe the interactions while taking notes. If all participants agree, the session will be video and audio recorded to support later data collection and analysis. Over the course of six months, you may be observed for up to three training/consultation sessions.

3) Interviews of librarian participants who have had one or more evidence synthesis instruction session(s) observed. The interview will be 45-60 minutes long with multiple questions about your experience with ES instruction and the technology and tools used to support that training. Questions may be supported by viewing clips of the recorded observation of online research consultation involving ES methods instruction. You will be asked to participate in a single, videoconferenced interview using Zoom or Teams at a time that is convenient to you.
4) Participant Characteristics Questionnaire. A link to a short, online questionnaire will be sent to you by email and will take approximately 5-10 minutes to complete. The questionnaire includes eight questions related to the general characteristics of your work and life experience in relation to teaching evidence synthesis methods online; the responses are open text format.

Possible Benefits, Risks and Discomforts
Participating in this study may lead to reflection on current practices related to teaching and learning evidence synthesis methods, which could enhance teaching and professional practice. In addition, although participating in the study might not directly benefit you, but we might learn things that will benefit others who are developing their instructional skills or practices related to evidence synthesis methods instruction. The findings of this study could be used to inform continuing professional development for librarians who teach evidence synthesis methods.

The risks associated with this study are minimal, but some people find personal reflection, watching recordings of yourself, and peer observation of work activities to involve judgement and may feel uncomfortable. How one's experience is embodied in a social, material, and interconnected world is essential to the sociomaterial perspective, but it can also be uncomfortable and novel to reflect on how your lived, personal experience affects your professional practices. There will be no questions about job performance or employment evaluation, other than an item on the questionnaire about whether synthesis methods instruction is considered part of your job description and/or evaluation. You may stop participating during the data collection or ask to stop viewing recording clips at any time if you feel uncomfortable. There are no other known risks for participating in this research beyond the impact on time constraints and workload. Each type of data collection is optional and is designed to be relatively brief and scheduled at your convenience to minimize that impact.

Compensation / Reimbursement
Participants will not be compensated, and will not incur expenses.

How your information will be protected:
Privacy:
Your participation in this research will be known only to the Dalhousie University members of the research team and other participants in the focus groups (if applicable). Robin Parker will be responsible for obtaining consent and collecting data. Your participation will not be shared without your consent with any parties beyond the Dalhousie research team, such as employers, colleagues, or professional associations. Email and scheduling communications will not include subject lines that disclose your participation in this research. If you participate in a focus group as part of this study, your identity may be able to be determined by other participants depending on the information you share and the mode of the focus group. In addition, for participation in the synchronous focus group participant names and voices will be visible/audible on the videoconference platform.

Confidentiality:
The information that you provide to us will be kept confidential. Only the research team will have access to this information. The people who work with us have an obligation to keep all research information confidential. All your identifying information (such as your name and contact information) will be securely stored separately from your research information. We will use a participant number (not your name) in our written and computer records so that the research information we have about you contains no names. During the study, all electronic records will be kept secure in an encrypted file on the researcher's password-protected computer. All paper records will be kept secure in a locked filing cabinet located in Robin Parker's office at Dalhousie University.

We will describe and share our findings in Robin Parker's dissertation, conference presentations, journal articles, and other forms of dissemination and knowledge translation, such as recommendations for continuing education or other librarian training. Any data you provide that is included in the findings will be de-identified prior to publication or other dissemination. This means that you will not be identified in any way in our reports.

Limits to confidentiality: Participants are expected to maintain confidentiality of other parties involved, but we cannot guarantee they will maintain confidentiality from the shared participation sessions.

Data retention:
Once the study is over your data will be de-identified by removing personal and institutional names from the transcripts and masking identifying characteristics or labels of teaching sessions. The de-identified transcripts and discussion posts will be stored in a research repository (such as Dalhousie Dataverse) to allow for re-use by the research team for future research, or other researchers, subject to approval by a Research Ethics Board. There are no plans to destroy the de-identified data; copies of the of the data that include identifying information will be destroyed once a key has been created and a copy has been created without identifiers.

Data repositories:
Information about this research (aka meta-data) may be shared publicly in digital form via the internet to advance knowledge. With your consent, I plan to deposit de-identified data in a research database such as Dalhousie Dataverse. I will remove or replace personal information that could identify you before the data (e.g. remove mentions of your name, library, university or specific training workshops from transcripts) are shared in an effort to ensure that no one will be able to identify you. Despite these measures, I cannot guarantee your anonymity or predict how those who access the data will use them. Access to the research data will be restricted to researchers who have obtained ethics approval for re-use of research data. You may decline having your individual data deposited.

If You Decide to Stop Participating
You are free to leave the study at any time. If you decide to stop participating during the study, you can decide whether you want any of the information that you have provided up to that point to be removed or if you will allow us to use that information. After participating in the study, you can decide for up to two weeks if you want us to remove your data. After that time, it will become impossible for us to remove it because it may already be analyzed and potentially presented and/or published.

How to Obtain Results
I will share the redacted transcription from the interview with you (if applicable) for member checking

prior to analysis. In addition, preliminary findings in the final codebooks and initial themes (with participants anonymized) will be shared in reports via email with all interested participants. You will be informed of presentations and publications sharing the final study results and copies will be sent via email. You can indicate interest in receiving results by including your contact information at the end of the signature page. After completion of the study, I will send you a message offering the options of the full report (draft manuscript) or a summary of findings and recommendations, depending on your preference.

Questions

We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Robin Parker (at 902 494-8961, robin.parker@dal.ca) or Mike Smit (at 902 494-1901, mike.smit@dal.ca) at any time with questions, comments, or concerns about the research study. We are happy to address any questions over phone, email, or videoconference (Zoom or Microsoft Teams).

If you have any ethical concerns about your participation in this research, you may also contact Research Ethics, Dalhousie University at (902) 494-3423, or email: ethics@dal.ca (and reference REB file # 2021-5642).

Signature Page

Project title: Librarian instruction of methods for evidence syntheses: A sociomaterial ethnographic study

Lead researcher: Robin Parker, Dalhousie University, robin.parker@dal.ca

You may also copy this page into an email response sent from your institutional email to provide electronic consent. Please indicate your choices to the participation options in the table below.

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I understand that I have been asked to take part in a focus group and/or a teaching observation with follow-up interview all of which will occur online. I agree to take part in this study. I realize that my participation is voluntary and that I am free to withdraw from the study at any time, until 2 weeks after participating in the study.

Name	Signature	Date
_____	_____	_____

Options (you can still participate in the research if you select no):

I agree to participate in the asynchronous online focus group (via Padlet)	☐Yes ☐No
I agree to participate in the synchronous online focus group (via Padlet and Zoom)	☐Yes ☐No

I agree that direct quotes from my focus group contributions may be used without identifying me	☐Yes ☐No
I agree to online observations of my ES methods instruction (subject to separate consent from the learner)	☐Yes ☐No
I agree to video and audio recording of the observed ES methods instruction (subject to separate consent from the learner)	☐Yes ☐No
I agree that screen captures of shared screens during the evidence synthesis methods consultation may be used without identifying me (images cropped to remove identifying elements)	☐Yes ☐No
I agree to an online videoconference interview	☐Yes ☐No
I agree that my interview may be video and audio-recorded (only audio retained)	☐Yes ☐No
I agree that direct quotes from my interview may be used without identifying me	☐Yes ☐No
I agree to have my de-identified data included in a research data repository (individual data, such as interview transcripts, will only be released to researchers with research ethics approval)	☐Yes ☐No

_____ _____ _____

Name Signature Date

Please provide an email address below if you would like to be sent a summary of the study results.

Email address: _____

APPENDIX E: LEARNER CONSENT FORM LETTER

DALHOUSIE UNIVERSITY

CONSENT FORM

Project title: Librarian instruction of methods for evidence syntheses: A digital sociomaterial ethnographic study

Lead researcher: Robin Parker, Dalhousie University, robin.parker@dal.ca

Other researchers
Dr. Mike Smit [PhD supervisor], School of Information Management, Faculty of Management, Dalhousie University, mike.smit@dal.ca
Dr. Jill Hayden, Department of Community Health & Epidemiology, Faculty of Medicine, Dalhousie University, jhayden@dal.ca
Dr. Anna MacLeod, Division of Medical Education, Faculty of Medicine, Dalhousie University, anna.macleod@dal.ca
Dr. Erna Snelgrove-Clarke, School of Nursing, Faculty of Health Sciences, Queen's University, erna.snelgroveclarke@queensu.ca

Funding provided by: This research is part of Robin Parker's doctoral studies, which are funded, in part, by the Killam Scholarship Trust.

Introduction
We invite you to take part in an ethnographic study being conducted by, Robin Parker, who is a Doctoral candidate in the Interdisciplinary program at Dalhousie University. This study is part of Robin's doctoral research exploring the online teaching experiences and practices of academic health librarians when supporting learners working on evidence synthesis projects. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on your studies, research support, or library access if you decide not to participate in the research. The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.

You should discuss any questions you have about this study with Robin Parker. If you have questions later, please contact Robin Parker, robin.parker@dal.ca. Please ask as many questions as you like.

Purpose and Outline of the Research Study

The purpose of this ethnographic study is to explore academic librarians' experiences and practices teaching online when helping health sciences learners with evidence synthesis methods. This study will explore the networks of technology, texts, material objects, as well as social and organizational influences involved in academic health librarians' online instruction of evidence synthesis methods. This methods instruction includes, but is not limited to, training regarding comprehensive search skills for evidence synthesis projects, such as systematic and scoping reviews. Data collected via focus

groups, observations of teaching, and interviews with librarians who provide this type of instruction will be analyzed. The goal of this research is to better understand how different social and material elements are important to the process of teaching synthesis methods to learners and to illuminate the invisible work of academic librarians when teaching evidence synthesis methods online.

Who Can Take Part in the Research Study
You may participate in this study if you are a learner in medicine or other health professions (such as nursing, dentistry, pharmacy, physical therapy, occupational therapy, etc.) and are remotely consulting or otherwise receiving online training from an academic librarian regarding evidence synthesis methods (including, but not limited to, comprehensive searching).

What You Will Be Asked to Do
This research includes multiple forms of data collection but the only one that involves learners is virtual observations of individual instruction (aka research consultations) involving evidence synthesis methods.

Robin Parker will join during the online, remote research consultation and will ask for consent to observe the interactions while taking notes. If all participants agree, the session will be video and audio recorded using separate software to support later data collection and analysis.

Receiving evidence synthesis support from a librarian in no way depends on your agreement to participate in this study. You do not need to do anything different during the consultation than you would any other time you meet virtually with a librarian.

Possible Benefits, Risks and Discomforts
Participating in this study may lead to reflection on current practices related to teaching and learning evidence synthesis methods, which could improve your learning experience. In addition, although participating in the study might not directly benefit you, but we might learn things that will benefit librarians who are developing their instructional skills or practices related to evidence synthesis methods support. The findings of this study could be used to inform continuing professional development for librarians who teach evidence synthesis methods.

The risks associated with this study are minimal, but some people find observation of learning activities to involve judgement and may feel uncomfortable. The researcher will not ask you any questions to evaluate your learning or understanding of evidence synthesis methods. You may stop participating during the data collection at any time if you feel uncomfortable. There are no other known risks for participating in this research.

Compensation / Reimbursement
Participating in observations for this research project does not involve any compensation.

How your information will be protected:
Privacy:
Your participation in this research will be known only to the librarian assisting you and Dalhousie University members of the research team and the librarian participant providing your research consultation. Robin Parker will be responsible for obtaining consent and collecting data. Beyond the Dalhousie research team, your participation will not be shared without your consent with any parties, such as employers, colleagues, or supervisors. Email and scheduling communications will not include subject lines that disclose your participation in this research.

Confidentiality:
The information that you provide to us will be kept confidential. Only the Dalhousie research team will have access to this information. The librarian helping you and any people who work with us have an obligation to keep all research information confidential. All your identifying information (such as your name and contact information) will be securely stored separately from your research information. We will use a participant number (not your name) in our written and computer records so that the research information we have about you contains no names. During the study, all electronic records will be kept secure in an encrypted file on the researcher's institutional OneDrive storage. All paper records will be kept secure in a locked filing cabinet located in Robin Parker's office at Dalhousie University.

We will describe and share our findings in Robin Parker's dissertation, conference presentations, journal articles, and other forms of dissemination and knowledge translation, such as recommendations for continuing education or other librarian training. Any data you provide that is included in the findings will be de-identified prior to publication or other dissemination. This means that you will not be identified in any way in our reports.

Limits to confidentiality: Participants are expected to maintain confidentiality of other parties involved, but we cannot guarantee they will maintain confidentiality from the shared participation sessions, such as observations. However, academic librarians have the additional obligation of confidentiality regarding the instructional support they provide to individuals.

Data retention:
Once the study is over your data will be de-identified by removing personal and institutional names from the fieldnotes and masking identifying information. The de-identified fieldnotes and any non-identifying screen captures will be stored in on my institutional OneDrive to allow for re-use by the research team for future research. There are no plans to destroy the de-identified data. Copies of the of the data that include identifying information will be destroyed once a key has been created and a copy has been created without identifiers or once the data have been analyzed to anonymize observations of individual sessions.

Data repositories:
Information about this research (aka meta-data) may be shared publicly in digital form via the internet to advance knowledge. No original data from the observations (field notes, recordings, or screen captures) will be included in the data repository, but the codebook created by analyzing all of the observations will be deposited with only anonymized information. Access to the research data for the overall project will be restricted to researchers who have obtained ethics approval for re-use of research data.

If You Decide to Stop Participating
You are free to leave the study at any time. If you decide to stop participating during the study, you can decide whether you want any of the information that you have provided up to that point to be removed or if you will allow us to use that information. After participating in the study, you can decide for up to two weeks if you want us to remove your data. After that time, it will become impossible for us to remove it because it may already be analyzed and potentially presented and/or published.

How to Obtain Results

We will not have your contact information to provide follow-up or results, but if you are interested, you are welcome to follow up with the research team directly to request the full report (draft manuscript) or a summary of findings and recommendations.

Questions

We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Robin Parker (at 902 494-8961, robin.parker@dal.ca) or Mike Smit (at 902 494-1901, mike.smit@dal.ca) at any time with questions, comments, or concerns about the research study. We are happy to address any questions over phone, email, or videoconference (Zoom or Microsoft Teams).

If you have any ethical concerns about your participation in this research, you may also contact Research Ethics, Dalhousie University at (902) 494-3423, or email: ethics@dal.ca (and reference REB file # 20XX-XXXX).

At the beginning of the observation session, you will have the opportunity to provide oral consent to the following options (you can still participate in the research if you select no to some of them):

I agree to online observations of my evidence synthesis methods instruction	☐Yes ☐No
I agree to video and audio recording of the observed ES methods instruction	☐Yes ☐No
I agree that screen captures of shared screens during the evidence synthesis methods consultation may be used without identifying me (images cropped to remove identifying elements)	☐Yes ☐No

APPENDIX F: FOCUS GROUP MATERIAL AND GUIDE

Focus Group 2 (asynchronous)

Planned asynchronous, text-based session (conducted on Padlet.com: https://padlet.com/robin_parker2/36w94t2btlg051nf)

Instructional material to prompt reflection

Material from systematic review workshop created by academic librarians (e.g. Session materials from LIB261 found here https://libguides.kcl.ac.uk/systematicreview/train)

1. Slide deck(s)
2. worksheet(s)
3. linked resources

Directions to participants

Email and included on discussion board:

This focus group is part of a sociomaterial ethnographic study examining how academic librarians instruct learners in the methods to conduct evidence synthesis (ES) research, including, but not limited to comprehensive search methods. This part of the data collection involves group reflection on instructional material with the purpose of exploring how librarians engage with the research methods content, technology, pedagogical approaches, and various other resources and materials when teaching ES to groups in online environments. Thank you very much for taking the time to participate and contribute. As a reminder, more details about the study can be found in the Consent Letter, which was emailed to you. Please note that Padlet.com stores data on servers in the United States; for your privacy, you are encouraged to only use your first name in posts and omit naming your institution.

Please take as much time as you need to look through the teaching material posted here and reflect on the questions based on your impressions of this teaching material and your own experience teaching comprehensive searching and/or other aspects of ES methods. Feel free to respond to other participants comments or add new posts. You may also want to post links to resources or material you have used in your own ES methods instruction; you are encouraged to redact personal and institutional information prior to posting.

Questions

1. Please comment on the ways you see knowledge synthesis methods content presented here; what do you like, dislike, do similarly or different?
2. Please comment on the ways you see various technologies presented here; what do you like, dislike, do similarly or different?

3. Please comment on the ways you see pedagogical approaches presented here; what do you like, dislike, do similarly or different?
4. How would you envision engaging with learners in a virtual environment around ES methods using this workshop material?
5. How would you envision engaging with learners in a virtual environment using this workshop material to demonstrate technologies involved with conducting ES/KS projects?
6. What other texts, technology, or material would you or do you use or refer to when you are teaching ES methods to groups online/remotely?
7. What other ES methods content do you teach or touch on when doing group instruction, such as seminars or workshops?
8. What stands out to you about the teaching materials shared here?
9. How have you handled technological challenges when teaching ES methods? For example, issues with the videoconferencing software? Or problems with the databases or systematic review management software? Can you describe an instance when you needed to navigate software or other technology that wasn't working as expected?

Additional possible prompts:

1. Can you use an example from your own teaching that is similar than the material from this exemplar workshop?
    a. How is it similar? Material? Technology? Content? Teaching approach?
2. Can you use an example from your own teaching that is different than the material from this exemplar workshop?
    a. How is it different? Materials? Technology? Content? Teaching approach?

Prompting email reminders

[After the start of the focus group with all questions posted on the Padlet board, an email will be sent to highlight an additional question every few days (ie. questions 1 and 2 sent out 48 hours after the start of the focus group period, questions 1,2, and 3 sent out 72 hours after the previous email, etc.)]

Thank you for agreeing to participate in the focus groups for my doctoral research on librarian instruction of evidence synthesis methods. Please consider taking 15-30 minutes in the next few days to reflect on the teaching material posted on Padlet (https://padlet.com/robin_parker2/36w94t2btlg051nf) and address some or all of the questions below:

1. Please comment on the ways you see knowledge synthesis methods content presented here; what do you like, dislike, do similarly or different?
2. Please comment on the ways you see various technologies presented here; what do you like, dislike, do similarly or different?
3. Please comment on the ways you see pedagogical approaches presented here; what do you like, dislike, do similarly or different?
4. How would you envision engaging with learners in a virtual environment around ES methods using this workshop material?
5. How would you envision engaging with learners in a virtual environment using this workshop material to demonstrate technologies involved with conducting ES/KS projects?
6. What other texts, technology, or material would you or do you use or refer to when you are teaching ES methods to groups online/remotely?

7. What other ES methods content do you teach or touch on when doing group instruction, such as seminars or workshops?
8. What stands out to you about the teaching materials shared here?
9. How have you handled technological challenges when teaching ES methods? For example, issues with the videoconferencing software? Or problems with the databases or systematic review management software? Can you describe an instance when you needed to navigate software or other technology that wasn't working as expected?

Synchronous Focus Group via Zoom

As above regarding access to material on Padlet.com, email with instructions, and questions asked during the focus group, plus oral consent script for online videoconferenced focus group. Participants will have access to review questions and materials in a duplicated discussion board for three days in advance and will also be asked the same questions orally.

Email following synchronous focus group session:

Thank you for participating in a focus group for my study on librarian instruction of methods for evidence syntheses (LIMES). I have opened comments on the discussion board [link] if you would like to add anything else to the conversation. Please note that Padlet.com stores data on servers in the United States; for your privacy, you are encouraged to only use your first name in posts and omit naming your institution. You may also want to post links to resources or material you have used in your own ES methods instruction; you are encouraged to redact personal and institutional information prior to posting. I will close comments and lock the board in 48 hours. After that, you are welcome to email me directly with any additional information or questions related to this study.

Asynchronous & synchronous Focus Group

As for above plus a slightly modified oral consent script for online videoconferenced focus group. The latter will be slightly modified to reflect that access to Padlet and comments preceded the asynchronous session.

APPENDIX G: OBSERVATION FORM

Librarian instructor [institution]:	Learner type and level [if known]:
Research questions	Observation Starting Points:
(1) What invisible work do academic health librarians engage in to provide online instructional support to learners about evidence synthesis methods, including, but not limited to, literature search methods? **(2) What social and material factors influence this work?**	9 Dimensions – based on James Spradley (1980): 1. Space: the physical place or places 2. Actor: the people/technology/material involved 3. Activity: a set of related acts people do 4. Object: the physical things that are present 5. Act: single actions that people do 6. Event: a set of related activities that people carry out 7. Time: the sequencing that takes place over time 8. Goal: the things people are trying to accomplish 9. Feeling: the emotions felt and expressed Spradley, J. (1980). Participant observation. New York: Holt, Rinehart and Winston. P. 78

Observations	Memos

APPENDIX H: INTERVIEW GUIDE

Semi-Structured Interview Guide

[Main questions: “what” and “how” with probes related to failures and breakdowns (Adams & Thompson, 2016, p. 49; MacKenzie & Dalmer, 2020, p. 6).]

Consent script

“Thank you for your interest in my research and for agreeing to participate in my doctoral study. I’m examining the teaching practices and experiences of academic librarians who support health sciences learners working on evidence synthesis projects. As you are now aware, I’m Robin Parker and the lead researcher on this ethnographic research project. I work at Dalhousie University and am also an Interdisciplinary PhD candidate there. This part of the research is an opportunity for me to prompt some further reflections on how you engage with learners, technology, textual and digital material, as well as other elements when you are teaching methods for evidence synthesis projects. This interview will follow a semi-structured format with some prepared questions, but we may follow up on additional ideas. [I have also prepared a few short clips from the recording of the research consultation(s) I observed with you to help us refer to specific interactions (if applicable)]. Before we start, I’d like to confirm that you have read the explanation of the study in the consent letter and have had the opportunity to ask any questions and have your concerns addressed. With your permission I will start recording … Now that the recording has started can you please verbally confirm consent to participate in my research, including the option to have individual data deposited in a data repository..”

Definitions/scope of research

“For the purpose of this research, librarian instruction of methods for evidence syntheses includes group and individual (or team) instruction delivered by an academic health librarian to audiences that include health professions learners. The content of the instruction can be related in any way to ES methods, including, but not limited to differentiating types of ES, the steps of systematic, scoping, or other reviews, how to conduct a comprehensive search, tools and technologies used for ES projects (e.g. database searching, citation management software, review management software, project management or team communication software, etc.). Instruction related to evidence-based practice more generally, the basics of how to search for literature, or how to navigate library resources for academic work broadly is not included in this research. Since ES is a component of EBP and literature searching skills may be applied to a range of types of projects, I understand that the boundaries may not be entirely distinct. However, for the purpose of this interview, try to keep in mind and limit discussion to instruction and training where the learners intended to complete or work on any type of research synthesis, following established standards and guidelines. In addition, this research not focused on the role of academic librarians conducting mediated searches for ES projects; in other words, this study examines the instructional and consultative roles of librarians, and not their contributions as authors or team members on ES projects.”

Interview questions

1. Demographics
    a. How long have you worked as an academic librarian supporting health profession learners?
    b. What programs and types of learners do you work with, in particular for ES instruction?
    c. Is knowledge synthesis/systematic review support or instruction part of your job description? If so, approximately how much of your role are you expected to dedicate to supporting or teaching KS methods?
    d. Whether or not ES methods instruction is included in your job description, approximately what proportion of your work time do you spend preparing or delivering ES methods instruction, including assessing learners and providing feedback?
2. What online ES instruction have you done in the past year?
    a. Individual/small group?
    b. Large group?
3. How do you conduct that instruction?
    a. What tools and technology do you employ in order to teach? (e.g. email, videoconferencing software, chat software, appointment booking tools, online registration platforms, etc.)?
    b. What tools, resources, and technologies do you teach as part of the ES methods content?

[If available, clips of the observation recording will be used to highlight specific interactions with the learner and/or technology and other material. Clips will be selected and prepared following guidance from Iedema et al., 2019 and Ajjawi et al., 2020.]

4. [Optional prompts following previous question] I was able to observe your interactions with learners and noted several types of interactions with technology, including the videoconferencing software, citation databases, etc. Here are some examples of the types of interactions I observed. [Show short (30-60 second) clips of recording, not more than 4-5 minutes total].
    a. Reflecting on the behaviours and interactions shown in these clips, do you feel this is typical of your evidence synthesis teaching? In what way is it or is it not typical?
    b. Are there any other technologies or materials that you employ often (or rarely) when teaching KS methods and/or comprehensive searching?
    c. How do you decide which technologies and materials to use in your instructional sessions (both individual or group)?
5. In what ways do you engage with the technology/materials and the learner(s)?
    a. How have you handled technological challenges when teaching ES methods? For example, issues with the videoconferencing software? Or problems with the databases or systematic review management software?
    b. Can you describe an instance when you needed to navigate software or other technology that wasn't working as expected?
    [The impact of disruption in technology is a way of understanding its role in sociomaterial approaches.]
6. Describe some of the ways that you prepare for individual research consultations related to ES projects when it involves a student project (in other words, you will not be developing and conducting the comprehensive search yourself).
    a. How do you ask the learner to prepare for the ES research consult?

7. Describe the ways, if any, that you interact with ES methods organizations, such as Cochrane, JBI, Campbell, etc.? For example, are you a member or author with any ES organization?
    a. What standards or guidance do you refer to in your instruction?
8. How has the instruction related to ES methods changed as a result of teaching remotely since the start of the pandemic?
9. The details about how you developed the skills and competencies you use when teaching KS methods (including comprehensive searching) is beyond the scope of this project. However, I'd like you to reflect on one surprising thing you have had to learn to do your best supporting learners with KS methods? For example, has there been a particular skill (or set of skills) or type of knowledge that you did not have when you started in your role that you wish you had gained or known sooner?

APPENDIX I: PARTICIPANT CHARACTERISTICS QUESTIONNAIRE

Link to questionnaire: https://forms.office.com/r/6D15u3VKmF

Questionnaire description and questions

LIMES participant characteristics
Questionnaire description [included at in the email to participants along with link and at the start of the Microsoft Form itself]:

You previously consented to participating in this study, where the detailed context and our commitment to confidentiality was described to you through the consent form previously signed. A blank copy of the complete consent form can be viewed and downloaded here: <https://dalu-my.sharepoint.com/:b:/g/personal/rb605371_dal_ca/EXcNqY3p2BlGiDaHaSKiKy0BeLo1efE3WVcudR_HoNjYyA?e=6iRQaM>. Through the data collection and preliminary analysis process, we have identified value in asking for a bit more information about your personal context to inform further analysis.
As such, the purpose of this form is to collect contextual information about the librarian participants in the Librarian Instruction of Methods for Evidence Synthesis (LIMES) ethnographic study and **will take approximately 5-10 minutes to complete**. In this study, evidence synthesis (ES) methods instruction refers to group or individual support and training for any part of the research process for comprehensive reviews (e.g. knowledge syntheses, systematic reviews, scoping reviews, etc.), including, but not limited to comprehensive searching.
Any details provided here will not be reported in any way that can be linked to individual responses or in such a way that would allow readers to identify participants, but will aid my analysis and interpretation of data collected through the other parts of this study. **You may complete any or none of these questions, and may close the browser at any time without submitting at all.** For any question marked in the system as required, you may simply indicate you don't wish to respond in the text box to proceed. By completing the questionnaire and voluntarily submitting your responses, you are giving consent for the information provided to be used to inform analysis and to be presented in summary format in study reports. Thank you, again, for being part of this study.

*1. As this survey is administered anonymously, please provide your name here. Names will not be reported in connection to responses here or in other parts of the LIMES study data collection. Linking questionnaire responses and data from the other data collection methods by way of numbered (redacted) cases will help me contextualize responses through my analysis.
[open text box]
*2. How long have you worked as an academic librarian supporting health professions learners?
[open text box]
*3. What programs and types of learners do you work with, in particular for evidence synthesis methods (including but not limited to comprehensive searching instruction)? For example, what disciplines (e.g. nursing, medicine, psychology, etc.) and levels (undergraduate, graduate, residents, etc.) attend any workshops or consultations you offer?
[open text box]

*4. Is knowledge synthesis/systematic review support or instruction part of your job description or included in your performance evaluation?
[Select response]
Yes
No
Maybe/sort of
Other
*5. If so, approximately how much of your role are you expected to dedicate to supporting or teaching KS methods? Responses can be the proportion of your job (e.g. 20%) or approximate hours per week, on average (e.g. 4 hours per week).
[open text box]
*6. Whether or not ES methods instruction is included in your job description, approximately what proportion of your work time do you spend preparing or delivering ES methods instruction, including assessing learners and providing feedback? This includes any group/class sessions as well as individual consultations. Responses can be the proportion of your job (e.g. 20%) or approximate hours per week, on average (e.g. 4 hours per week).
[open text box]

*Reflexivity and Context

Reflexivity is an important part of qualitative research for both the researcher and the participants. The contextual information provided here will help me gain a rich understanding of the factors you view as important and will be incorporated into the analysis exploring the networks of human and non-human contributors.

*7. In addition to the work context information requested above, is there anything about how you self-identify or your lived experience that influences how you approach teaching ES methods in the online environment? This could be any characteristics or history, such as your age, past profession(s), relationship with ability or disability, family status, cultural background, etc. Anything that comes to mind when considering the material, technological, and social world in which you teach and engage with ES methods and learners.
[open text box]
8. Is there anything else you would like to tell me about your work and experience providing online synthesis methods instruction to health sciences learners?
[open text box]

APPENDIX J: RESEARCH DATA MANAGEMENT PLAN

Data files for repository

1. De-identified/redacted text from asynchronous, online focus group (one .txt file per question)
2. De-identified/redacted text from synchronous, online focus group (one .txt file per question)
3. De-identified/redacted transcript from synchronous, online focus group (single .txt file)
4. De-identified/redacted notes from observations (one PDF file per observation session)
5. De-identified/redacted interview transcripts (one .txt file per interview)

Data management plan

Research phase **[who has access]**	**Focus Group 1 (Summer 2021) (synchronous only)**	**Focus Group 2 (Fall 2021) (synchronous and asynchronous)**	**Observations (Fall 2021 – Winter 2022)**	**Interviews (Spring 2022)**	**Participant Characteristics Questionnaire (Summer 2022)**
Recruitment [Robin Parker]	Email to listserv > Screening form on Microsoft Office Forms	Email to listserv > Screening form on Microsoft Office Forms	Librarians: Email to listserv > Screening form on Microsoft Office Forms	Email to listserv > Screening form on Microsoft Office Forms	N/A
Consent [Robin Parker]	Email from screening form > e-signature on PDF or email consent	Email from screening form > e-signature on PDF or email consent	*Librarians* > Email from screening form > e-signature on PDF or email consent *Learners* > oral consent recorded in observation notes and/or Panopto recording	Email from screening form > e-signature on PDF or email consent	Prior consent to other data collection methods; Link to study information and blank consent form in Questionnaire pre-amble
Data Collection	Type of data: text; audio and video	Type of data: text; audio and video	Type of data: fieldnotes (text); audio and video	Type of data: text, audio and video	Type of data: textual

Research phase **[who has access]**	**Focus Group 1 (Summer 2021) (synchronous only)**	**Focus Group 2 (Fall 2021) (synchronous and asynchronous)**	**Observations (Fall 2021 – Winter 2022)**	**Interviews (Spring 2022)**	**Participant Characteristics Questionnaire (Summer 2022)**
[Robin Parker]	Format of data: mp3 & .mp4 files; .txt file of chat Technology used: padlet.com; Zoom Storage: padlet.com; Zoom files saved to personal work laptop; transferred Dalhousie OneDrive	Format of data: website discussion posts; Technology used: Zoom Storage: padlet.com; Zoom files saved to personal work laptop and then transferred Dalhousie OneDrive	Format of data: PDF and .mp3/.mp4 files Technology used: participant institutional videoconference software AND Dalhousie panopto; Notability on iPad Pro for fieldnotes Storage: Video and audio = Panopto; field notes = Notability iPad Pro and back-up to Dalhousie OneDrive	Format of data: .mp3 & .mp4 files; .txt file of chat Technology used: Zoom Storage: Zoom files saved to personal work laptop and then transferred Dalhousie OneDrive	Format of data: .csv file Technology used: Microsoft Forms Storage: Dalhousie OneDrive
Data Processing [Robin Parker]	Transcribe audio using Otter.ai Redact transcripts and replace with pseudonym/ participant number	Export discussion boards to PDF; Copy discussion posts and comments to Word; Remove identifying information and replace with	Transcribe audio using Otter.ai; Redact field notes to remove identifying information and replace with participant/ learner/ institution	Transcribe audio using Otter.ai; Move video file to NVivo; Redact transcripts to remove identifying information; Create participant/ institution key	Match responses to participant key Redact names

Research phase [who has access]	Focus Group 1 (Summer 2021) (synchronous only)	Focus Group 2 (Fall 2021) (synchronous and asynchronous)	Observations (Fall 2021 – Winter 2022)	Interviews (Spring 2022)	Participant Characteristics Questionnaire (Summer 2022)
		participant numbers/pseudonyms; Create separate participant key; Transcribe audio using Otter.ai; Redact transcripts and replace with pseudonym/ participant number	numbers or pseudonyms; Create key for institution de-identification; Review of video to add to memos and field notes [RP only]; Screen captures of video without identifying information (save as .png files)		
Data Analysis [Robin Parker]	Import Word file of transcript, video files into NVivo; Create interim codes; Identify actors, assemblages, and networks	Import Word file of transcript, video files into NVivo; Create interim codes; Identify actors, assemblages, and networks	Import PDF files into NVivo; Create interim codes; Identify actors, assemblages, and networks	Import Word file of transcript, video files into NVivo; Create interim codes; Identify actors, assemblages, and networks	Create redacted case descriptions for each participant in NVivo Summarize work characteristics Describe range of reflexivity responses Responses inform analysis of other data
Data Preservation [Robin Parker]	Save de-identified posts to TXT files AND Save redacted	Save de-identified posts to TXT files AND Save redacted transcripts to TXT files;	Only de-identified fieldnotes saved as redacted PDFs	Save redacted interview transcripts as TXT files	Save summary descriptions of responses as TXT files

Research phase **[who has access]**	**Focus Group 1 (Summer 2021) (synchronous only)**	**Focus Group 2 (Fall 2021) (synchronous and asynchronous)**	**Observations (Fall 2021 – Winter 2022)**	**Interviews (Spring 2022)**	**Participant Characteristics Questionnaire (Summer 2022)**
	transcripts to TXT files; Archive data in Dalhousie Dataverse	Archive data in Dalhousie Dataverse	Archive data in Dalhousie Dataverse	Archive data in Dalhousie Dataverse	
Data Access [public metadata; data available to public/researchers upon request]	Metadata and readme TXT files open access; TXT files of redacted discussion posts, comments, and transcript accessible upon request to research team.	Metadata and readme TXT files open access; TXT files of redacted discussion posts, comments, and transcript accessible upon request to research team.	Metadata and readme TXT files open access	Metadata and readme text files open access; TXT files of redacted transcripts accessible upon request to research team.	Metadata and readme text files open access; TXT files response summary accessible upon request to research team.
Data Reuse [public metadata; data available to researchers upon request]	As above with creative commons acknowledgement and ethics approval.	As above with creative commons acknowledgement and ethics approval.	As above with creative commons acknowledgement and ethics approval.	As above with creative commons acknowledgement and ethics approval.	As above with creative commons acknowledgement and ethics approval.

APPENDIX K: ARCHIVE OF INTERNET RESOURCES

Thesis Section	Site; URL	Archive links; Dates
1.4.2	Cochrane Handbook; https://training.cochrane.org/handbook/current	https://archive.ph/ruUu4; 7 Sep 2021 https://archive.ph/ihIJd; 22 Aug 2024
1.4.2	JBI Reviewer Manual; https://jbi-global-wiki.refined.site/space/MANUAL	https://archive.ph/r47el; 22 Aug 2024
2.3	Search Translation Resources (2024 version); https://dal.ca.libguides.com/systematicreviews/searchstrategies#s-lg-box-wrapper-19379202	https://archive.ph/QYSY2; 22 Aug 2024
2.7	EPPI-Centre Training; https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3317	https://archive.ph/iniwJ; 23 Aug 2024
2.7	Cochrane Interactive Learning; https://training.cochrane.org/interactivelearning	https://archive.ph/PSjKt; 22 Aug 2024
2.7	The John Hopkins MOOC on Coursera; https://www.coursera.org/learn/systematic-review#modules	https://archive.ph/8JiGT; 19 Aug 2023 https://archive.ph/LP9vk; 22 Aug 2024
2.7	Stockholm Environment Institute online course; https://systematicreviewmethods.github.io/	https://archive.ph/WQshS; 22 Aug 2024
2.7	Toronto Metropolitan University Short Course; https://pressbooks.library.torontomu.ca/graduatereviews/	https://archive.ph/qMUxD; 22 Aug 2024
2.7	Campbell Collaboration course; https://oli.cmu.edu/courses/systematic-reviews-and-meta-analysis-o-f/	https://archive.ph/p7VsJ; 22 Aug 2024
4.3.3	LIB 261 Search Techniques for Systematic Reviews taught at Kings College London; https://libguides.kcl.ac.uk/systematicreview/train	https://archive.ph/slJhK; 22 Aug 2024

Thesis Section	Site; URL	Archive links; Dates
5.4	Dalhousie Knowledge Synthesis Guide; https://dal.ca.libguides.com/systematicreviews	http://archive.today/x4Tof; 26 May 2024
5.4.1	University of Manitoba Knowledge syntheses & Systematic Reviews Guide, 2024 Systematic Review Workshop Series; https://libguides.lib.umanitoba.ca/RFHS-KSsupport/2024SRWS	http://archive.today/wWeSy ; 26 May 2024
5.4.1	University of Manitoba Knowledge syntheses & Systematic Reviews Guide, Other Past Workshops; https://libguides.lib.umanitoba.ca/RFHS-KSsupport/OtherWorkshops#s-lg-box-wrapper-19810805	http://archive.today/x0Fml; 26 May 2024
5.4.1	UofT Grey Literature Guide; https://guides.library.utoronto.ca/c.php?g=577919&p=4123572	http://archive.today/Eqvpy; 26 May 2024
5.4.2	Unity Health Review Decision Tool; https://guides.hsict.library.utoronto.ca/SMH/systematic/decisiontool	http://archive.today/hgcHc; 26 May 2024
5.4.2	Dalhousie Libraries KS Guide, MEDLINE to Embase video; https://dal.ca.libguides.com/systematicreviews/searchstrategies#s-lib-ctab-16412193-0	http://archive.today/op0qz; 26 May 2024
5.4.3	University of Alberta Library Systematic Reviews, Scoping Reviews, and Health Technology Assessments - Searching the Literature; https://guides.library.ualberta.ca/systematic-reviews/search-filters	https://archive.ph/a1VuQ; 22 Aug 2024
5.4.4	Yale Library Systematic Searching Video Tutorials; https://library.medicine.yale.edu/tutorials/subjects/systematic-searches	https://archive.ph/vR1bH; 23 Aug 2024
5.5	University of Calgary Systematic Review Skills Curriculum; https://libguides.ucalgary.ca/SRskills	https://archive.ph/XRDdH; 23 Aug 2024
5.5	Dalhousie Libraries KS Guide – Covidence page; https://dal.ca.libguides.com/systematicreviews/CovidenceHelp	https://archive.ph/aOMd0; 23 Aug 2024
6.3.1	Dalhousie Libraries Evidence Synthesis Librarian Booking Form;	https://archive.ph/Ntd1a; 22 Aug 2024

Thesis Section	Site; URL	Archive links; Dates
	https://outlook.office365.com/book/RobinParker@dalu.onmicrosoft.com/	
6.3.1	University of Western Ontario Request Form; https://www.lib.uwo.ca/forms/systematicreview/consultation-course.php	https://archive.ph/H5FGY; 22 Aug 2024
6.3.1	Right Review Decision Tool; https://rightreview.knowledgetranslation.net/	https://archive.ph/qk6bg; 24 Aug 2024
6.3.1	University of Toronto Gerstein Science Information Centre's Guide to Comprehensive Searching; https://guides.library.utoronto.ca/comprehensivesearching	https://archive.ph/jDVe7; 24 Aug 2024
6.3.3	Dalhousie KS Guide, Search Documentation: Best Practices; https://dal.ca.libguides.com/systematicreviews/searchstrategies#s-lib-ctab-16349158-5	https://archive.ph/GIXh0; 24 Aug 2024
7.3.1	Special Ovid Filters for MEDLINE; https://ospguides.ovid.com/OSPguides/medline.htm#limits	https://archive.ph/wAl5S; 23 Aug 2024
7.3.1	Dalhousie Libraries Research Camp Research Synthesis Modules; https://dal.ca.libguides.com/ResearchCamp/modules#s-lib-ctab-16776882-5	https://archive.ph/UbMQB; 25 Aug 2024
Other	Introduction to Systematic Review Searching Workshop, Geoffrey and Robyn Health Sciences Library, University of Alberta; https://sites.google.com/ualberta.ca/introductiontosystematicreview/home	http://archive.today/hAd3q; 7 Jun 2021