JLSC

ISSN 2162-3309 | JLSC is published by the Pacific University Libraries | http://jlsc-pub.org

Volume 7, General Issue (2019)

Grey Literature: Use, Creation, and Citation Habits of Faculty Researchers across Disciplines

Kristen Cooper, Wanda Marsolek, Amy Riegelman, Shannon Farrell, & Julie Kelly

Cooper, K., Marsolek, W., Riegelman, A., Farrell, S., & Kelly, J. (2019). Grey Literature: Use, Creation, and Citation Habits of Faculty Researchers across Disciplines. *Journal of Librarianship and Scholarly Communication, 7*(General Issue), eP2314. https://doi.org/10.7710/2162-3309.2314

This article underwent fully-anonymous peer review in accordance with JLSC's peer review policy.

ISSN 2162-3309 10.7710/2162-3309.2314

RESEARCH

Grey Literature: Use, Creation, and Citation Habits of Faculty Researchers across Disciplines

Kristen Cooper
Plant Sciences Librarian, University of Minnesota
Wanda Marsolek
Engineering Liaison and Data Curation Librarian, University of Minnesota
Amy Riegelman
Social Sciences Librarian, University of Minnesota
Shannon L. Farrell
Natural Resources Librarian, University of Minnesota
Julie A. Kelly
Science Librarian: Applied Economics, Ecology, and Horticulture, University of Minnesota

INTRODUCTION Grey literature is ephemeral, and the level to which it is created, used, and cited by faculty, graduate students, and other researchers is not well understood. **METHODS** This electronic survey was distributed to a sample (57%) of the faculty across a wide variety of disciplines with the only criteria based on tenure and tenure-track faculty at the University of Minnesota Twin Cities, a large R1 institution. **RESULTS** Faculty across disciplines both use and create grey literature for several reasons, including its far more rapid publication process. **DISCUSSION** Many faculty in a wide variety of disciplines are using and creating grey literature. The survey illustrates the different types of grey literature that are being used and for what purpose. Other topics, such as how faculty are finding grey literature (via Google Scholar and professional contacts), whether they are citing it, and which types they create (e.g., conference papers, preprints, technical reports) are also discussed. **CONCLUSION** As a result of this survey, librarians can provide support for faculty who use and create grey literature in all disciplines and advocate for and promote grey literature to faculty. With more scholars participating in systematic reviews of grey literature, librarians will need to be more cognizant of where and how it may be discovered.

Received: 03/26/2019 Accepted: 09/08/2019

Correspondence: Kristen Cooper, 85 Magrath Library, 1984 Buford Ave, St. Paul, MN 55108, coope377@umn.edu

IMPLICATIONS FOR PRACTICE

1. Findings confirm that grey literature is being used and created in multiple disciplines, not just the sciences.
2. Librarians can impact faculty's discovery of grey literature outside the existing avenues of Google Scholar and professional contacts.
3. Faculty are using grey literature to stay current on research, which is a reason academic libraries should consider increasing their awareness and collection development of this type of scholarship.

INTRODUCTION

Grey literature is ephemeral in nature and it is not typically published through traditional scholarly channels. It comes in many forms—from conference papers to dissertations to technical reports—and the level of peer review can vary greatly from cursory to a full double-blind review. The full text of grey literature may sometimes be found in disciplinary repositories and institutional repositories (IRs), as well as on government websites. Academic libraries collect grey literature materials to varying degrees, and both commercial indexes and free resources such as Google Scholar may include citations to grey literature items. The level to which it is created, used, and cited by faculty, graduate students, and other researchers is not well understood.

LITERATURE REVIEW

Research about grey literature has been conducted by both disciplinary researchers and practitioners who create, use, and cite it, and also by the librarians and information professionals who collect, manage, index, and make grey literature available. In both cases, the literature tends to focus on a few narrow topics, while other potential areas of investigation, including multidisciplinary studies, remain underrepresented. One of those areas yet to be thoroughly investigated involves comparing the views and practices of researchers across a variety of disciplines, particularly the reasons why they may or may not create, use, or cite grey literature. That is the focus of this project.

In disciplinary work on grey literature, conference literature is a common topic, and there are a number of articles that consider how often the work included in conference presentations is later published as a journal article. These tend to be focused on one narrow subject area or even a particular conference and are more common among disciplines where the only product of a conference presentation is a brief abstract and not a full paper. Works by McRoberts, Ferguson, Schwalm, Timmer, and Ballard (2014) and Fosbøl, Fosbøl,

Harrington, Eapen, and Peterson (2012) in the areas of wildlife management and cardiology, respectively, serve as examples of this type of research, and there are many more in other fields. These studies generally select a conference that took place three to five years ago and search the current journal literature by author and subject to see how many items they can match with particular conference papers. Some authors go a step further and try to explain or look for ways to predict why some conference presentations lead to a journal article and others do not (Nasef, Skidmore, & Shah, 2011; Spencer, Majkowski, & Suda, 2017). Although these particular authors do not extrapolate beyond their own fields, the factors that they identify—such as strong research questions, collaboration among institutions, and active mentorship—could easily be applied to other disciplines.

Individual fields have different practices and attitudes about grey literature, and this is reflected in the research they produce on the topic. Several authors address grey literature in broader discussions about the difficulties in the current scholarly communication system in their particular field and possible solutions for the future. Velden and Lagoze (2010) explore the value of new scientific communication models for chemistry while acknowledging that not everyone in the field embraces the idea of these changes. Works in engineering also focus on conference proceedings in the context of newly emerging forms of communication (Musser, 2016; Shirakawa, Furukawa, Nomura, & Okuwada, 2012). In the health sciences, at least some of the works consider the broader range of grey literature and the challenges in locating it and assessing its value to researchers (J. Adams et al., 2016; Happe & Walker, 2013). One survey of public health researchers found that they placed a high value on grey literature and accessed it in a variety of ways (Hunt & Bakker, 2018). Again, these authors do not take the conclusions that they drew in their own subject areas and suggest that they might apply elsewhere, but readers could take a wider view. Fresh insights about the new landscape of scientific communication—or effective ways to disseminate or search for hard-to-locate materials—could benefit researchers, practitioners, and librarians working in many other fields.

Grey literature is sometimes covered in citation analyses that are conducted by both librarians and disciplinary researchers. Like the conference-paper-to-journal-article studies, they almost always cover a narrow subject area. While the emphasis of citation analyses is seldom on grey literature, they may note one or more types, particularly theses and dissertations, in their data collection and analysis. Grey literature may also be conglomerated so that it is not clear what type (theses and dissertations, working papers, white papers) researchers are finding. The norms of an individual discipline vary in regard to whether it is common or even appropriate to cite some forms of grey literature—such as conference papers and posters or technical reports—which influences their inclusion or exclusion in citation analyses. A few authors have performed citation analyses that focus on conference papers (e.g., Chiware

& Becker, 2018; McMinn & Fleming, 2011). In these two cases the authors had specific research questions that revolved around conference materials. In one case (Chiware & Becker, 2018), the authors wondered about graduate student behavior regarding citations to conference materials in their own theses and dissertations in information technology. In another example (McMinn & Fleming, 2011), the authors wanted to track the influence of one engineering conference over a period of 25 years and used citations as a proxy. Neither of these studies offered large universal truths about grey literature, but they serve as examples for others who might want to study citations to grey literature in their own fields. We do not mean to imply that no work has been done to compare grey literature practices or publications across fields. A few authors, mainly librarians or staff working in centers that study larger topics in higher education, have undertaken projects that cut across disciplines in their approach to grey literature. Harley's research, while focusing on the broader questions of scholarly communication and academic values, compares several disparate subject areas and describes the nature of the literature in each one as well as their sharing practices (Harley, Acord, Earl-Novell, Lawrence, & King, 2010; Harley, Earl-Novell, Arter, Lawrence, & King, 2007). The authors note the importance of preprints in physics and the emerging use of working papers in political science. Nederhof, van Leeuwen, and van Raan (2010) compare nonjournal publications in political science, economics, and psychology. While the emphasis is on books, several kinds of grey literature, including conference proceedings, working papers, and theses, are covered. Sulouff, Bell, Briden, Frontz, and Marshall (2005) interviewed subject librarians who covered 25 disciplines to discover what types of grey literature they were aware of and to gauge the level of requests about grey literature that they received from researchers in these subject areas. They used their findings to recommend actions in regard to grey literature and IRs, including targeting particular departments that might be most likely to have materials to contribute. Kelly (1998) surveyed 70 professional associations across the health sciences to find out the fate of the abstracts of presentations at their annual meetings.

Although on the surface it might not be obvious, grey literature and the study of its production, dissemination, searchability, and value have gained more traction recently due to the rapid growth of systematic reviews and other products of evidence synthesis, such as scoping reviews and meta-analyses. These types of publications have been common in the health sciences for well over a decade, and the numbers outside of that arena are growing each year, especially in nutrition, agriculture, education, and psychology (Riegelman & Kocher, 2018). The premise of systematic reviews is that a thorough and reproducible search on a well-defined research question is performed across a variety of resources. Two groups that produce guidelines for systematic reviews, the Campbell Collaboration and the Cochrane Collaboration, emphasize the importance of specifically seeking out grey literature during the search process (Campbell Collaboration, 2019; Higgins & Green, 2018). Recent

research in the area includes studies on the types of grey literature that are included in systematic reviews, as well as the effect of grey literature on the resulting evidence synthesis (R. J. Adams, Smart, & Huff, 2017; Hartling et al., 2017). Although they are unusual, there are a handful of systematic reviews covering only grey literature in cases where that is where the information is likely to be found. For example, Godin, Kirkpatrick, Hanning, Stapleton, and Leatherdale (2017) limited their searches to grey literature when looking for guidelines for school-based breakfast programs. To investigate the current practices in design, development, and operation of microservices in information technology, Soldani, Tamburri, and Van Den Heuvel (2018) searched for and located industrial documents that covered current practices on the topic.

Further research and more widely disseminated knowledge about grey literature in various fields will allow librarians to more effectively serve on evidence synthesis teams and in other capacities related to open access and dissemination of information. Discoverability of grey literature is one important aspect of these endeavors, and this area of research has expanded recently. For example, Michels and Fu (2014) provide an overview of conference proceedings in various scientific fields in Web of Science, which began indexing them in 2008. The emphasis is on their usage in bibliometric analyses, and it is noted that they are not covered thoroughly by bibliographic indexes, nor are they produced or valued in the same way across disciplines. Marsolek, Cooper, Farrell, and Kelly (2018) consider the availability of grey literature in commercial indexes as well as IRs for a wide variety of subject areas. This study found that over 66% of the 100+ commercial databases and over 90% of the 100+ IRs examined included grey literature, although thoroughness of coverage was an issue in both categories and discoverability was hampered in many of the IRs by the lack of sophisticated search interfaces.

Although there is a growing body of research about grey literature, few studies have examined it across a broad range of disciplines, and gaps remain concerning the differences in the production and use of grey literature between disciplines as well as reasons why researchers may or may not create or cite it. Many have focused their work on analyses of the literature itself and have not gathered information directly from researchers. By surveying researchers across disciplines about the creation, use, and citing of grey literature, this study fills in these gaps.

METHODS

This study intended to examine:

1. Individual faculty experiences with finding, using, and or creating grey literature

2. Differences in how various disciplines interact with and access grey literature
3. Whether the library is meeting the needs of the faculty who are using or creating grey literature
4. What resources or services might assist faculty in working with grey literature

How We Defined Grey Literature

For the purpose of this survey, grey literature is defined as works such as conference papers and posters, working papers, technical reports, versions of articles submitted for publication, dissertations and theses (D&T), and government documents. It does not include books, book chapters, or journal articles published by commercial or traditional publishers.

Study Participants and Survey Distribution

Participants in the survey were recruited based on their employment status as faculty at the University of Minnesota Twin Cities, a large R1 institution with 18 colleges and approximately 2300 faculty members. This was the only selection criteria used. Working with the university's Survey Advisory Team, a random sample of 57% of tenured and tenure-track faculty, or 1300 individuals, was generated. The sample included 1008 tenured faculty and 292 tenure-track faculty. The survey was distributed using Qualtrics and was open from April 10, 2018, to May 10, 2018. One reminder message was sent. Of the total emails sent, only three were undeliverable, bringing the number of individuals reached to 1297.

Survey Instrument

Questions focused on whether or not faculty use, cite, or create grey literature and the reasons behind those choices. The survey was sent to colleagues with survey expertise to check for clarity and understanding prior to distribution. Feedback was incorporated into the final instrument, and examples are listed here as a broad demonstration. For the full survey, please see the appendix.

- Do you use grey literature in your role as a faculty member?
- What are the reasons you do not use grey literature?
- Do you ever cite grey literature in peer-reviewed articles that you write?
- How do you find grey literature?
- Do you create grey literature in your role as a faculty member?

Data Analysis

The data was cleaned using OpenRefine 3.2. Responses were grouped into broad disciplinary categories based on the college and department information provided by the recipients. This was done due to the small number of responses in some disciplines, as well as to maintain respondent anonymity. These broad categories were health sciences, natural sciences, physical sciences, humanities, arts, education, and business. Data analysis consisted of descriptive statistics and Chi-square analysis performed using R 3.5.1 (R Core Team, 2018). For Chi-square analysis, p-values of less than 0.05 were considered to be significant.

RESULTS

Survey Participants

The total number of respondents to the survey was 171, which represented a 13.2% response rate. The majority of participants were full professors (55% of respondents), with fewer in the categories of associate (25.6%), assistant professor (17.5%), and emeritus professor (1.9%). At the University of Minnesota, the overall distribution of faculty is 33% full professors, 29% associate professors, and 38% assistant professors. The majority of respondents stated that they have been active in their discipline for 21+ years (51.6%). Respondents came from fifteen different colleges. The vast majority of respondents were from the Academic Health Center (six colleges combined), representing 33.8%. The colleges with the next highest response rates were the College of Liberal Arts (16.8%), the College of Food, Agricultural, and Natural Resources Sciences (14.4%), and the College of Science and Engineering (13.8%). The remaining colleges response rates totaled 21.2%. Participants represented 75 departments.

Using Grey Literature

When asked if respondents used grey literature, regardless of disciplinary category or time in field, the majority (n=139, 84%; p-value = 2.213e-06) of respondents selected that they did. Figure 1 illustrates use by discipline. Some researchers commented that grey literature was critical to their work:

> "So-called grey literature is critical to my work, and used frequently, whether government reports, white papers, conference papers, or other."

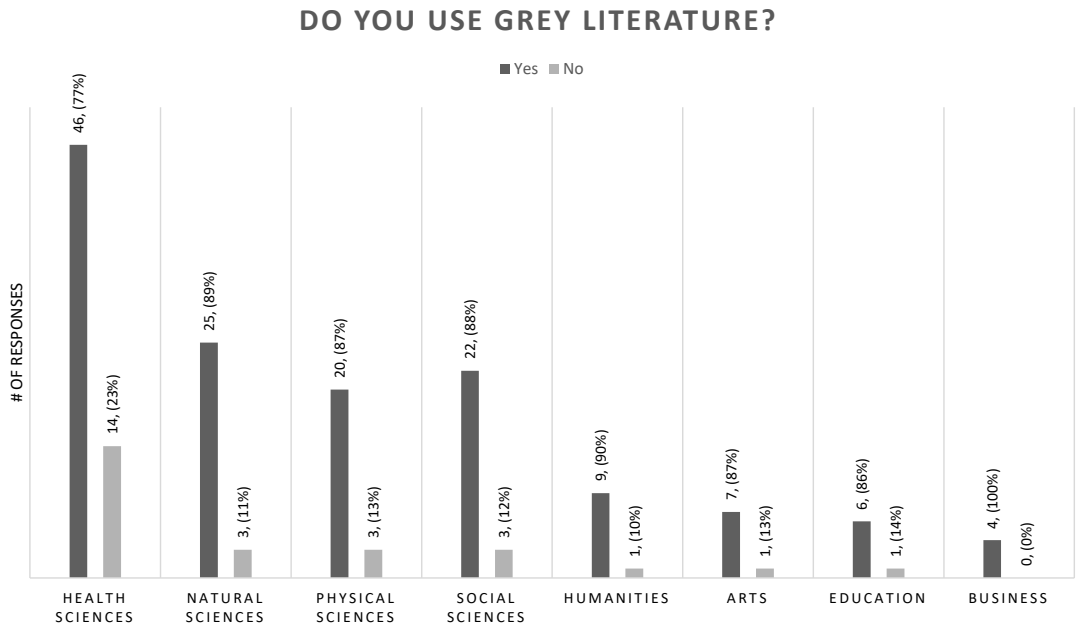

Figure 1. Number of faculty in different disciplines that use grey literature in their work (n=139)

Those who responded that they did not use grey literature (n=26, 16%) were asked to select the reason or reasons why. Reasons for not using grey literature included concerns about quality (n=15, 58%) and lack of stringent peer review (n=13, 50%). Other reasons were irrelevance to field (n=6, 23%), lack of reward or recognition for writing grey literature in their department (n=5, 19%), irrelevance to current position (n=3, 12%), and time constraints (n=2, 8%). There were no distinct trends across the disciplines.

There was not a statistically significant relationship between the types of grey literature used by the different disciplines (see Table 1), except for in the use of working papers and theses/dissertations. Respondents in the social sciences were more likely to indicate that they used working papers, while those in the health sciences were less likely to use them. Respondents in the sciences (physical, social, and natural) were more likely to use theses/dissertations. Among those who responded to the question about what types of grey literature they use (n=136), the following totals were reported: conference papers (n=113, 83%), D&T (n=98, 72%), technical reports (n=94, 69%), government documents (n=84, 62%), preprints (n=75, 55%), and working papers (n=60, 44%) (see Figure 2). The survey revealed that all types of grey literature were used by at least one respondent in each discipline (see Figure 3). However, faculty preferences were distributed differently according to discipline. The type of grey literature most used in the health sciences, social sciences, humanities, arts,

and business disciplines was conference papers. Natural science faculty reported the use of technical reports and D&T. Physical science faculty primarily relied on D&T as their most commonly used grey literature format. Education was an outlier, primarily focusing on preprints. Less used but still common were government documents and working papers. Additionally, free-text answers revealed the use of other types such as media/news documents, nongovernmental organization (NGO) reports, industry reports, Extension publications, and lab research and other documentation used in teaching materials.

Types of Grey Literature	p-value
Conference papers	0.2465
Working papers	4.924e-06
Technical reports	0.1404
Government documents	0.2249
Preprints	0.1185
Theses/Dissertations	0.02179

Table 1. Statistical significance of relationships (p-value <0.05) between use of grey literature by type and discipline.

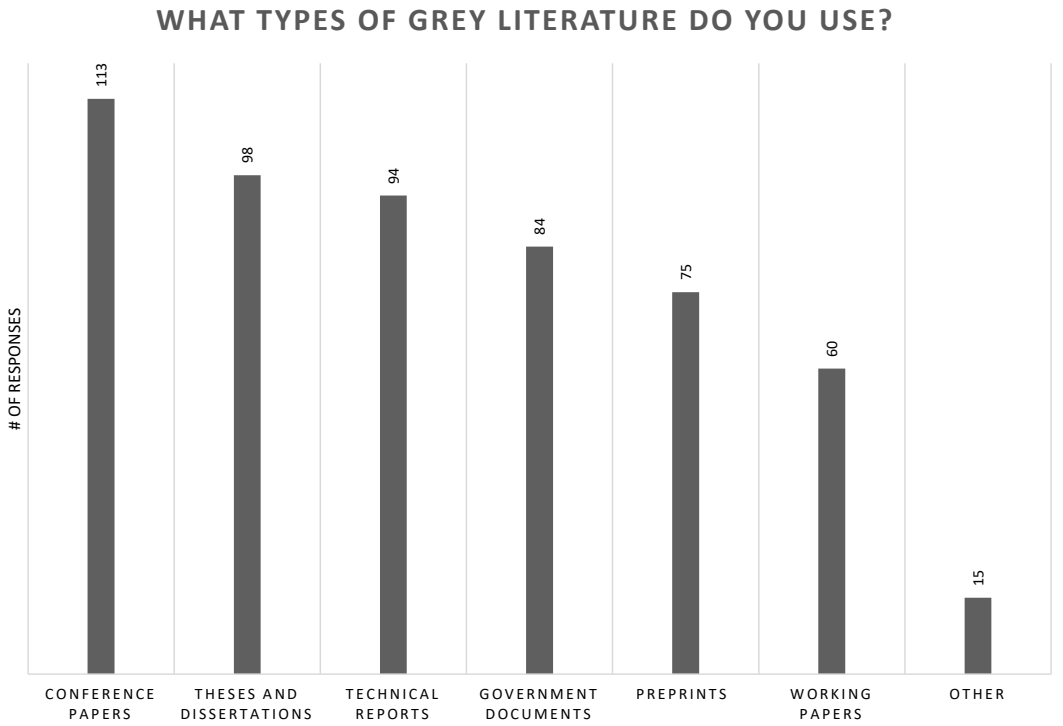

Figure 2. Types of grey literature that faculty use in their work (n=136)

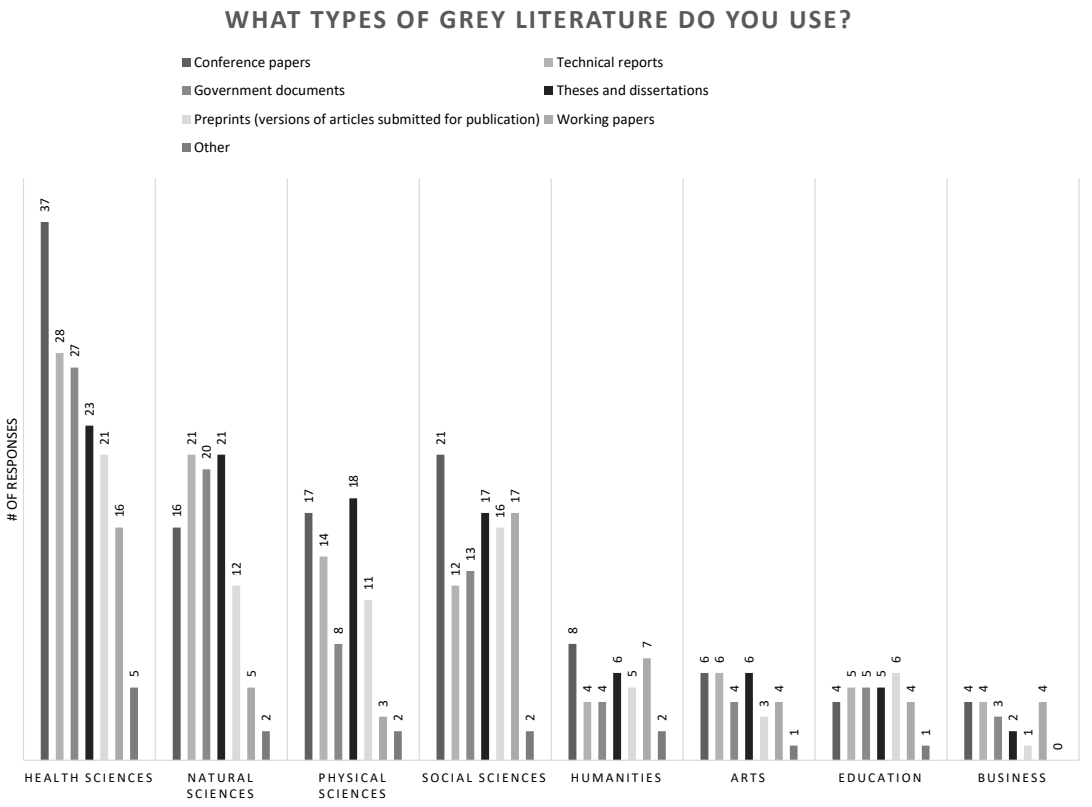

Figure 3. Types of grey literature that faculty use in their work, by discipline (n=136)

When surveyed about how they used grey literature, five main themes emerged: to find open access versions, to keep up with current trends, to locate descriptions of technical methods, to supplement teaching and learning, and to aid in evidence synthesis purposes such as conducting systematic reviews.

Respondents' experience with the lag time of the peer-review process led them to seek out grey literature to keep them informed on emerging research themes, potential research collaborations, and data sets for data synthesis. An example of this would be when a preprint is available in an open access version while the version of record has not yet been published by the journal. The importance of staying current on topics was also mentioned as being helpful when seeking grant funding.

Some respondents were complimentary of the level of detail in technical methods shared in D&T that were not typically captured in traditional journal publications due to word count restrictions. Respondents also found that technical methods available in grey literature

sometimes reveal trending methods and algorithms pertinent to new scholarship, and technical reports within government and NGO documents often include desired methods and statistics.

Inclusion of grey literature in teaching and learning seemed especially helpful not only in terms of course materials but for fostering conversations with graduate students. For evidence synthesis purposes, faculty indicated a desire to access grey literature when acquiring background information, combating publication bias, and responding to expectations (e.g., guidelines from the Cochrane Collaboration for systematic reviews) regarding inclusion of grey literature.

Citing Grey Literature

When asked if respondents cited grey literature in their own work, 89% reported that they did, while 11% did not cite grey literature for various reasons. There was a statistically significant relationship between citation of grey literature and discipline (p-value = 8.315e-06). As for reasons why they did not cite, the top responses were that grey literature was used solely to acquire background information and that they had concerns about its quality. A smaller number of people stated that grey literature was not relevant to their field or current position, that they were unsure how to properly cite it, or that journals do not allow citation. Regarding citation decisions, one researcher responded that citing is acceptable:

> "I think it's OK to use grey literature as long as it is presented with appropriate hedges and limitations. Sometimes it's necessary to cite grey literature because there are often new topics that are not deeply researched in the mainstream literature."

Another stated that they avoid doing it:

> "I try to avoid citing grey literature if at all possible."

Finding Grey Literature

There was not a statistically significant relationship between finding grey literature and discipline (p-value = 0.312). However, when asked about how they found grey literature, Google Scholar and professional contacts were the top two choices in nearly every discipline (see Figure 4). Yet, of the options provided, with two exceptions across the eight disciplines, people in every discipline selected all of the choices at least once. Less-used sources were traditional library resources such as literature indexes/databases, the library catalog, and IRs. Additional answers revealed the use of other methods such as browsing conference

proceedings; searching government, organization, or think-tank websites; and reading social media. Others suggested setting email alerts to capture relevant content published in nontraditional outlets as well as discovering grey literature by retrieving research cited by other scholars in the discipline.

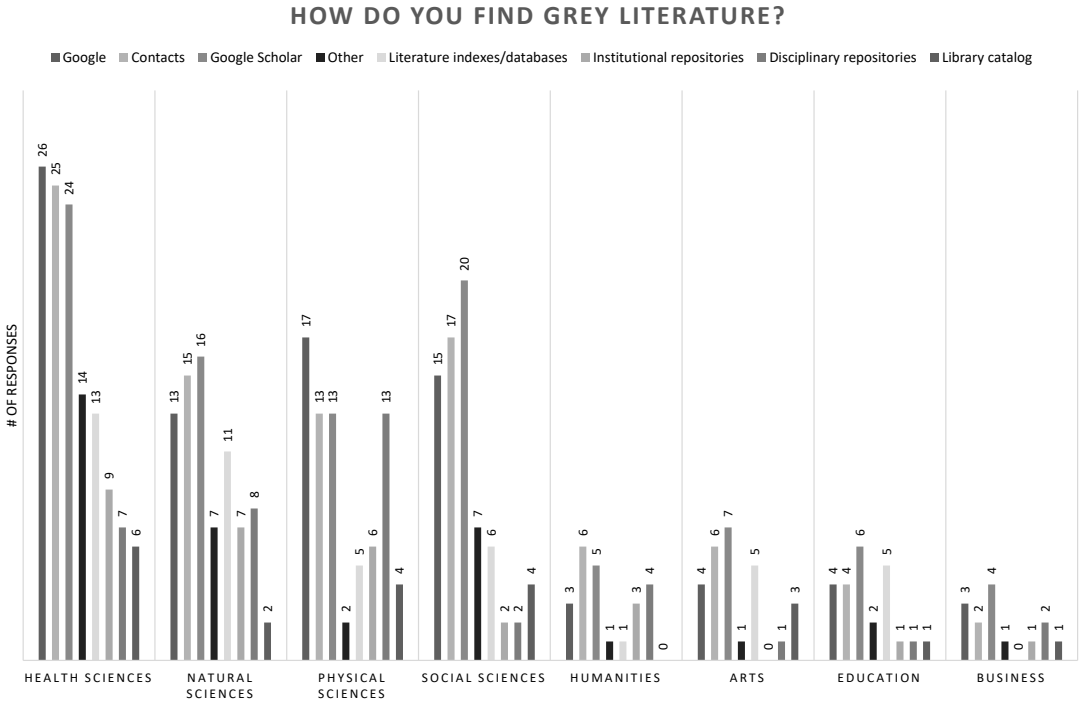

Figure 4. How faculty in different disciplines find grey literature (n=136)

Creating Grey Literature

When asked if respondents created grey literature, approximately 79% (n=126) reported that they did, while 21% (n=34) did not (p-value < 2.2e-16). Considering disciplinary categories, the social sciences demonstrated the highest rate of grey literature creation at 92% (see Figure 5). Some commented on scientific priority aspects of grey literature in their field:

> "Creating and publicizing grey is critical in my field, where the turnaround time between a 'finding' and black publication is often two years. Grey establishes scientific priority."

Another referenced the value of technical reports in their discipline:

> "Conference papers are very common in my field. . . . Also technical reports are written for documenting information on new tools."

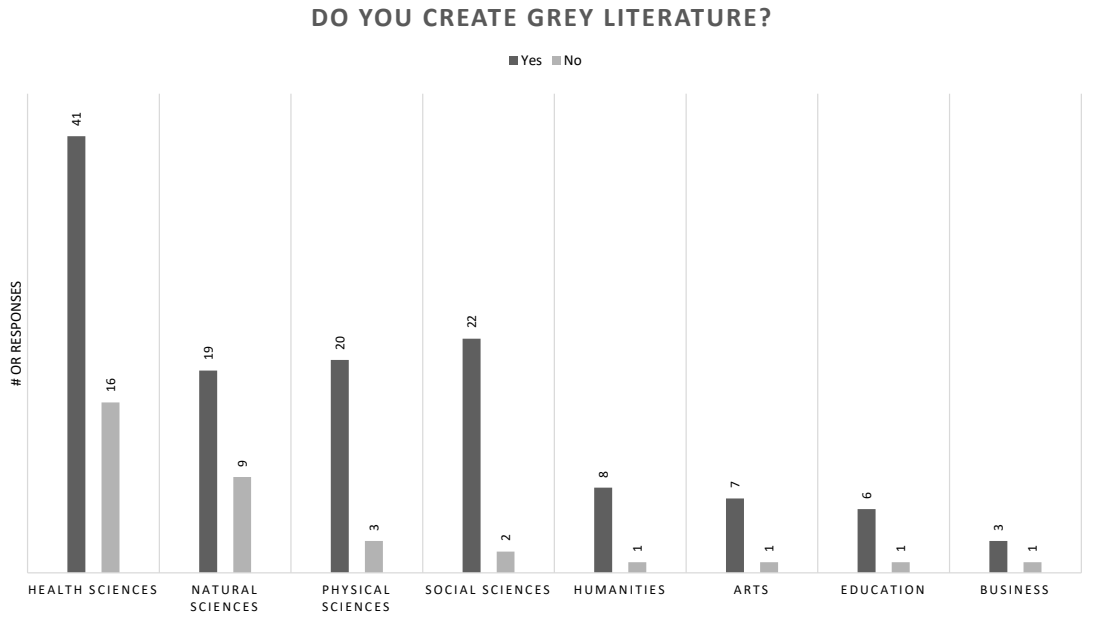

Figure 5. Number of faculty that create grey literature, by discipline (n=158)

There was a statistically significant relationship between the types of grey literature created by the different disciplines, except for the creation of government documents (see Table 2). When asked about what types of grey literature they created, respondents (n=126) were able to select as many as applied. Responses revealed that the document type most frequently created was conference papers (n=91, 72%) followed by preprints (n=55, 43%), technical reports (n=53, 42%), working papers (n=44, 35%), and government documents (n=11, 9%) (see Figure 6). Additional answers revealed that respondents created content in other venues including web pages, blogs, training and assessment materials, supplemental materials (e.g., data), and Extension publications. One respondent mentioned the benefits of communicating quickly via policy briefs:

> "I also create policy briefs, 2-page summaries of research in progress, so that I can communicate with practitioners more rapidly than the peer review process would allow."

Overall, there was a statistically significant relationship between respondents' use and creation of grey literature (p-value = 2.733e-14); those who use grey literature also create it.

Types of Grey Literature	p-value
Conference papers	0.02805
Working papers	0.00181
Technical reports	0.02141
Government documents	0.9356
Preprints	0.002394

Table 2. Statistical significance of relationships (p-value <0.05) between creation of grey literature by type and discipline

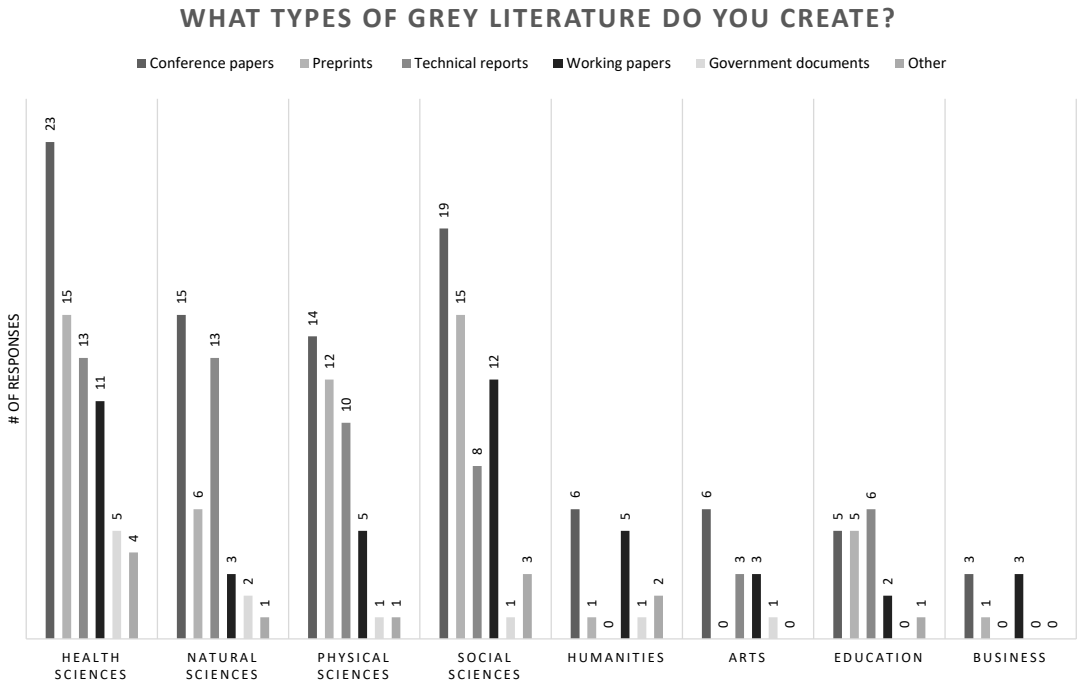

Figure 6. Types of grey literature that faculty create, by discipline (n=127)

For the respondents (n=34) who do not create grey literature, a top reason was that it was not relevant to their current position (n=13, 39%). Other reasons included that creation of grey literature was not rewarded or recognized in their department (n=13, 39%) or field (n=5, 15%), the lack of stringent peer review (n=9, 27%), time constraints (n=10,

30%), and concerns about the quality of grey literature (n=8, 24%). A survey respondent expressed reluctance to create grey literature because publication in traditional outlets is favored for tenure and promotion:

> "In the tenure and promotion stipulations preference is placed on publication in traditional outlets. While I use grey literature for teaching and publication, I do not create them."

DISCUSSION

The authors set out to discover if and how faculty create, use, and find grey literature. Due to the time required for the stringent peer-review process, many faculty seek out grey literature to stay informed about new trends and information in their disciplines. Faculty also create grey literature for the same reason more frequently once they are tenured and publication venues are less scrutinized. We wanted to know more about how faculty in specific disciplines find and use grey literature, and under what circumstances they create it. These findings will help shape how librarians can better support faculty with grey literature through access and preservation.

Across all disciplines, we found a higher use of grey literature than we originally expected. For example, researchers in music, design, and writing all used and created grey literature, which we had not expected. Those three disciplines focused primarily on conference papers, working papers, and D&T. Knowing that grey literature use is not restricted to the sciences will likely be eye opening to librarians in the arts and humanities and other areas. Since librarians may be assuming that only certain disciplines use it and have not been collecting grey literature, this could potentially alter collection development practices to include more grey literature in the future.

Google and Google Scholar were the most commonly reported resources for locating grey literature across disciplines, which is an important finding to consider in terms of IRs. When librarians know that researchers are using Google to locate grey literature, it is important for them to encourage grey literature content creators to deposit their work into IRs. This not only helps mitigate the web instability factor to which grey literature falls prey, but it also increases accessibility when Google crawls IRs. As many subject librarians reach out to faculty and researchers about the services they can provide, IRs ought to be near the top of the list of outreach. Examples of what materials can be added should be disseminated, along with the benefits of depositing. If possible, examples of others who are depositing should also be shared.

Many institutions automatically deposit D&T into IRs. For those who do not, librarians can reach out to graduate and doctoral programs, or directly to the students in those programs to encourage them to upload their D&T so they can be easily accessed and preserved in the long term. Encouraging the practice of depositing D&T could pave the way for these same individuals to be conscious of the usefulness of repositories during their careers.

Many of the faculty surveyed were concerned about the quality and lack of stringent peer review in grey literature, and this was one of the main reasons they did not use it. However, there is a disconnect between what respondents said and what they are actually doing. Although quality was a concern, this did not stop 79% of respondents from creating grey literature. This implies that researchers may actually be concerned about what others (i.e., peers, tenure committees, publishers, etc.) will think of them using grey literature rather than creating it. Some respondents noted that they did not find creating grey literature to be worth the effort:

> "People in my field dismiss grey literature because it is not peer-reviewed in the traditional way as journal articles. I personally think this is problematic especially because peer review processes are far from perfect and grey literature has a place, but if it's not valued, it doesn't get used."

The survey used to determine how faculty create, use, and find grey literature contained a significant limitations; in accordance with the University of Minnesota's policies regarding surveying, we were required by our University Survey Advisory Team to use their services for sampling, scheduling survey dissemination, and sending of reminder messages. The survey was emailed to 57% of the faculty (1300) at a single institution and those who returned the survey was an even smaller number of 172 (13.2%); therefore, the authors' ability to extrapolate to a larger population was limited. The fact that those submitting the survey were at more senior levels in their careers may have caused our sample to be less balanced than would be ideal. Response rates were highest among faculty in the health sciences, which may also influence our findings. An engaging next step would be to replicate this survey at other institutions. Learning if researchers in similar disciplines have similar grey literature practices regardless of institution would be helpful to subject librarians in those areas. This could also potentially encourage researchers who are currently not creating or using grey literature to be more open to the idea, especially if they learn that their peers are using it to stay current and fill gaps in the traditionally published literature.

Future research could study how journal paywalls impede access to the version of record of a journal article. As indicated by survey respondents, access to open access versions (e.g., preprints) is sought as an alternative to the version of record published by a journal. Also

related to the version of record, future research could examine preferences for D&T over the published journal version. Respondents stated that they liked using D&T because they contain greater levels of detail than were found in journal articles covering the same research. One researcher stated,

> "I also utilize dissertations and theses for extended documentation of experimental techniques and full datasets."

Another potential area for future research is examining perceptions held by subject librarians and collection development staff about grey literature. There is not much in the literature regarding librarians' knowledge of grey literature use or creation by researchers. What previous research has been done shows that while subject librarians are aware of grey literature, there is much that they do not know, and grey literature is not specifically addressed in many collection development policies (Lehman & Webster, 2004; Sulouff et al., 2005). Additional research examining coverage of grey literature in library collections has found that while it is present, there is little evidence of active collection (Juricek, 2009; Marsolek et al., 2018). This disconnect between the use and creation of grey literature by researchers and the lack of active curation could be due in part to librarians' assumptions concerning grey literature. Do they believe that grey literature does not play a role in research outside particular scientific fields? Are they unaware of the role that grey literature plays in systematic reviews? Examining the attitudes toward grey literature held by librarians and collection development staff could shine light on opportunities for expanding library knowledge of grey literature and increase the amount of grey literature recruited for library collections and IRs.

Some respondents commented that they would never cite grey literature, while others said they treat it the same way as more traditional publications. With this variation in citation practices, another potential study could analyze how publishers talk about citing grey literature in journal author instructions. Do publishers prohibit the citing of grey literature, or are they not addressing it? How is their attitude interpreted by authors? If the findings favored citing grey literature, this could help librarians when advocating for researchers to seek out grey literature.

CONCLUSION

Our findings overall will help provide direction and shape how librarians can move forward to assist faculty with avenues for finding grey literature more effectively. Those surveyed are not looking to library subscription databases or IRs but rather Google and professional contacts to find grey literature. Understanding what types of grey literature disciplines

create will better position subject librarians to advocate for using an IR for preservation and continued access when consulting with department leadership, staff, and faculty. Regardless of discipline, researchers and faculty are in fact using and creating grey literature. In many disciplines where publication delay interferes with timely information dispersal on current trends, depositing grey literature into an IR will aid the dissemination along with the retrieval of grey literature. With more scholars participating in systematic reviews, librarians will need to be more cognizant of where and how grey literature is discoverable. Endorsing the depositing of materials into IRs is a step in the direction of efficiency.

REFERENCES

Adams, J., Hillier-Brown, F. C., Moore, H. J., Lake, A. A., Araujo-Soares, V., White, M., & Summerbell, C. (2016). Searching and synthesising 'grey literature' and 'grey information' in public health: Critical reflections on three case studies. *Systematic Reviews*, *5*(1), 164. https://doi.org/10.1186/s13643-016-0337-y

Adams, R. J., Smart, P., & Huff, A. S. (2017). Shades of grey: Guidelines for working with the grey literature in systematic reviews for management and organizational studies. *International Journal of Management Reviews*, *19*(4), 432–454. https://doi.org/10.1111/ijmr.12102

Campbell Collaboration. (2019). Campbell collaboration systematic reviews: Policies and guidelines, *1*, 1–44. https://doi.org/10.4073/cpg.2016.1

Chiware, E., & Becker, D. (2018). Citation patterns of conference proceedings in master's and doctoral studies: A case study of information technology and systems. *SAGE Open*, *8*(2). https://doi.org/10.1177/2158244018770496

Fosbøl, E. L., Fosbøl, P. L., Harrington, R. A., Eapen, Z. J., & Peterson, E. D. (2012). Conversion of cardiovascular conference abstracts topPublications. *Circulation*, *126*(24), 2819–2825. https://doi.org/10.1161/CIRCULATIONAHA.112.120535

Godin, K. M., Kirkpatrick, S. I., Hanning, R. M., Stapleton, J., & Leatherdale, S. T. (2017). Examining guidelines for school-based breakfast programs in Canada: A systematic review of the grey literature. *Canadian Journal of Dietetic Practice and Research*, *78*(2), 92–100. https://doi.org/10.3148/cjdpr-2016-037

Happe, L. E., & Walker, D. (2013). Using grey literature to prepare pharmacy students for an evolving healthcare delivery system. *American Journal of Pharmaceutical Education*, *77*(4), 82. https://doi.org/10.5688/ajpe77482

Harley, D., Acord, S. K., Earl-Novell, S., Lawrence, S., & King, C. J. (2010). *Assessing the future landscape of scholarly communication: An exploration of faculty values and needs in seven disciplines*. Retrieved from http://escholarship.org/uc/cshe_fsc

Harley, D., Earl-Novell, S., Arter, J., Lawrence, S., & King, C. J. (2007). The influence of academic values on scholarly publication and communication practices. *Journal of Electronic Publishing*, *10*(2). https://doi.org/10.3998/3336451.0010.204

Hartling, L., Featherstone, R., Nuspl, M., Shave, K., Dryden, D. M., & Vandermeer, B. (2017). Grey literature in systematic reviews: A cross-sectional study of the contribution of non-English reports, unpublished studies and dissertations to the results of meta-analyses in child-relevant reviews. *BMC Medical Research Methodology*, *17*(1), 64. https://doi.org/10.1186/s12874-017-0347-z

Higgins, J. P. T., & Green, S. (Eds.). (2018). *Cochrane handbook for systematic reviews of interventions*. Cochrane Collaborative. https://doi.org/10.1002/9780470712184.ch2

Hunt, S. L., and Bakker, C. J. 2018. A qualitative analysis of the information science needs of public health researchers in an academic setting. J. Med. Libr. Assoc. 106(2):184–197. https://doi.org/10.5195/jmla.2018.316

Juricek, J. E. (2009). Access to grey literature in business: An exploration of commercial white papers. *Journal of Business and Finance Librarianship*, *14*(4), 318–332. https://doi.org/10.1080/08963560802365388

Kelly, J. A. (1998). Scientific meeting abstracts: Significance, access, and trends. *Bulletin of the Medical Library Association*, *86,* 68–76. https://doi.org/10.1109/PESGM.2017.8274732

Lehman, H., & Webster, J. (2004). Describing grey literature again: A survey of collection policies. *GL6*. https://doi.org/10.1017/CBO9781107415324.004

Marsolek, W. R., Cooper, K., Farrell, S. L., & Kelly, J. A. (2018). The types, frequencies, and findability of disciplinary grey literature within prominent subject databases and academic institutional repositories. *Journal of Librarianship and Scholarly Communication*, *6*(1), 0–23. https://doi.org/10.7710/2162-3309.2200

McMinn, S. H., & Fleming, K. (2011). Tracking the use of engineering conference papers: Citation influence of the Stapp Car Crash Conference. *Collection Building*, *30*(2), 76–85. https://doi.org/10.1108/01604951111127443

McRoberts, J. T., Ferguson, A. W., Schwalm, D. L., Timmer, J. M., & Ballard, W. B. (2014). Publication rates of presentations given at annual conferences of The Wildlife Society, 1994–2006. *Wildlife Society Bulletin*, *38*(1), 134–141. https://doi.org/10.1002/wsb.378

Michels, C., & Fu, J.-Y. (2014). Systematic analysis of coverage and usage of conference proceedings in web of science. *Scientometrics*, *100*(2), 307–327. https://doi.org/10.1007/s11192-014-1309-4

Musser, L. (2016). Preserving the digital record of science and engineering: The challenge of new forms of grey literature. *Issues in Science and Technology Librarianship*, *83*. Retrieved from http://istl.org/16-winter/short.html

Nasef, N., Skidmore, M., & Shah, P. S. (2011). Enablers and disablers allowing trainees' abstracts to proceed to full manuscripts: Lessons from a large neonatal training program. *Journal of Perinatology*, *31*(6), 411–416. https://doi.org/10.1038/jp.2010.140

Nederhof, A. J., van Leeuwen, T. N., & van Raan, A. F. J. (2010). Highly cited non-journal publications in political science, economics and psychology: A first exploration. *Scientometrics*, *83*(2), 363–374. https://doi.org/10.1007/s11192-009-0086-y

R Core Team. (2018). R: A language and environment for statistical computing. Vienna, Austria: R foundation for statistical computing. Retrieved from https://www.r-project.org/

Riegelman, A., & Kocher, M. (2018). For your enrichment: A model for developing and implementing a systematic review service for disciplines outside of the health sciences. *Reference User Services Quarterly*, *58*(1), 22–27. https://doi.org/10.5860/rusq.58.1.6837

Shirakawa, N., Furukawa, T., Nomura, M., & Okuwada, K. (2012). Global competition and technological transition in electrical, electronic, information and communication engineering: Quantitative analysis of periodicals and conference proceedings of the IEEE. *Scientometrics*, *91*(3), 895–910. https://doi.org/10.1007/s11192-011-0566-8

Soldani, J., Tamburri, D. A., & Van Den Heuvel, W.-J. (2018). The pains and gains of microservices: A systematic grey literature review. *Journal of Systems and Software*, *146*, 215–232. https://doi.org/10.1016/j.jss.2018.09.082

Spencer, S., Majkowski, C., & Suda, K. J. (2017). Predictors of publication rates for abstracts presented at American Association of Colleges of Pharmacy (AACP) annual meetings. *American Journal of Pharmaceutical Education*, ajpe6409. https://doi.org/10.5688/ajpe6409

Sulouff, P., Bell, S., Briden, J., Frontz, S., & Marshall, A. (2005). Learning about grey literature by interviewing subject librarians. *Grey Journal*, *1*(3), 131–136. Retrieved from papers3://publication/uuid/82D20102-6715-4711-B751-841855519AD2

Velden, T., & Lagoze, C. (2010). *The value of new scientific communication models for chemistry* [White paper]. Retrieved from https://ecommons.cornell.edu/bitstream/handle/1813/14150/whitepaper_final.pdf?sequence=4

APPENDIX A
Survey Questions

Q1 Do you USE grey literature in your role as a faculty member? We define grey literature as conference papers, working papers, technical reports, versions of articles submitted for publication, theses and dissertations, and government documents

- Yes, I use grey literature
- No

Q2 What are the reasons you do not USE grey literature? (select all that apply)

- Not relevant to my field
- Not relevant to my current position
- Not rewarded or recognized in my department
- Concerns about quality of grey literature
- Lack of stringent peer review
- Time constraints
- Other _____

Q3 What types do you use? (select all that apply)

- Conference papers
- Working papers
- Technical reports
- Government documents
- Preprints (versions of articles submitted for publication)
- Theses and dissertations
- Other _____

Q4 How do you use grey literature in your work? (free text)

- _____

Q5 Do you ever cite grey literature in peer-reviewed articles that you write?

- Yes
- No

Q6 What are the reasons you do not CITE grey literature? (select all that apply)

- Not relevant to my field
- Not relevant to my current position
- Concerns about quality of grey literature
- Journals do not allow citation of grey literature
- Unclear how to properly cite grey literature
- Only use as background information
- Other _____

Q7 How do you find grey literature? (select all that apply)

- Google
- Google Scholar
- Disciplinary repositories (e.g., ArXiv, SocArXiv)
- Institutional repositories (e.g., U of M Digital Conservancy - conservancy.umn.edu)
- Literature indexes or databases (e.g., Web of Science, PsycINFO) provided by the U Libraries
- Professional contacts
- University Libraries' catalog
- Other _____

Q8 Do you CREATE grey literature in your role as a faculty member? Again, we define grey literature as conference papers, working papers, technical reports, versions of articles submitted for publication, and government documents

- Yes, I create grey literature
- No

Q9 What are the reasons you do not create grey literature? (select all that apply)

- Not relevant to my field
- Not relevant to my current position
- Not rewarded or recognized in my department
- Concerns about quality of grey literature
- Lack of stringent peer review

- Time constraints
- Other _____

Q10 What types of grey literature do you create (select all that apply)

- Conference papers
- Working papers
- Technical reports
- Government documents
- Preprints (versions of articles submitted for publication)
- Other _____

Q11 Please share any additional comments that you have (free text)

- _____

Demographics

Q12 What is your position?

- Assistant Professor
- Associate Professor
- Full Professor
- Emeritus Professor

Q13 College/School

- Biological Sciences
- Continuing Education
- Dentistry
- Design
- Education and Human Development
- Extension
- Food, Agricultural and Natural Resource Sciences
- Graduate
- Law
- Liberal Arts

- Management
- Medicine
- Nursing
- Pharmacy
- Public Affairs
- Public Health
- Science and Engineering
- Veterinary Medicine
- Other _____

Q14 Department (free text)

- _____

Q15 How long have you been in this field?

- 0 - 5 years
- 6 - 10 years
- 11 - 15 years
- 16 - 20 years
- 21+ years

Q15 Do you have an extension appointment?

- Yes
- No

Q16 If you would be willing to help us out by participating in a follow up interview, please enter your name and email in the boxes below.

- Name _____
- E-mail _____