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Surveying the Landscape: Exploring STEM Instructors' Selection Criteria for Instructional Materials

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Abstract

Required and supplemental instructional material selection is a key component for the design of college courses. Our research explores the criteria that college instructors use when choosing books, videos, news items, and other instructional materials for students in science, technology, engineering, mathematics, and medical science (STEM) courses. We surveyed college and university STEM instructors to determine if they were utilizing Open Education Resources (OER) and Open Access (OA) books, articles, or other resources. We also asked whether instructors are selecting materials based on accessibility, diversity of format types, representation of a variety of identities within STEM professions, or other criteria. We asked what information resources are consulted when instructors select instructional materials. Using qualitative coding analysis of free text responses, we identified several themes in the data that will help librarians and publishers to find, curate, and advertise more useful materials for STEM course instructors. We add the voices of these instructors to the literature on how science, engineering, and technology college instructors are selecting resources. We discuss what engineering and other STEM librarians can do to increase resources from diverse perspectives, OER, and other OA resources used in these courses, which may make the coursework more accessible to additional students.

Introduction

Many college courses require students to use a textbook [1] or other instructional materials (IM), and the selection of these is a key component for the design of college courses [2]. Some courses may rely on committees to select core IM, and some pre-professional curricula may be quite prescribed, while other course instructors may have the discretion to select required or supplementary materials for their course. These choices are often protected by academic freedom policies [3].

In particular, science, technology, engineering, mathematics, and medical sciences (STEM) courses may rely heavily on IM, such as textbooks, to augment lecture and laboratory learning activities and lectures. Textbooks are often content-rich and may have substantial online resources to assist learners and support instruction [2]. However, there are a myriad of additional information resources available to supplement or replace textbooks, and these might be purchased by students, provided by faculty (e.g. course reserves), provided through university and college libraries, or be Open Access or Open Educational Resources (OER) that are available at no cost online. Understanding the IM selection practices of STEM college instructors would assist librarians in selecting more relevant materials for student use, aid publishers and producers of OER in the development of new textbooks and other materials, and lead to improvements in curated online collections of OER and other IM. However, these practices are not well documented in the literature [4], [5], [6].

Our research questions are:

- What criteria do STEM college instructors use when choosing instructional materials for students in science, technology, engineering, mathematics, and medical science (STEM) courses?
- Where do instructors get information/suggestions for instructional materials?

Literature Review

Recent efforts to document and promote the use of evidence-based pedagogy (aka research-based instructional strategies, high-impact practices, etc.) in STEM focus on classroom and laboratory activities but also do note some updated instructional materials (IM) and a few textbooks that adopted best practices from disciplinary educational research [5]. Textbook selection practices, particularly OER adoption, have been studied for STEM courses, including engineering mechanics [7] and health sciences [4]. Other OER-related research includes the positive effects on student learning outcomes [1], efforts to design OER [8], how OER could be better curated in repositories [9], and detailed case studies [10].

For some STEM instructors, there is tension between faculty members' pressure to focus their time on producing a substantial volume of grant-funded research publications and the effort expended to develop a new course or modify an existing course [2]. Felder and Brent recommended the following considerations for STEM instructors who evaluate textbook options:

- book reviews,
- match of content and the content order to the course plan,
- instructor supports (test question banks, illustrations, and other materials to support lectures),
- learner supports (self-tests, practice problems with answers),
- inclusion of multimedia (illustrations, tutorials, equations), and
- cost to students [2].

However, newer faculty may be advised to replicate what their peers have already developed or to solicit colleagues' opinions when selecting the primary textbook for a course rather than embark on a detailed evaluation of options [2].

Despite the documented barriers to evidence-based practices, such as more accessible and inclusive IM in STEM college courses [5], the literature is rich with case studies on instructor adoption of specific instructional materials and lesson plans, such as InTeGrate [11], a 36 online student-centered module for foundational geoscience concepts. These studies often include measures of change in instructor beliefs or teaching philosophy but do not document how instructors selected materials before the study's intervention. There is additional encouragement to ensure instructors are inclusive in their teaching techniques by acknowledging the different perspectives within their discipline. Assigning IM that contains a variety of perspectives in a course and providing the latitude for students to expand their responsibilities of inquiry can expand the diversity of study and engage students as individuals [12]. Instructors shifting their role from expert towards a guide on the side can take time, but it is an investment in a campus cultural shift that will help all students to be included in the curriculum [12]. Assigning IM that contains a variety of perspectives in a course and providing the latitude for students to expand their responsibilities of inquiry can expand the diversity of study and engage students as individuals [12]. Additionally, including persons with diverse identities in IM can be helpful for students who are from historically underrepresented groups [13] and there are some published examples of this practice [14]. However, Skopec et al. found that STEM instructors often avoided including inclusive perspectives [15].

Method

We did not find that existing validated survey instruments, such as the Teaching Practices Inventory [6], delved into the level of detail we desired regarding IM. We developed a 12-question online survey to address our research question and collected demographic data about our research participants (see appendix). The survey included both multiple choice questions and open-ended questions. The only required question established that respondents were over the age of 18 and teach college-level STEM courses, including science, technology, engineering, medicine, psychology, and/or mathematics.

We administered the survey using a university-hosted Google form that did not gather additional identifying data about respondents. To establish the validity of our survey [16], we asked several college STEM instructors and other faculty to test and provide feedback on our draft survey questions in a Google form. After these revisions, the survey and data management plan were exempted from full Institutional Review Board (IRB) review and received approval, project number UNLV-2023-276.

Coauthor 2 distributed an invitation to participate in our research study between October 31 - December 31, 2023, using social media [17], an email list of engineering faculty at coauthor 2's institution, and professional library organization Listservs and similar discussion groups. Distribution outlets are detailed in the appendix. We included a request that our invitation be shared widely to achieve snowball sampling. We found it more difficult to locate discussion groups for STEM faculty and instructors open to posting by non-members. However, we located one open discussion group for teaching and learning centers, the POD Network, and posted our survey recruitment message there. Coauthor 2 reposted the survey invitation via the social media platforms several times during the recruitment period.

The most challenging aspect of conducting this qualitative research survey was sharing it with STEM instructors. Vitak et al. critique the IRB process for applying strict requirements for low-risk research [18]. While our study was low-risk, we successfully underwent the IRB process and received approval exempt from full board review. However, we found that two community colleges would not recognize our qualifying IRB. Each college's IRB requested that the research study go through their college’s IRB qualification before allowing their faculty to receive the recruitment message. In one instance, coauthor 1 asked to forward the recruitment message from coauthor 2's initial postings and was told to submit the survey to coauthor 1's IRB before doing so. In the second instance, after someone had forwarded our survey invitation to their colleagues, a community college's IRB used the contact information on our recruitment message to notify coauthor 2 that we must delete all data from persons at their institution and submit our proposal to their IRB for review. This is even though our recruitment methods, shared with them, included the IRB project number and the IRB affiliation, with the standard statements regarding compliance with Human Subjects rules and regulations per the IRB. Coauthor 2 responded to each IRB with information about the purpose and details of our study as well as participant risk reduction and contact information for the authorizing IRB. Neither college responded to either coauthor after receiving this information.

The above IRB inquiry provides evidence of at least one instance of snowball sampling via email distribution of the recruitment message. Additionally, prior to the recruitment email sent by coauthor 2, some respondents noted they had received the invitation via an email from a colleague. Coauthor 2 also received a copy of a message forwarding our survey invitation to the Instruction interest group of Consortium of Academic and Research Libraries in Illinois <instruction-ig@carli.illinois.edu> and the Reaching Across Illinois Library system <iacrl@list.railslibraries.org>. We were unable to locate additional discussion groups for STEM faculty and instructors that were open to posting by non-members.

Our data analysis methods were a mix of quantitative and qualitative. We summarized the multiple choice answers selected for each question. Free text responses were provided to at least one question by all but one of our respondents. For all free text responses we used qualitative, emergent coding of textual responses, using several cycles of open and axial coding [19]. Open coding was performed until we achieved saturation and no new codes were discovered. Each coauthor performed the initial coding for several questions, and discussed outcomes with the other coauthor until we achieved a consensus coding. We then used an axial coding method across all free text responses to group codes and define the boundaries of and variety of meaning within emergent themes.

Findings

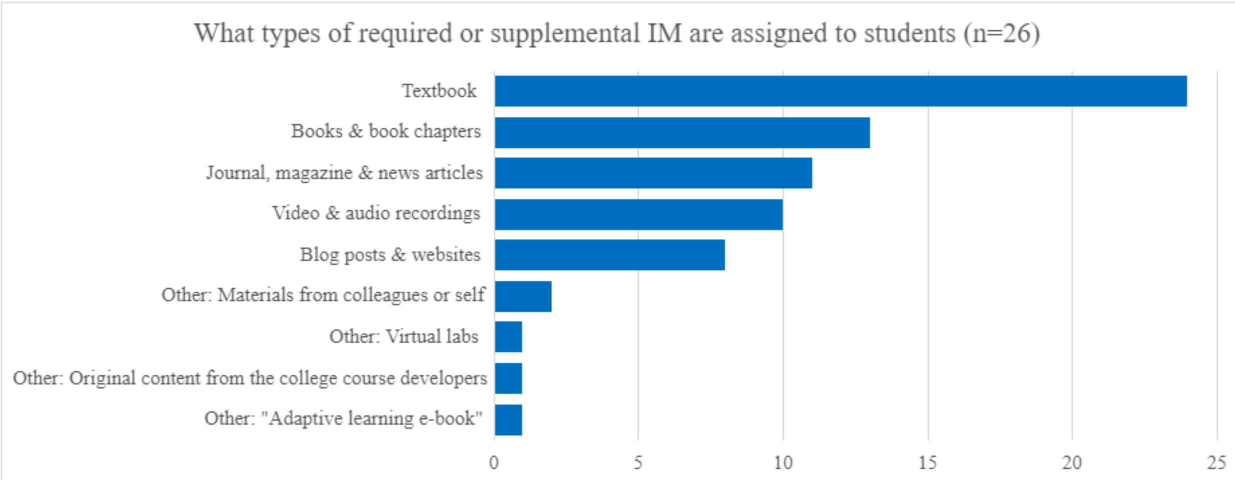
We caution readers that due to the small sample size (n=26) and nature of the qualitative analysis method used, these results are not designed to be inferential to the larger population of college STEM instructors. Other than characterizing our sample, we emphasize evidence of presence or absence of themes in our data. There was also a glitch in the survey form detected after the 10th response was registered, where questions 3 and 7 did not allow for the selection of multiple answers. Because we included an option to select *Other* with a free text field for each of these questions, it does not appear to have affected our data. The survey form is provided in the appendix.

To characterize our respondent population, we asked about the subject areas taught, the degree types offered at their institution, in what country they teach. All 26 respondents teach in the U.S., with 42% from associate-only institutions, and the remaining 58% offered a combination of degree programs. The subject areas taught were identified as10 for engineering (31%), 6 for chemistry (21%), 4 for biology (14%), 3 for mathematics (10%), 2 for computer science (7%), 2 for physics (7%), 1 for astronomy (3%), 1 for psychology (3%), and 1 for geography (3%).

Although our sample is small, our respondents' demographics were fairly typical of the overall U.S. STEM profession (Gray, n.d.; Mintz, n.d.; *NSF's NCSES Releases Report on Diversity Trends in STEM Workforce and Education | NSF - National Science Foundation*, 2023; *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2021 | NSF - National Science Foundation*, n.d.). Respondents were asked to describe aspects of their identity, and told that this was to help us compare our sample to national statistics from the STEM instructor profession and to detect patterns in the responses related to identity. Eighteen respondents chose to self-identify some aspects of their identity, with 13 as white, 2 as Asian, 1 as mixed-race/Asian; and 9 as males, 6 as females, and one as non-binary. We had one respondent self-identify as queer, one as bisexual, 5 respondents as cisgender/cissexual, and 5 as straight/heterosexual. One respondent self-identified as Christian, and four as agnostic/atheist/non-religious. We had two people self-identify their ages, one in their 30s and one over 60. One person self-identified with a physical disability.

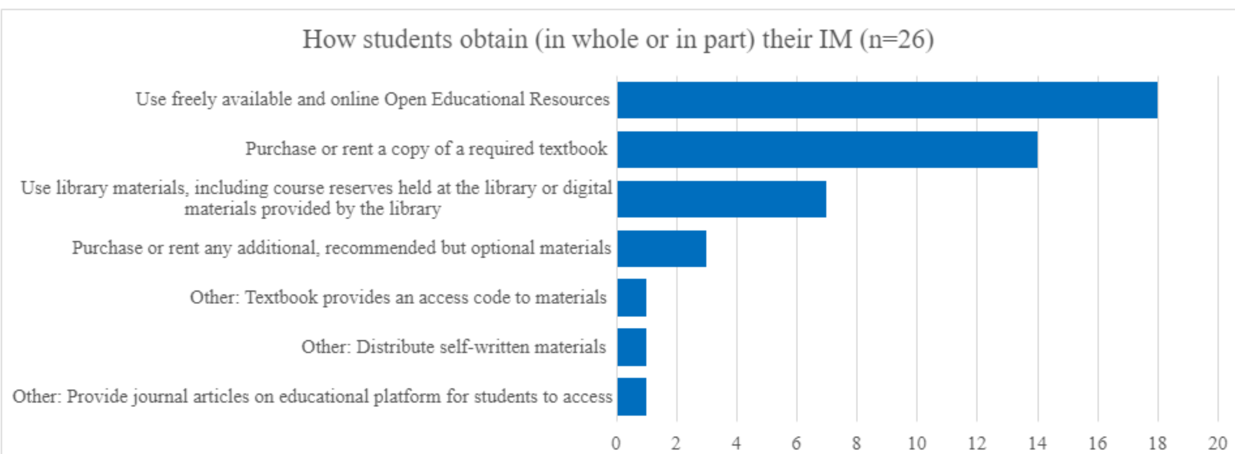
We asked what types of required or supplemental IM are assigned to students (question 5). Of the 26 responses to this question, all but one respondent depended on textbooks for their courses, and 18 used video and audio recordings. All other multiple choice answers were selected but less prevalent, including books and book chapters; journals, magazines, news articles; and blog posts and websites.

Figure #1



When asked how students obtain (in whole or in part) their IM (question 7), the most frequent multiple choice answer was OER (18 of 26 respondents). The remaining answer options were all selected by at least a few respondents, including purchase or rental of a required textbook, purchase or rental of optional IM, and use of materials provided by their library, such as course reserves.

Figure #2

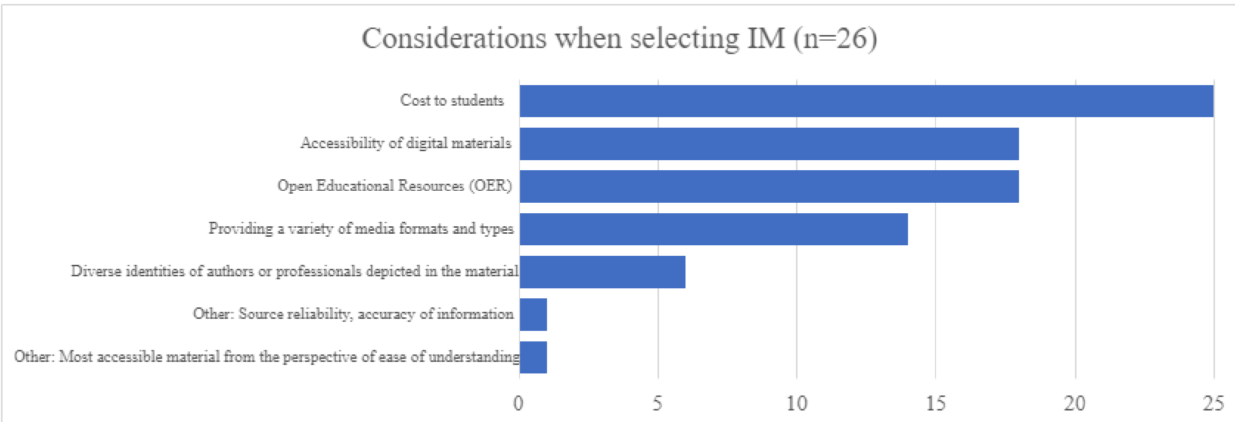


When respondents were asked if their institution's library provides their students with copies of the IM they assign or recommend in their courses (question 8), the majority of answers were either *No* or *Some but not all*.

Questions 9 and 10 both explicitly asked what factors are used to determine the types of required or supplemental IM are assigned to students. All respondents answered question 9, including 4 who included a free text "Other" response (figure 3), and 18 listed additional factors in question

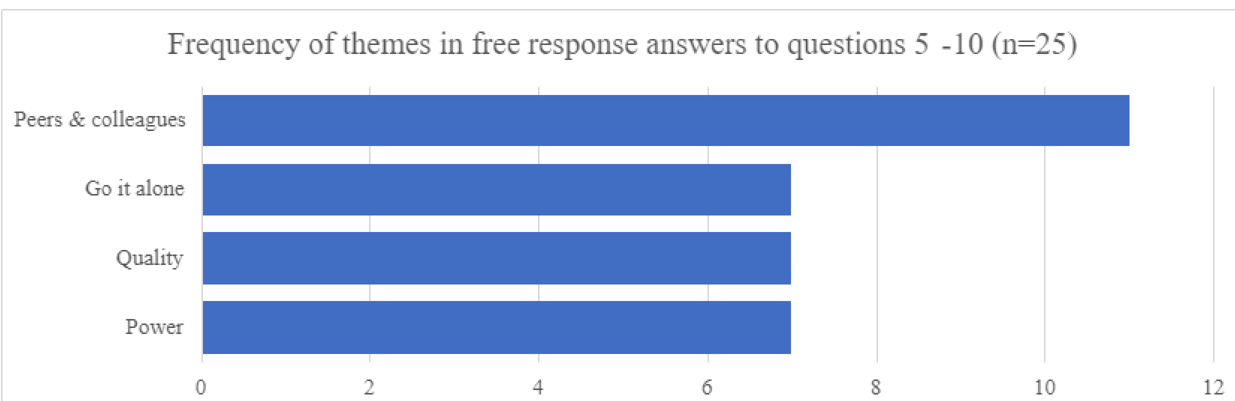
10. The three most frequently selected answers were cost to students, OER, and accessibility of the materials (e.g., closed captions, alternative text, or screen reader compatibility). There were also several respondents who selected the remaining two factors, providing a variety of media formats, and representation of diverse identities within the profession.

Figure #3



All but one respondent (n=25) provided at least one free text response to questions 5-10. Our qualitative, axial coding of these free text responses resulted in four themes: Power, Go It Alone, Peers & Colleagues, and Quality (figure 4).

Figure #4



Power. Definition: There is an indication by title of a person or group, or by the description of the colleague(s) relationship to the instructor, or by the type of criteria used, that a power differential exists between the instructor and the other person(s).

We found seven instructors indicated a power relationship when describing the criteria used or information sources sought out when selecting IM. This theme was identified in text from questions 5, 6, & 10. For instance quotes with a position title e.g., *"Department chair"*, or by nature of the relationship of their home unit with an accrediting organization, *"There are ABET issues to consider.*" Ensuring the *"Transferability of the course"* was another consideration, and this instructor, teaching at a PhD granting institution, answered question 6 with *"Direction from the four year university."*

Other instructors described persons or groups with an unclear but potential power relationship, and we included them here for further discussion. These include *"College guidance", "instructional designer", "Original content from the college course developers", "... some books are disliked by senior faculty so we can't use them."* and *"getting feedback from students on what works well"*.

Go it Alone. Definition: The instructor either creates their own IM, modifies existing IM to suit their course needs, and/or indicates they select existing IM using their own judgment and knowledge.

Seven instructors mentioned creating or selecting IM alone, without the involvement of others, in responses to questions 5, 6, & 7. Examples include *"I write and distribute some materials myself"* and *"Materials developed by colleagues and myself"*.

Peers & Colleagues. Definition: When an instructor mentioned persons or groups of persons that influence their IM selection decisions, such as faculty, instructors, or institutional employees both within and outside of the instructor's department. These persons may provide information about IM directly, provide IM copies, or their observed use of IM is influential to responding instructors.

Based upon this definition, there is some overlap with the power theme. Eleven instructors mentioned either peers or colleagues in responses to questions 5, 6, & 10. For example: "*recommended by the Chemistry department", "borrow materials from instructors that have taught the course at other universities",* and *"suggestions from colleagues"*.

Quality. Definition: This theme is closely coded, with the words quality, reputable, accuracy and reliability used by the instructors to describe the IM, or ongoing support for the IM.

Seven instructors included this theme in their responses to questions 9 & 10. Examples include *"Quality of technical support for faculty and students", "I try to select material from reputable journals"* and *"source reliability, accuracy of information"*.

Discussion

We established some sense of the types of IM that U.S. college STEM instructors are currently using. We expected to see heavy reliance on textbooks and discovered that of the 26 respondents, all but two indicated that they were using more than just the textbook (figure 1). Some respondents were using multiple types of resources to aid the learning curriculum, including many using audio and video recordings, and fewer using books, journal articles, blog posts and websites.

Academic librarians and others supporting OER adoption can take heart that several respondents to this study are investigating or using OER for their STEM courses. More than half of the respondents were using at least some OER IM, but were also recommending or requiring some fee-based materials for their courses. This implies that to some degree, most of our respondents have overcome some barriers to OER adoption, including challenges locating materials that are of suitable quality, with adequate updates and focused on the course content parameters [20]. At least one of our respondents noted they do modify OER materials for their specific needs, which was another barrier identified in the former study. Another instructor mentioned working with colleagues to create OER, and some libraries are active in this space [8].

When asked if their institution's library provides their students with copies of the IM they assign or recommend in their courses, several respondents were unsure, indicating that they do not work with their campus libraries in the selection and provision of IM. There were indications that some instructors are assigning materials available in their campus libraries. Assigning materials available within the library or on a library webpage serves as a signal to students that the library is also a resource for them [21]. The academic library is an important piece of supporting STEM education for students, as Davis discovered through her study focused on “undergraduate women in STEM because they depend on the physical space as a quiet, distraction-free place to study where technology is readily available” [22]. Making use of library resources thus has benefits to many students beyond providing a no-cost IM source.

There were two notable absences in the responses related to information sources for IM selection. No respondents mentioned using book reviews, in spite of this recommendation made in at least one STEM instructional guidebook [2]. Also, none of our respondents indicated that librarians were a resource for selecting IM. This may reflect a belief that librarians do not provide support or have expertise in this type of information search and evaluation. However, there are many efforts and studies in library and information science about supporting the creation and use of OER [8], [23] and OA materials [24]. Several of our respondents indicated that the library was a source of IM, but none indicated that librarians were a source of expertise or peer-to-peer information about IM selection or creation. This highlights the need for additional communication and outreach by librarians seeking to support adoption of open IM in STEM classrooms.

We were able to answer our first research question, about the criteria STEM instructors use to select IM. We found a wide variety of factors used by the responding instructors. Most respondents did consider cost to students, OER, and the accessibility of IM, and several indicated that they considered including a variety of media format types, as well as representation of diverse identities among the STEM professionals depicted or included in the IM (figures 1-3). Other factors captured in the Quality theme included readability, accuracy and quality of the IM, and ongoing support from the producer of the IM. Additional factors in the Power theme included consistency of the IM with other instructors, expectations for transferability of the course, and accreditor requirements. Notably absent in our data was any mention of seeking out IM with instructor support e.g. test question banks [2], or of seeking to include diverse perspectives from their disciplinary field [2].

Our data support that considerations of cost for students is a concern in U.S. based higher education, and OER may be used in whole or in part as supplemental materials [7]. Concerns with OER textbooks as the required or primary IM may be due to the quantity or quality of the content or learning resources included, such as practice problem sets or demonstrations of how to work practice problems [7]. Cost to students was an important factor for consideration for IM selection. One response mentioned using an older edition of a textbook. For a time this allows students to purchase used copies at lower prices, until the book becomes difficult to locate, even for a library (personal observation of coauthors). Instructors using this practice need to remain aware of the market pricing of used out-of-print books and older e-books, as well as the potential for publishers to halt licensing for an older ebook.

Many of our respondents are seeking accessible IM in a variety of formats that could benefit learners with different needs or preferences. These are key components of learner-centered instruction like Universal Design for Learning [25]. Universal Design for Learning is a framework that empowers the student to direct their learning through multiple avenues of representation, action and expression, and engagement. This framework allows individual students to utilize various modes and preferences of learning simultaneously in the class. The respondents considering the accessibility of classroom materials (see figure 3 above) may reflect an awareness of the American Disabilities Act of 1990[1] requirements for classroom materials, and perhaps a belief in Universal Design for Learning practices [26]. Inclusion of a variety of media formats and types may also reflect a belief in Universal Design for Learning, or perhaps a belief in learning styles which has been widely adopted even while the evidence for learning styles has been debated in the literature [27]. These IM selection practices are consistent with

[1] https://www.ada.gov/law-and-regs/ada/

some of the tenants of the inclusive syllabi framework. We address this further in the implications for practice and future research section below.

We found evidence within several themes to address our second research question, regarding the sources of information instructors use to select IM. Several respondents mentioned using Peers and Colleagues to inform their IM selection, and others were doing their own research and using trial and error to fine tune their IM selections over time (Go It Alone). We also found complex Power dynamics were involved. Instructors often teach more than one course over an academic year or a career, and thus we expected to see multiple strategies mentioned. As noted earlier, there is expected overlap between responses and instructors in the Power and the Peers and Colleagues themes. However, we did not see overlap between instructors with responses in the Power or the Go It Alone themes. Perhaps those who employ a Go It Alone strategy for their IM selection also opt to teach courses without a strong Power dynamic at play. Also, one instructor's responses are in both the Go It Alone and the Peers and Colleagues themes, as they use a mix of self-reviewed and colleague-recommended materials.

Our Power theme is similar to the social power framework of French and Raven [28], which has been used to explore OER adoption [29]. This framework includes five types or "bases" of power among persons: reward, coercive, legitimate, referent, and expert. Reward and coercive power bases involve persons with the ability to deliver direct and tangible positive or negative outcomes to the instructor, respectively. A person with a legitimate power base would have the ability to exercise positional authority over the instructor. Persons with referent powers would have influence over an instructor who feels respect for them, or is inspired by them. Experts may hold influence over instructors' choices based upon their specialty expertise. One exception to this framework in our data includes instances where the instructor indicated a power differential between peers regardless of position on the organizational structure (legitimate) or by position title (expert or legitimate). The instructors with these responses implied that fellow faculty can influence their decision making in ways that might be punitive, e.g., *"so we can't use them..."* The use of the word *"can't"* implies more power than expected among peers (referent or expert), and no formal titles implying a legitimate base of power were used in this response.

Two other power dynamics were described by respondents. One respondent described using feedback from their students when selecting IM. It is unclear from our data if this instructor solicited feedback throughout the semester, effectively sharing power with the students, or if end-of-course feedback is used to select IM for future semesters and students. Another respondent noted that another academic institution provided direction to their department. The power implied in this statement was held by the *"four year university"* to influence the IM selection at the doctoral granting institution. This is an interesting power dynamic, and may reflect an institutional-level ceding of instructional expertise authority to an institution more focused on undergraduate teaching than on research outputs and number of graduate degree conferrals.

Limitations

We caution readers that due to the small sample size and nature of the qualitative analysis, these results are not designed to be inferential to the larger population of college STEM instructors. Other than characterizing our sample, we emphasize the description of themes in our data. Additionally, our respondents all teach in the U.S. and these results may not reflect practices among other college STEM instructors.

Social media distribution of the survey proved to be challenging. There has been a documented push for academics to increase their presence on social media to boost their professional networks, improve the distribution of their expertise to non-expert audiences, and enhance the reputations of their college or university [30], [31]. However, it may be that the career reward structures for STEM faculty incentivize the development and maintenance of a professional social media network that is focused not on instruction, but other professional activities such as research [32] or administrative leadership roles. It may also be that coauthor 2's social media networks did not include sufficient connections to STEM instructors with robust networks.

Additionally, snowball sampling from the authors' library professional organization discussion groups did not appear to be successful in escaping our disciplinary field, Library and Information Science. We were outsiders familiar with our intended population, but not using their communication networks to reach them directly. When our network of contacts begins with a group that works with our target population, with some but minimal overlap, this adds an extra barrier to recruitment. We also did not appear to achieve snowball sampling through the open discussion group for teaching and learning center experts. The use of snowball sampling, in general, may be difficult for this population. There may be reluctance among non-social scientists to forward survey invitations using institutional emails without local permissions, as the inquiry from other institutions' IRBs demonstrated. It is possible these inquiries highlight a caution shared by potential STEM participants who are less familiar with social science research recruitment processes and human subject protections.

Finally, it is possible that respondents modified their answers to survey questions based upon this prompt to describe their identities: "We are collecting this demographic information to compare our survey participants with national and global statistics and see if there is any correlation between responses and identity." However, we did reduce this possibility by making the demographics question free text and optional, allowing participants to select which aspects of their identity were shared.

Implications for practice and future research

Librarians involved in OER adoption efforts and others working in the IM selection and production spheres need to increase their visibility to this population of college instructors [10]. None of our respondents indicated that they work with librarians to select materials, even if the library provides access to the IM. Collaborative efforts with STEM instructors to curate OER and other IM and presentation of these efforts within STEM disciplinary venues are needed to raise awareness among STEM instructors [8], [9]. Librarians could be involved in updating existing collections of OER IM (e.g., OpenStax, MERLOT, CourseSource, Open Textbooks for Engineering, University of Minnesota's Center for Open Education, American Institute of Mathematics, and Openly Available Sources Integrated Search)[2] to include more of the criteria that we found are used by college STEM instructors [9].

As mentioned, the inclusive syllabi can include relevant, diverse perspectives that will signal to students whose ideas will be addressed, what knowledge and activities are relevant to the real world and/or students' future professional lives, and provide opportunities to share lived experiences [13]. An inclusive syllabus could include guest speakers or IM from professionals who provide a unique perspective on their career path or are members of historically underrepresented groups within the profession [33]. The language, activities, and IM, assigned in the syllabus play a key role in inclusive teaching practices because it is one of the first communications between instructors and students [13]. Similarly, Sims Bishop [34] noted the importance of books for young adults and children that can serve as mirrors, where readers can see themselves represented in those works. Padilla et al. noted that lack of presence, including within the curriculum, can serve as a barrier to college success, thus inclusion of persons reflecting aspects of students' identities could be beneficial [33] and may result in a sense of belonging for all students [13].

Seeking IM that include demographically diverse STEM professionals is challenging even for publishers and librarians, as cataloging materials with metadata about presumed author or content demographics is problematic [35], [36], [37]. However, this can be accomplished by working with the community of living STEM professionals, and by using published information about historical persons. While publisher and library catalogs may not include the metadata to quickly search for these characteristics, librarians can assist instructors to design search strategies to first identify such persons using awards lists or affinity group member profiles, and then to seek out their scholarship or locate other IM using book reviews and finding aids [38].

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[2] https://openstax.org/ ; ; https://www.merlot.org/merlot/ ; https://qubeshub.org/community/groups/coursesource/ ; https://libguides.lib.fit.edu/OEREng https://open.umn.edu/opentextbooks/ ; https://aimath.org/textbooks/ ; https://emtech.suny.edu/resource/openly-available-sources-integrated-search-oasis/

For instance, several faculty in Political Science maintain a database of women experts to assist with selecting materials for course syllabus development, guest speaker invitations, and organizing panels at conferences.[3] Academic librarians and instructors in the STEM disciplines could follow this example. However, resource lists and databases maintained in isolation from the community of STEM instructors may be unsuccessful if the instructors do not trust the resource, or lack additional peer-support to implement changes to their syllabi and teaching methods [5]. Ideally, such resource lists and databases would be maintained with members of these communities of practice, perhaps via existing committees in professional organizations. Librarians, publishers, and teaching and learning center groups should collaborate with STEM instructors' professional organizations to create, promote, and maintain these resources.

Our research will continue with expansion of recruitment for a similar survey or interviews with similar research questions. Structured interviews of STEM instructors during professional organization conferences may yield greater response rates (T. Vo, personal communication to S. Wainscott, December 1, 2023). There is an existing inventory tool designed for college and university teaching practices that already includes a question about IM [6], and we will consider modifying this instrument to elicit more detailed data about the types of IM that appeal to instructors, and about the influences that affect IM selection. The variety of power dynamics that emerged within our data was intriguing. Moore and Reinsfelder [7] found that lack of control over IM selection was a substantial barrier for OER adoption for some engineering instructors. This is an area ripe for additional investigation. Future IM selection and adoption research should gather information about the employment status of the instructors (tenured, tenure-eligible, full- or part-time, contingent contracts, etc.) to better understand the power dynamics at play with IM selection. We will also collect information about each course to note constraints such as the need for consistency among multiple instructors across a single term, or connections to other courses in a sequence. Understanding the instructor's perception of their authority to select materials will provide valuable data to contextualize their responses, and inform the study of IM selection practices.

Conclusion

Our qualitative survey results suggest a multitude of criteria that STEM course instructors may use when selecting materials for use in their courses. Some do require only a primary textbook and many consider cost to students and accessibility of the IM. We found evidence that there are college STEM instructors who seek OER and other freely available material resources, materials that highlight the diversity of STEM professionals, as well as more accessible materials to support student learning. This information can help both librarians and publishers identify, evaluate, and market more useful materials for STEM course instructors. Making these materials easier to discover may support additional adoption of evidence-based, high-impact instructional practices in college-level STEM courses. While our sample size was limited by participant

[3] https://womenalsoknowstuff.com/

recruitment challenges, our qualitative, exploratory data analysis results can be used in the development of future research that might use more persuasive recruitment methods and in-depth data collection such as interviews, focus groups, or observational methods to better understand the characteristics of instructional materials selected for college STEM courses. We hope the responses of these STEM instructors inform their peers as well as publishers and librarians who support this important aspect of STEM instruction for undergraduate and graduate students.

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Appendix

Table 1. Survey distribution outlets

Coauthor 2's Mastodon accounts (two), hashtags included #STEM #HigherEd #Academia #STEMEducation and #HigherEducation
Coauthor 2's LinkedIn account (one)
Email list of engineering faculty at coauthor 2's institution
Special Libraries Association, several STEM-related subgroups' discussion groups https://connect.sla.org/home
ASEE Engineering Libraries Division open listserve (ELDnet-L) https://sites.asee.org/eld/programs-resources/email-discussion-lists/
Association of College and Research Libraries, Science Technology Section discussion group https://connect.ala.org/home
POD Network Open Discussion Group https://podnetwork.org/

STEM Instructors Instructional Materials Survey

Investigator and Contact Phone Number: Sue Wainscott 702-895-2262

You are being asked to participate in the study because you are over the age of 18 and are an instructor of science, engineering, technology, medicine, psychology, and/or mathematics at a college or university.

If you volunteer to participate in this study, you will be asked to complete this online survey.

This study includes only minimal risks. The study will take 15 minutes of your time. You will not be compensated for your time.

For questions regarding the rights of research subjects or any complaints or comments regarding the manner in which the study is being conducted, you may contact the UNLV Office of Research Integrity – Human Subjects at 702-895-2794, toll-free at 877-895-2794 or via email at IRB@unlv.edu.

Your participation in this study is voluntary. You may withdraw at any time. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Participant Consent:

I have read the above information and agree to participate in this study. I am at least 18 years of age. You may print a copy of this form for your records.

* Indicates required question

1. Are you an instructor for courses in science, engineering, technology, medicine, psychology, and / or mathematics at your college or university? *

   Mark only one oval.

   - ( ) Yes - Please continue!
   - ( ) No - Thank you for checking out our survey! You can exit now.

2. In what country do you currently teach?

3. Which degree types are offered at your college or university?

Check all that apply.

- [ ] associate
- [ ] bachelor
- [ ] master
- [ ] doctoral
- [ ] professional degree (such as doctor of medicine, MD, etc.)
- [ ] Other: ____________________

4. In what subject areas do you teach courses?

5. What types of required or supplemental instructional materials (readings, videos or other media) are assigned to students?

   Please select all that apply.

   Check all that apply.

   - [ ] textbook
   - [ ] books & book chapters
   - [ ] journal, magazine & news articles
   - [ ] video & audio recordings
   - [ ] blog posts & websites
   - [ ] Other: ____________________

6. What do you rely upon to give you the best resources for the instructional materials you assign or recommend in your courses, if any?
   Please add any details and be specific in your answer.

   ____
   ____
   ____
   ____
   ____

7. Are students in any of your courses expected to

   Check all that apply.

   - [ ] purchase or rent a copy of a required textbook
   - [ ] purchase or rent any additional, recommended but optional materials
   - [ ] use freely available and online Open Educational Resources
   - [ ] use library materials, including course reserves held at the library or digital materials provided by the library
   - [ ] Other: ____________________

8. Does your institution's library provide your students with copies of the instructional materials you assign or recommend in your courses?

Mark only one oval.

- ( ) Yes
- ( ) Some but not all
- ( ) No
- ( ) Other: ______________________

9. When you select instructional materials (readings, videos or other media), do you consider the following? Please select all that apply.

   You are also encouraged to check "other" and provide more detail and considerations than what is listed.

Check all that apply.

- [ ] cost to students
- [ ] Open Educational Resources (OER)
- [ ] providing a variety of media formats and types
- [ ] accessibility of digital materials (closed captions, alternative text, screen reader compatibility)
- [ ] diverse identities of authors or professionals depicted in the material
- [ ] Other: ______________________

10. Are there other factors you consider when you select (or choose not to select) materials for your courses?

____

____

____

____

____

11. We are collecting this demographic information to compare our survey participants with national and global statistics and see if there is any correlation between responses to identity.

Please describe any aspects of your identity that you are willing to share. For instance, disability, gender, sexual orientation, gender identity or expression, national origin, race, color, caste, or religion.

12. In order to describe our survey distribution, we'd like to know how you found our survey.

Mark only one oval.

- Professional organization listserve
- Email from a colleague
- LinkedIn
- Bluesky
- Mastodon
- Other:

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