7-2023

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The Journal of Academic Librarianship 49 (2023) 102713

Contents lists available at ScienceDirect

The Journal of Academic Librarianship

journal homepage: www.elsevier.com/locate/jacalib

In their words: Student reflections on information-seeking behaviors

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ARTICLE INFO

Keywords:
Information literacy
Information-seeking behavior
Search strategies
Source selection
Instructor influence

ABSTRACT

Academic librarians try to facilitate student information seeking by providing classroom instruction, creating tutorials and guides, and selecting and modifying search tools to best meet student needs and preferences. These efforts are often informed by interactions with students, and can be even better informed through analysis of student descriptions of their searching practices. In this case study, 50 upper-division students from the Social and Behavioral Sciences major completed searching tasks in a few library search tools and were then interviewed about their search behaviors, both in the experimental setting and in general. Their responses illuminate some of their tendencies, including considerations when choosing sources, strategies employed when searches fail, and adoption of their instructors' priorities.

Introduction

College students are frequently faced with demands to find and evaluate information, and it is the job of the academic librarian to facilitate that process. It therefore behooves us to understand as completely as possible the information-seeking behaviors of students. As we provide instruction in the classroom and at the reference desk, create online tutorials or guides, and select and configure databases, our efforts can be impactfully informed by our knowledge of how students think about searching for and evaluating information. To that end, the current study analyzes qualitative data from student interviews to attempt to address the following questions: How do students describe their strategies for searching for and evaluating information? What are their criteria for selecting sources?

While there have been numerous studies on student information-seeking behavior, ours makes a novel contribution in several respects. First, our qualitative dataset was collected as part of a larger, mixed methods study, and we are able to complement, build upon, and triangulate with the quantitative analyses we previously conducted (Dahlen et al., 2020; Dahlen & Hanson, 2017). Second, our interview questions are in some cases parallel to those in other studies, allowing us to corroborate or contradict earlier findings, and in other cases break new ground, particularly in the area of student reasoning behind selecting sources after a search. Finally, one of the major themes that emerged from our analysis is the influence that instructors have on student information-seeking behaviors and values, which is not a prominent motif in the library science literature.

This study was conducted at [our institution], a comprehensive, public university located on California's central coast. When these data were collected in Spring 2015, our enrollment was around 6400 students, 94 % of whom were undergraduates. Fifty-eight percent were first generation college students, 45 % were from historically excluded racial or ethnic groups, and 35 % were low-income.

Literature review

Search strategies

Today's college students have grown up searching for information online. While most students have ample searching experience, their skill sets have been largely developed using Google, which had 90 % of the search engine market in 2010 and 84 % in 2022 (Statista Research Department, 2022). Novice searchers tend to have confidence in their ability to find what they need in library databases using the same strategies as they would in Google (Bloom & Deyrup, 2015; Perruso, 2016). While this might be viewed as disadvantageous, it may in fact be useful in preparing students to identify "information pieces" to use in making source selection decisions in library databases (Bodemer, 2012).

Users of Google or other search engines will be accustomed to the way that these tools rank results, placing the most relevant ones first and making it largely unnecessary to go past the first page of results. Asher et al. (2013) observed that 92 % of students using library search tools and Google Scholar selected all their sources from the first page of results, effectively outsourcing much of the relevance evaluation to the

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https://doi.org/10.1016/j.acalib.2023.102713
Received 25 January 2023; Received in revised form 7 April 2023; Accepted 10 April 2023
Available online 24 April 2023

search engine. Similarly, Hamlett and Georgas (2019) found that only 17 % of students went past the first page of search results in library discovery systems. Our study builds on this research, investigating students' awareness of their search behavior by comparing how often students go beyond the first page of results to how often they report doing so.

When searching for information, convenience and efficiency are top student priorities. Cross and Gullikson (2020) observed students rushing through the search and selection process, scanning titles and abstracts for their keywords before quickly moving on, even when their initial search terms did not contain all of the concepts related to their topic. Undergraduates surveyed by Komissarov and Murray (2016) placed higher value on the immediate availability of full text than on most other considerations, including currency, credibility, and even their ability to understand the source. While these priorities may not apply to a subset of undergraduates engaged in advanced research, they are generally embraced by the typical college student (Bonnet et al., 2013).

While students have their go-to search strategies, they may employ different tactics when their initial search fails to uncover the desired information. Students in Dalal et al.'s (2015) study often changed their search terms in response to disappointing search results. Asher and Duke (2012) found that changing the research topic was one reaction to a failed search, though most students spent time searching and revising their search terms before doing so. Bloom and Deyrup (2015) noted that students were "habitual" topic changers, and that if changing the topic did not achieve the desired result, students would change databases. Another approach is satisficing, or making do with results that are less than ideal. Agosto (2002) describes youth satisficing in relation to web-based decision making. Even more experienced students have been observed to satisfice strategically, selecting sources that they knew would be sufficient to perform well on their assignment (Warwick et al., 2009). Our study expands on the findings described here by prompting students to reflect in greater depth on their strategies after a failed search.

Evaluation and selection of information

Multiple studies have evaluated sources chosen by students, looking at criteria such as relevance, currency, and credibility (e.g. Dahlen & Hanson, 2017; Lambert et al., 2021; Leeder et al., 2012; Pearce, 2019); far fewer have done what we do in the present study, which is to ask students about their reasoning when making these choices. Twait (2005) explored the criteria that students employ when they select sources by having them think aloud while conducting searches and asking them what an ideal source would be. List et al. (2016) provided students with a list of eight possible sources that they could use to answer question prompts, and then asked them to justify their choices. Our study combines elements of these two approaches by having students conduct their own searches for information, then questioning them about their reasoning for choosing each source. This approach of interviewing students while the search was fresh in their minds was advantageous in that it led to detailed answers about specific sources they had chosen. We also asked students explicitly about the role that currency, credibility, and relevance played in their selection of sources.

Currency

The date of publication is an important consideration when selecting sources, though what is considered acceptable will vary depending on the discipline and the topic of research. In their assessment of assignment prompts, Head and Eisenberg (2010a) found that fewer than 11 % of prompts mentioned currency as a factor in selecting sources. Similarly, Koelling and Russo (2021) document infrequent inclusion of publication date as a criterion in assignment prompts for first-year composition classes. Instructors may be reluctant to assign a specific date range due to topical variation in acceptable publication dates, and they may address currency in other ways in the classroom, which seems likely given that many students are attentive to this consideration. In a broad-scale student survey, 77 % of students reported considering currency when evaluating websites and 67 % did so for library resources (Head & Eisenberg, 2010b). Additional studies have also documented publication date as an important consideration for students when selecting sources (Cross & Gullikson, 2020; Komissarov & Murray, 2016), though it was less important in others (List et al., 2016).

Credibility

Students are generally aware that source credibility is an important consideration when selecting sources, though they are not universally confident in their ability to assess it. Komissarov and Murray (2016) report that students at their institution described the peer review process, author reputation, and source reputation as "somewhat important" considerations, and all of the student participants in Vinyard et al.'s (2017) study mentioned the importance of using credible sources. Bonnet et al. (2013) found that some undergraduates engaged in advanced research mentioned assessing the credibility of the sources they used, and Twait's (2005) sample of students mentioned credibility more often than most other selection criteria. However, almost a quarter of students in Insua et al.'s (2018) study reported low confidence in finding credible sources. This may be exacerbated by assignment prompts only addressing vaguely, at best, criteria for source credibility (Koelling & Russo, 2021). When students are unsure how to evaluate credibility, they may place their trust in library databases to return credible results (Asher et al., 2013; Liu et al., 2018; Rosenzweig et al., 2019).

Relevance

Unsurprisingly, relevance is a primary consideration for students when selecting sources. Komissarov and Murray (2016) found that relevance was the most important consideration for their students. In Twait's (2005) study, content relevance was the only source selection criterion mentioned by every student participant. Schultheiß et al. (2018) found in their eye-tracking study that while students were influenced by the prominence of search results (as ranked by Google), they chose more relevant results over higher ranking results. Relevance and other non-epistemic considerations were more frequently cited by students as justification for source selection than epistemic criteria, such as credibility, in List et al.'s (2016) investigation.

Instructor influence

A major theme that emerged from our research is how influential instructors are in shaping students' information-seeking behaviors and dispositions. While we were unable to locate other literature similarly documenting the extent of this influence, there are a number of investigations that address the roles of non-library faculty in information literacy instruction. Several studies have found that students are more likely to seek help from faculty than from librarians or other sources (Bonnet et al., 2013; Catalano, 2013; Thomas et al., 2017; Vinyard et al., 2017). This trend may be countered, however, when instructors refer their students to a librarian, which makes them more likely to seek librarian assistance (Vinyard et al., 2017). Instructors also play a role in recommending library databases to students (Komissarov & Murray, 2016), and in influencing their source selection decisions (Twait, 2005). Based on graduate students' reliance on faculty for assistance with locating information, Catalano (2013) has proposed training faculty in advanced search techniques, and Lacy and Hamlett (2021) have described a successful train-the-instructor model at a community college. Team teaching is another way to combine the strengths of librarians and other faculty in meaningful ways (Bharuthram et al., 2019). Instructors' sustained interactions with students puts them in a good position to influence students' information-seeking behaviors and dispositions.

Methods

Data collection

This research utilizes part of an extensive dataset that we collected in 2015. In order to investigate various aspects of student information-seeking behavior, we created an experimental setting in which student participants were asked to complete a search task in three library search tools. Participants were given a prompt to find the "best quality" articles (left intentionally vague to allow for interpretation) on one of two topics, which were chosen to represent the kind of broad research topics students might start with at the beginning of an assignment (see Appendix A). The search tools used were EBSCO's Social Sciences Abstracts and two versions of ProQuest's Summon, one that employed the default settings and one that was pre-scoped to exclude newspapers and to include information from social science disciplines, thus imitating some of the parameters of a subject database like Social Sciences Abstracts. Participants' search processes and the two articles they chose from each search tool were recorded with screencast software. Additionally, they were interviewed by the authors both during and after their searches. Finally, participants completed a survey about their search experience. IRB approval was obtained in 2014 and covered data collection and all subsequent analysis.

Much of the quantitative data we collected has already been analyzed and published. One previous finding was that while most participants preferred to use the discovery system, they selected more authoritative articles from the traditional database, Social Sciences Abstracts (Dahlen & Hanson, 2017). We also found that participants' search behaviors varied between tools, that there are three distinct categories of facet use among participants, and that certain search behaviors aid or hinder participants' ability to select high quality information from library search tools (Dahlen et al., 2020). The current study draws primarily on the qualitative data collected from formal interview questions and more casual conversations with participants during and after their searches. These data had previously been used only selectively to provide additional context for the quantitative data, but had not yet been systematically analyzed.

Our qualitative data consist of the transcribed conversations between the authors and study participants. The screencasts were captured with Camtasia Relay and the dialogue was transcribed by NVivo Transcription. Some of the transcribed dialogue is casual conversation during the search process, but most is from interviews, which we conducted in a semi-structured manner. After participants selected their articles from each search tool, we asked them why they picked those articles and whether they would feel confident using them for a class assignment. After the searches in all three tools had been completed, we asked participants a few additional questions about their considerations when selecting articles, including the publication date, the credibility of the source, and the relevance of the article to the topic. Finally, we asked a couple of questions about their typical searching habits, including how often they go beyond the first page of search results and what they do when they are not satisfied with the results of their search. (See Appendix B for exact wording of questions.) Our methods differ from those of previous studies on student information-seeking behavior primarily in that we explore, through interviews conducted after students completed search tasks in library databases, student reasoning for search behaviors and article selection, in some cases triangulating the results with our previously published quantitative data for deeper understanding.

We acknowledge that our dataset is eight years old at the time of publication, and that this is a limitation of our research. Search tools have been updated in the subsequent years, and students may have changed as well. Nonetheless, we believe that our data and its analysis still offer important insights into student search behavior. While vendors continually modify their search tools, the general look and feel of the interfaces of discovery systems, and particularly EBSCO databases (such as Social Science Abstracts), remain largely the same. This study investigates student sentiment and motivation around search behavior and source choice, which we would not expect to be substantially affected by recent modifications to library databases. Most of our student participants belong to the same generation as students today (Generation Z), though today's students have lived through the COVID-19 pandemic and its concomitant crisis of trust in information, which may have affected students' information-seeking behaviors in ways that are difficult for us to predict. As librarians who have frequent contact with students, however, we continue to hear today's students express many of the same sentiments that are systematically captured in our data. Our study is a snapshot of student behavior and sentiment at a particular point in time, and it can serve as a baseline for future research on this topic.

Participants

Our study participants were 50 juniors and seniors majoring in Social and Behavioral Sciences (SBS) at California State University, Monterey Bay (CSUMB). This major was chosen based on one of our original motivations for collecting this dataset, which was to answer the question of whether an indexing and abstracting database, such as Social Sciences Abstracts, is worth retaining when most students seem to prefer discovery services. The answer to that question was "yes" (Dahlen & Hanson, 2017), and to answer it we selected a study population that we deemed the most likely to benefit from the Social Sciences Abstracts database. Given that we were limited to 50 participants for practical reasons (each participant received a $50 gift card incentive and had an unlimited amount of searching time, though the average was 45 min), we also thought it preferable to limit our study to a more uniform population rather than factor in additional variables such as major or class standing.

Participants were recruited via email, and the first 50 to respond were selected. This sample represented 26 % of the population of upper-level SBS majors at the time of data collection. To try to reduce the perception of invasiveness, we did not collect demographic information about the participants. The demographics of this major at the time of data collection were: 48 % Latinx students, 34 % White students, and 52 % underrepresented minorities. This major has significant numbers of transfer students (75 %), first generation college students (68 %), and low income students (47 %). Sixty-two percent of SBS majors are female, 38 % are male, and 63 % are aged 24 and under. This study's first author is the liaison librarian to this department and conducts classroom instruction and one-on-one research consultations with its students. Among our participants, 64 % reported previously attending library instruction sessions or having a research consultation with a librarian.

Data analysis

The transcribed dialogue was analyzed in NVivo. Transcripts were coded using open coding followed by focused coding. Themes were not identified in advance but rather derived from the data. While all qualitative data was coded, the only data reported here is that which is relevant to our research focus on search practices and source selection. The themes that emerged are presented below, along with descriptions, the number of participants whose comments were coded at each theme, and illustrative quotes.

Results

Many of the results presented here are organized by interview questions, so that we can see the themes that emerged from participants' responses to each question. Interview questions were primarily focused on participant practices for searching or for evaluating and selecting information, so these results are presented in those categories. There was also a theme that appeared across interview questions/categories (the influence of instructors on participant behavior), and that will be

presented separately.

Search process

The ways in which students use library search tools was a major focus of an earlier publication using this dataset, and in that investigation, we focused on what participants did while searching by analyzing the screencasts of their searches (Dahlen et al., 2020). Because we were able to collect data on what students actually do when searching, rather than what they say they do when asked, our interview questions on this topic were limited.

Pages of results

Our first question was: When searching for articles for a class assignment, how often would you say that you go beyond the first page of search results? Forty-eight percent had responses indicating that they often or always go beyond the first page when searching, while 26 % indicated that they sometimes do this, and 26 % indicated that they rarely or never do (Table 1). A number of participants observed that results tend to get less relevant further into the results list, and that was their reason for not going too far into the pages of results.

Strategies for failed searches

Another question we asked participants was what they do when they are searching for information sources and are not getting the results that they hoped for. We specified that they were to reflect on their general search process, not specifically what they did during that day's search exercise. Search term modification was the most frequently mentioned strategy (n = 31, 62 %), followed by searching elsewhere (n = 22, 44 %). All of the strategies that were mentioned by more than one participant are included in Table 2, which is partially presented below and fully presented in Appendix C.

Some of the themes that arose most frequently have sub-themes that further elucidate participants' search strategies. Even when sub-themes are only present for a small number of participants, we believe that they merit mention, as they are likely to be present for additional participants who did not describe their process with the same level of detail.

Within the "search term modification" theme (n = 31, 62 %), participants mentioned making a change to the search terms, primarily trying different words or phrases. Some of the more specific modifications that came up more than once include:

- Narrowing the search by adding additional terms or making terms more specific (n = 4, 8 %)
- Broadening the search by removing search terms (n = 2, 4 %)
- Rearranging the search terms by putting them in different orders or in different search boxes (n = 2, 4 %)
- Using terms found in an article record (keywords, words from abstract) as search terms (n = 2, 4 %)

Some of the participants whose strategy was to switch to a different search tool ("search elsewhere" theme; n = 22, 44 %) were specific in mentioning where they search. These responses included:

- Google Scholar (n = 8, 16 %)
- Another library database (n = 6, 12 %)
- Google (n = 6, 12 %)
- Wikipedia (n = 1, 2 %)

Several participants who mentioned using a non-library search tool mentioned using that tool to find sources or keywords and returning to the library search tools to search with the newly discovered terms or to find full text (n = 4, 8 %).

There was not a lot of consistency in the responses within the "utilize search tool features" theme (n = 8, 16 %), meaning that participants did not mention utilizing the same search tool features. The only exception is the two participants who mentioned the date filter, though one wanted to use it to broaden and the other to narrow. Within the "ask for help" theme (n = 7, 14 %), five participants indicated they would ask their instructor and two said they would ask a librarian.

Table 1
Themes from participant responses to "When searching for articles for a class assignment, how often would you say that you go beyond the first page of search results?".

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Often or always go beyond first page	n = 24 48 %	Participant describes frequently going past the first page of search results	"I'll generally check the first two or three pages. Most databases, as far as I've seen, tend to put the most relevant to what you're searching in those first few pages, so if I don't find something that I'm looking for in the first two to three pages, I'll generally refine my search. Change it to something else. How far do I go past the first page? Almost all the time. How far do I go past the third page? Almost never."
Sometimes go beyond first page	n = 13 26 %	Participant describes occasionally going past the first page of search results	"It really depends. I would say if it's hard to find a source I would keep going, but if it's something I see right away and it looks really good to me and I start reading it and it's really good, then I'll stay on the first page. It just depends. I would say—I can't even say a number, it just depends on the situation."
Rarely or never go beyond first page	n = 13 26 %	Participant describes going past the first page of search results seldom or never	"If I'm having real trouble finding something that I can put a source to I'll just start digging through pages. But I hardly ever will really go past the first page. If I feel like I have to, then that's when I start changing my [search terms] at the top to see if it's what I'm typing in, if I can't alter it a little bit."

Evaluation and selection of information

Recall that as part of their searching exercise, participants chose two "best quality" articles from each of the three library search tools, for a total of six articles chosen by each of the 50 participants. After each article was chosen, we asked participants: Why did you pick this article? Most responses listed multiple reasons for choosing each article. We then followed up with: Would you feel confident using this article as a source

Table 2
Select themes from participant responses to "What do you do when you're not getting the results you hoped for?" (full list of themes in Appendix C).

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Search term modification	n = 31 62 %	Make a change to the search terms, including using different words or changing their order	"When I don't get the results, I alter what I'm searching for. So like for 'academic achievement,' I just think of anything else that might mean the same thing, like a synonym of a phrase or something. But mostly just changing up the words and word play, adding in certain phrases. Because it might trigger other articles that have the same focus or subject, but just they'll word it differently."
Search elsewhere	n = 22 44 %	Switch to a different search tool, including library and non-library tools	"I would Google. Honestly, I'll just type that into Google, and I'll go through whatever, trying to find different key words or something—just get lost in Google." "Google Scholar as a backup. I can always go back and look in the library articles and databases, and you can look up other things that maybe will be relevant when you search. I know Sage Journals is another different one, other than these. Maybe use one of those other sources."
Use search tool features	n = 8 16 %	Use filters, drop down menus, or other features of the search tool	"On this site like [Summon], It gives you a certain checklist like do you want to find specific journals or only articles or in what language and what topic. I click those so that kind of reduces my search."

for an actual assignment? Of the 300 articles chosen, there was only one "no" response to this question. This gives us some confidence that participants were choosing articles using similar criteria to what they might use for their coursework.

Reasons for choosing articles

Many themes emerged from participants' responses to why they chose their articles (Table 3). The most frequently occurring theme was "content," which captures those responses that described the content of the article as their reason for choosing it (n = 39, 78 %). Another common theme was "contrasting or comparative focus" (n = 32, 64 %), in which participants described selecting articles because they were similar to or different from other articles they had chosen for the exercise. The "connection" theme (n = 31, 62 %) captures those responses that indicate that articles were chosen in part because the participant had a connection to it. These connections were sometimes personal experiences that led the participant to relate to the article, sometimes an interest in the topic, and sometimes beliefs or thoughts on the topic that were reinforced by the article.

Participant responses were coded under the "authoritative, data-driven source" theme (n = 30, 60 %) when they mentioned that the methods were scientifically sound or referred to the peer-review process as providing scientific validity. Just more than half of participants noted that "similarity to the prompt" (n = 26, 52 %) was a factor in choosing their articles. Slightly fewer participants mentioned "scope" (n = 24, 48 %) as a consideration in article selection, though some were drawn to the broadness of articles and others to their specificity. The remainder of the themes can be seen in Appendix C, Table 3.

As they responded to the question of how they selected sources, some participants mentioned where they found the information that led them to choose a particular article (Table 4). While not everyone described where they found this information, 24 participants (48 %) said that they found it in the abstract and 14 (28 %) found it in the title.

After searching all three tools and selecting all of their articles, participants answered a few additional questions: to what extent they considered, in choosing their articles, the date of publication, the credibility of the authors or the publication, and the relevance to their topic. Once they had answered, participants were also asked if what they had just described was also the approach they use when doing research for a class. The response was almost universally "yes," though there were some caveats about needing to conform to specific assignment prompts or instructor preferences.

Currency

With regard to the currency of the articles, students were asked: To what extent did you consider the date of publication when you chose your articles? Their responses were coded by whether they indicated that the publication date was an important consideration, somewhat important, or not very important (Table 5). Seventy-six percent of participants expressed that the date of publication was an important (n = 19, 38 %) or somewhat important (n = 19, 38 %) consideration when selecting articles. The remaining participants (n = 12, 24 %) suggested that the date of publication was not a very important consideration.

In addition to these broad categories of the importance placed on the date of publication, several other themes emerged throughout the interviews that shed light on how students think about source currency (Table 6). Forty percent of participants (n = 20) indicated that they have been influenced by their instructors to focus on more recently published sources, either because they need to follow the instructions of assignment prompts or because their instructors have convinced them of the value of more recent publications. Another theme was that the range of acceptable publication dates varied depending on the topic of research (n = 13, 26 %). A final theme was the intentional selection of a mix of articles with older and newer publication dates (n = 13, 26 %).

Credibility

Participants were also asked: To what extent did you consider the credibility of the authors or the publication when you chose your articles? A majority of participants (n = 27, 54 %) indicated that they ensured that their articles were scholarly, and 19 (38 %) specifically mentioned peer review. Because the question referred to "the credibility of the authors or the publication," 15 participants (30 %) noted that they did not specifically consider the authors or the journal, though many of them were looking for scholarly articles. Twelve participants (24 %) said that they considered the journal, and three (6 %) said that they considered the author. Eight (16 %) noted that they used the database limiters to narrow their search to scholarly articles only, though many more of them (n = 31, 62 %) were observed to do this in at least some of their searches. Three participants (6 %) mentioned the article's appearance as part of their evaluation of its credibility (Table 7).

In addition to the themes above that surfaced from responses to a specific question, several other themes related to credibility emerged throughout the interviews that shed light on how students think about this topic (Table 8). Most notably, 16 participants (32 %) made comments indicating that they trusted the search tool to determine the source credibility. In some cases (n = 5; 10 %), the very presence in a library database was enough to indicate that the source was credible; in others (n = 13; 26 %) the database's label was considered a sufficient marker of credibility. A number of participants (n = 14, 28 %) indicated that their instructors had an influence on their perceptions of credibility and what types of sources count as sufficiently credible. A few participants (n = 3, 6 %) mentioned ways in which non-scholarly sources can be useful in the search process.

Table 3
Select themes from participant responses to "Why did you pick this article?" (full list of themes in Appendix C).

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Content	n = 39 78 %	Participant described the content of the article when explaining why they chose it	"I chose this one because they're talking about teacher and child relationship quality. Basically, it really depends on the teacher and the relationship with the child." "I think that would provide the information on how boys and girls are conditioned to play with G.I. Joe or Barbie."
Contrasting or comparative focus	n = 32 64 %	Article chosen because it was either different from or similar to other articles the participant picked	"So they're both looking at the same thing, but they'll have slightly different things to talk about. So I would use both of these essentially to provide more evidence for that." "The content touches on a different perspective than the other one, so it kind of rounds out the argument."
Connection	n = 31 62 %	Article chosen because participant had a personal connection to it, found it particularly interesting, or it reinforced their thoughts or beliefs on the topic	"[They studied] immigrant student[s] in a wealthy white neighborhood, or school, and that reminded me of myself. I used to live in the poor side of L. A., and then I was fortunate enough to leave that, and move into Northern L.A. Santa Clarita. Which was a pretty white neighborhood, and I feel like I can relate to it because it did have a positive impact on me. I don't think I would be in college if I didn't move out of L. A…Yeah, so I feel like that. I can relate to it." "This one, it had some truth in it."
Authoritative, data-driven source	n = 30 60 %	Article chosen because it was perceived as being scientific, quantitative, qualitative, data-driven, etc.; includes positive perceptions of the methods, specifically the sample size, or that the article was peer-reviewed	"The description of the study sounds like it was a large sample group that was taken from varying samples. So it sounded more legit, scientifically." "I was looking at it because they had statistical data. They had numbers and dates and that sort of information, so I would use that to get the statistical data analysis of the situation."
Similarity to prompt	n = 26 52 %	Article chosen because it was similar to the assignment prompt or the keywords from the prompt	"Well that literally fit the prompt about as good as I could find." "Well, I read the title, and it seemed like it had a lot of what this prompt has to do with. And I read the [abstract], and it has a lot of key words that are in the search, so I picked that one."
Scope	n = 24 48 %	Article chosen either because of its broadness or its specificity	"This particular article was general enough to fit within the criteria. A number of the articles were about Latino children or Chinese children, and that doesn't fit, because we're not looking at just one ethnic group that's immigrated." "It was talking specifically. Cuz the other ones were kind of vague and it was just kind of all over the place, but this one was talking about one specific study they did with 87 kids."

Relevance

Participants were subsequently asked: To what extent did you consider the relevance of the article to your topic when you chose your articles? (Table 9). Every participant said that relevance was considered, and 60 % (n = 30) made comments indicating that it was a top consideration. The second most frequently occurring theme was "different angles," in which participants expressed their intention to find articles addressing different perspectives on a topic while still maintaining relevance to the research question. Twelve participants (24 %) noted that they evaluated relevance by the presence of key words from the prompt in the article or article record. A couple of participants (4 %) mentioned that they look for articles that are interesting to them in addition to being relevant to the topic.

In their responses to the question about considering relevance, a number of participants mentioned specific parts of parts of articles where they look to determine relevance. Ten participants (20 %) named the abstract, nine (18 %) referenced the title, and two (4 %) mentioned the full text (Table 10).

Instructor influence

In addition to the themes that emerged from responses to specific questions, an additional theme arose throughout the interviews: the influence that instructors have in shaping students' information-seeking behaviors. More than half of our participants (n = 28, 56 %) made comments that were coded at this theme. The theme arose in some of the

Table 4
Where participants found information driving their article selection.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Abstract	n = 24 48 %	Participant mentioned the abstract or the information therein as a reason for choosing the article	"When I read the [abstract], this provided me with the information that I was looking [for]." "[The abstract] kind of just describes what I'm looking for and actual information that I would want from it, so I don't have to read the whole thing to find out that it's not going to help me."
Title	n = 14 28 %	Participant mentioned the title or the information therein as a reason for choosing the article	"Well, the title was very—it just seemed like it picked up [on] what I was searching for…The title caught my eye." "I'm being completely honest. Every time I say, 'Yeah, I have two [articles chosen],' I have not read the [abstract] yet [chuckles]."

Table 5
Importance of date of publication as a consideration for article selection.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Date of publication important	n = 19 38 %	Date of publication was an important consideration when choosing their articles	"I considered that a lot, just because I know that's what teachers ask for. At least a lot my teachers have asked for fairly recent articles. So, I always look at the date when it was published."
Date of publication somewhat important	n = 19 38 %	Date of publication was a somewhat important consideration when choosing their articles	"It was pretty important, but not the most important aspect. From a scale or an order, I'd say it was maybe the third or fourth factor."
Date of publication not very important	n = 12 24 %	Date of publication was not a very important consideration when choosing their articles	"None. I never really take that into consideration."

previous analyses related to the evaluation and selection of information. As we saw in Table 6, 20 participants (40 %) noted the impact that instructors have on their considerations of currency, and 14 participants (28 %) mentioned instructors influencing their standards for credibility (Table 8). Taking those comments and all others throughout the interviews that were coded at "instructor influence," we were able to define two primary sub-themes. These sub-themes attempted to distinguish between participants indicating a desire to follow specific requirements given by instructors, or indicating that the instructors' values or priorities had been internalized by participants. Twenty participants (40 %) made comments focused on meeting requirements, while 16 (32 %) demonstrated some adoption of the instructors' values

Table 6
Other themes related to publication currency.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Instructor influence on currency	n = 20 40 %	Participant noted that their selection of publication date is informed by instructor guidance or specifications of a particular assignment	"Well just from what professors have told us, is that it is better when you have things that are more recent because they are just more relevant." "There are some classes that are very specific. When you're doing your search, they have to be from 2000 to present."
Publication date informed by topic	n = 13 26 %	Participant indicated that the publication dates they consider acceptable depend on the topic they are researching	"It would depend upon what I was writing about." "Like last semester I was in a class that required having research from not more than two years ago. And it made sense. I mean, that was a progressive time in technology where we learned more and more and there are certain things that are said in articles that weren't said 20 years ago."
Mix older and newer publication dates	n = 13 26 %	Participant mentioned intentionally incorporating articles with a range of publication dates	"I like to get a mixture of things that are recent and things that are older." "I like to look at older ones just to see what they've come up with, and then…I always want to compare it to something new just to see if they have added more information to the newer version than not."

or priorities. Numerous participants made comments that fell under both of these themes, suggesting that even students who have internalized the values to some extent are aware of the specific requirements of an assignment. Only two participants (4 %) had comments coded at the final sub-theme, which was related to instructors teaching students how to find information (Table 11).

Discussion

Search process

Pages of results

With regard to how often students go beyond the first page of search results, we were able to compare participant responses to the search behaviors recorded by the screencasts, giving our study a different

Table 7
Select themes from participant responses to "To what extent did you consider the credibility of the authors or the publication when you chose your articles?" (full list of themes in Appendix C).

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Ensured article was scholarly	n = 27 54 %	Participant noted that they made sure that the articles they selected were scholarly or peer-reviewed	"I wouldn't pick anything that's not peer reviewed or a scholarly article." "Well, I limit to scholarly and peer reviewed, the type from journals or something that can be recognized, or I can always Google and find out if it's legit. One part of these search engines [library databases], they give you good stuff and credible stuff that I always make sure I filter to link the full text and the scholarly peer review. Because that's known to be academic, and you can use it, and you're not like going uncited [chuckles]. Yeah, I always look for that, especially that."
Peer-reviewed	n = 19 38 %	Participant specifically mentioned peer review as a consideration for credibility	"It was very important because they do have to be scholarly articles, and they do have to be peer reviewed. And, this, for me, it proves that it has been scientifically studied." "They're peer reviewed. I don't have a degree—who am I to challenge something that is already peer reviewed?"
Did not consider author or journal	n = 15 30 %	Participant noted that they did not specifically consider the credibility of the author or the journal, though they may have used other criteria for evaluating the credibility of the source	"I'm not familiar with the scholarly people…The last thing I look at, if ever." "When I first started looking at them, I didn't really think of that. All I knew was, 'Oh, academic journal, so it should be scholarly enough.'"
Considered journal	n = 12 24 %	Participant mentioned considering the journal where the chosen article was published	"I'd much rather trust something like the American Sociological Association than Fox News. So that's definitely more credible because they've got credit in their research behind the name." "The publication I considered a lot, I did not spend time looking at the authors."
Limited search to scholarly sources	n = 8 16 %	Participant ensured that chosen articles were credible by using database limiters to narrow search to scholarly or peer-reviewed articles	"I kind of rely on this one right here [scholarly filter] just to make sure they're scholarly at least."

perspective than others that have looked at this question. Their reported behavior corresponded quite closely with their actual behavior in the experimental setting. The number of participants who went past the first page of results was recorded for each of our three search tools, and it was 48 % for one version of Summon, 50 % for the other version of Summon, and 22 % for Social Sciences Abstracts (the lower number for the latter can be explained by the frequent instances of SSA providing only one page of results). As indicated in Table 1, 48 % of participants reported that they often or always go beyond the first page and 26 % said that they sometimes do. The close correspondence of these numbers suggests that participants were able to accurately report on their search behaviors in this case, and we hope that accuracy extends to their responses to our other questions, some of which cannot be corroborated by observations.

How far into the results list students go when searching is a behavior that has been previously addressed by a number of studies, which typically found that students, from a wide variety of majors and years of study, are not likely to go beyond the first page of results (Asher et al., 2013; Cross & Gullikson, 2020; Georgas, 2014; Gewirtz et al., 2014; Hamlett & Georgas, 2019; Holman, 2011). The participants in our study did not conform to this behavior, and many were sufficiently cognizant of their tendencies to describe the circumstances that prompt them to visit subsequent pages or to try a different approach. Many students expressed awareness of decreasing relevance of results farther into the results list, though some took the absence of relevant results on page one as a directive to start a new search while others saw it as cause to go a few pages deeper into the results.

Our previous research found that going beyond the first page of search results was not correlated with selecting better sources (Dahlen et al., 2020), so librarians may not need to encourage or discourage this behavior. This finding does have implications for database providers as it highlights the value of search algorithms that successfully rank relevance: If students focus on the first few pages of results, this is where the most relevant results should be if students are to be retained in the database (the second most frequent strategy for dealing with a failed search was searching elsewhere; see Table 2). The importance of search algorithms is further highlighted by the 16 % of participants who listed the prominence of an article in the results list as one of their reasons for selecting it (Table 3). The value of search algorithms is unlikely to be news to most librarians, who have experience searching databases that have relevance ranking that produces logical results and those that do not. In the rare case when a database is available from multiple vendors, we can vote with our dollars for the option with better relevance ranking.

Strategies for failed searches

Asking students not how they search, but rather what they do when their initial search fails, was our distinctive approach for diving deeper

Table 8
Other themes related to credibility.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Trusting the tool for credibility	n = 16 32 %	Participant trusted that the articles chosen were credible, either because they were found through a library database (n = 5; 10 %) or because the database labeled them as scholarly, peer-reviewed, or academic journal (n = 13; 26 %)	"One part of these search engines, they give you good stuff and credible stuff that I always make sure I filter to link the full text and the scholarly peer review. Because that's known to be academic, and you can use it." "I always click on the scholarly ones. Because if they made it on there, they have to be real, right [laughter]?"
Instructor influence on credibility	n = 14 28 %	Participant mentioned their instructors, major, or assignments as influencing their criteria for credibility	"Ever since I joined my major they're strict on scholarly articles. I got used to it." "I was just going for scholarly journals. So that's one thing that I've been taught to do when doing research and to find credible sources."
Utility of non-scholarly sources	n = 3 6 %	Participant brought up scenarios in which non-scholarly sources can be useful while recognizing their limitations for credibility	"if I'm doing a research paper, and I would start only scholarly, but after you get a good idea of what the - in my particular case - what the theorists and what people are thinking within my major, then I'll look on Google. Then I'll go through and see if I can't find little snippets of information here and there. So I don't think scholarly is the only way to go, but if you're starting—you shouldn't start any other way. Unless you have no idea then that's when you Wikipedia it and read it and say, 'alright.'"

into how students behave when the most obvious or simple strategy does not yield desirable results. Encouragingly, 62 % of respondents said that they would modify their search terms, demonstrating an awareness of the importance of search terms and a certain degree of persistence. This finding departs from the observations of Cross and Gullikson (2020), who found that undergraduate and graduate students were unlikely to change their search terms even when they were not yielding the desired results. The second most commonly mentioned strategy, however, was searching elsewhere, with 44 % of participants listing that as an approach after a failed search, though not necessarily their first action.

Only 16 % of participants mentioned using features of the search interface to address a failed search. This is noteworthy because our screencasts show that 72 % of participants used the database facets during their searching (Dahlen et al., 2020). This indicates that most students are aware of facets and use them, but do not view them as a way to remediate a failed search. Facets can in fact be very useful in narrowing search results and improving their relevance, particularly when the initial search is too broad. Drawing students' attention to the utility of facets not just for format or date, but also for subject, may give them an additional strategy for persisting when a search fails.

A disappointing 14 % of participants said that they would ask for help when unable to find the results they were looking for, and of those, the majority (72 %) mentioned seeking assistance from their instructor. While instructors can be extremely helpful and are the subject matter experts, we librarians have expertise specifically in finding information. Reference desk transactions have been declining for years (Bandyopadhyay & Boyd-Byrnes, 2016), and so finding new ways to promote our reference services to students may help with their awareness of the library as a go-to resource for information needs.

Evaluation and selection of information

Reasons for choosing articles

One of our unique contributions to the literature on information-seeking behavior is an in-depth look at how students justify the sources they select following a library database search. There was a wide variety of reasons participants provided for choosing their articles, and for most, more than one reason was mentioned. While it may not be surprising that the most common theme was "content" (78 %), it is worth noting that many of the responses coded at this theme did not demonstrate awareness of how that content related to their overall information goals. A typical response took the form of "I chose this article because it talks about x" rather than "I chose this article because it talks about x, and x is an important element of the topic" or "x would help me answer the research question" or "I can use x to make a particular point." It may be that these considerations were too far removed from the consciousness of participants in this experimental setting, or that participants had a tacit awareness of how the articles' content was related to their overall goals. Being able to articulate this relationship, however, could be useful to students as a preliminary step toward writing from sources, rather than sentences. This is a concept articulated by Howard et al. (2010), whose work with the Citation Project found that students citing information in their papers tended to write from individual sentences in a source, using a direct quote or paraphrase, rather than summarizing the information from a source. Awareness of this tendency can help librarians provide targeted instruction to students about incorporating information from sources into their papers. For example, students might benefit from explicit instruction on the various roles that information from sources might play in their assignments, including establishing the context or background, defining terms, making a point, illustrating an example, supporting an interpretation, etc.

Encouragingly, though, some participants did list reasons for choosing articles that demonstrated an emerging recognition of how those articles might fit into the bigger picture of the assignment. Sixty-four percent of participants selected articles because of their contrasting or comparative focus in relation to their other sources. This shows that students are not choosing articles in isolation, but rather looking for sources that complement each other. We interpret this as a precursor to synthesizing information from sources, a skill that proves challenging for many students (Bury, 2016; Dahlen & Leuzinger, 2020; Eastman et al., 2018; Lundstrom et al., 2015; Rosenblatt, 2010). Additionally, 28 % of participants noted that they chose an article because they could imagine how they would use it in their paper, a promising indicator that at least some students have the bigger picture in mind, and a number that might be higher if the participants had actually been required to write a paper.

We have varying interpretations of participants listing their connection to an article as a reason for selecting it (62 %). In some cases, those connections seemed benign or positive, such as when participants mentioned finding an article particularly interesting or relatable. On the other hand, this theme also captured some participants seemingly

Table 9
Themes from participant responses to "To what extent did you consider the relevance of the article to your topic when you chose your articles?".

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Top consideration	n = 30 60 %	Relevance was one of the participant's primary considerations when choosing articles	"I think that was the most important thing…Stuff that was clearly related to the topic I was searching for. I thought those were the best ones." "The whole thing. I always make sure, because if it's not relevant, how are you going to write it? You're just going to have an article that you're just reading for fun, it's nothing that's going to help you out in your paper. So I always make sure. That's what I do with my articles, I make sure it's relevant to the topic, like 100 % relevant."
Different angles	n = 13 26 %	Participant mentioned finding articles with different angles, perspectives, or factors of a topic while still being relevant to the main research question	"I wanted it to be as accurate as possible, but I definitely did open my viewpoints to depict different scenarios as far as who was being portrayed in the article." "Usually when I'm writing a paper—I probably shouldn't get away with—but I usually get away with taking the topic and making it more specific. And sometimes I'm just really interested in one area of that topic, and I'll say 'I know that there's something to be said about this. I know there's something to be said about that.' But sometimes I'll be searching around and I'll find something really interesting and I'll say 'Well, I want to incorporate that into my paper. Let me do that, and let me find something else to compare it with, and we'll go from there.' So usually relevance is kind of a perspective in my stuff."
Key words	n = 12 24 %	Participant evaluated relevance by the presence of certain key words (including from the prompt) in the article's title, abstract, or full text	"I wanted to see the keywords in the prompt in my titles every time I chose them." "That was the most important part, just making sure in the [abstract], the key words matched, and they were actually related, not vaguely distantly related."
Interest also considered	n = 2 4 %	Participant mentioned that articles should be interesting in addition to relevant	"They're relevant and they're interesting I guess, just so that I could actually read it and I could have something to talk about in the paper… Because if I just pick a random one for whatever reason and I read it and I'm not interested in it, then I'm not going to be able to talk about it."

gravitating toward articles that resonated with their thoughts or beliefs on the topic. This behavior can be understood as a manifestation of confirmation bias, something that educators hope to combat by fostering information literacy and critical thinking skills. While this proclivity may be too pervasive to fully remedy through library instruction, a discussion of confirmation bias in our instruction sessions may help students resist gravitating only toward sources that reinforce existing beliefs.

A majority of participants (60 %) had reasons for choosing their articles that were related to their authoritative or data-driven nature. Many of these students specifically mentioned the method that the authors had used (e.g. surveys, interviews), the sample size, the quantity or type of data (e.g. qualitative, quantitative), or that it had been peer-reviewed. It was encouraging to see that students were attentive to these considerations, even if they were sometimes over simplified (e.g. bigger sample size = better study). Smaller numbers of participants mentioned the journal (12 %) or author (8 %) as a factor in their choice, or the source's use of theory (8 %). Many of these considerations align with the priorities of the SBS faculty, who put heavy emphasis on the importance of scholarly sources, along with attentiveness to method and theory.

We did not ask participants where they found the information that led them to choose their articles, but some volunteered that they had made their choices based on the title (28 %) or the abstract (48 %). The importance of these fields is consonant with the findings of Cross and Gullikson (2020), who observed undergraduate and graduate students rapidly scanning results lists for titles and dates, and then reading abstracts of sources that seemed sufficiently interesting. Students who choose sources based on the title alone, however, may be missing some relevant results. This is particularly notable given that 52 % of our respondents mentioned choosing articles based on seeing key words that were similar to those in the prompt. If students are scanning titles for words that match the terms they use to describe their topic, relevant articles described using different terminology are less likely to be noticed. Databases that include a few lines of the text under the title in the results list may help students see relevance when it is not immediately apparent from the title, and bringing students' attention to this pitfall in instruction sessions may be useful.

Currency

The date of publication was described as an important or somewhat important consideration for most participants (76 %) when asked. Similarly, previous studies have found publication date to be a consideration when choosing sources for students from a wide variety of years of study and majors (Cross & Gullikson, 2020; Head & Eisenberg, 2010b; Komissarov & Murray, 2016). Some of our participants also brought up currency unprompted in response to the prior question about how they chose their articles. In that context, 30 % of participants mentioned the recent publication date as a reason they chose an article, and 24 % noted that a chosen article had an older publication date but that they had decided to select it anyway. This demonstrates a widespread awareness of currency as one standard by which information is evaluated. While certain comments reflected an oversimplified view that newer always equals better, a more nuanced understanding of currency was evidenced by some participants in their justifications for choosing articles with older publication dates (24 %), their focus on the topic of research to inform the publication date (26 %) and their strategic mixing of older and newer sources (26 %). The average publication date of articles selected by our participants was about ten years prior to the time when students conducted their searches (Dahlen & Hanson, 2017), which reflects the selection of a range of older and newer sources.

Credibility

In retrospect, we realize that the wording of our question on credibility could have been improved to better capture a wider range of participant sentiment. We asked, "To what extent did you consider the

Table 10
Sites for evaluating relevance.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Abstract	n = 10 20 %	Participant mentioned the abstract as a site for evaluating relevance	"Yeah, and I go to the abstract and see if it talks about what I'm looking for." "Just from the [abstract] - I did not read the full text - but from the [abstract], it gave me a pretty good idea of what it was about, and it was really relevant to the prompt."
Title	n = 9 18 %	Participant mentioned the title as a site for evaluating relevance	"A lot, because I was focusing on the title. The title usually can tell me what my topic is on, because of how there's some key words in there."
Full text	n = 2 4 %	Participant mentioned looking at some amount of the full text to get a sense of relevance	"Well, the title itself is not enough. I feel like I always have to read at least the abstract. If that might not be enough, I'll open up the document and make sure - maybe scan through it, maybe the titles or the subtitles, just to make sure that I might link it to the topic. I might have to maybe read it all or just scan through it to see if it's something that I might link to the topic or if it's a good topic that I can add on to it…"

credibility of the authors or the publication when you chose your articles?" Some participant responses reflect a very literal interpretation of the question, stating that they did not consider the author or the journal. Other participants gave broader answers that described their considerations of source credibility, even when that did not specifically include the author or journal. A more expansive phrasing of the question would likely have captured additional detail regarding participants' credibility considerations.

With that limitation in mind, we can still say that credibility was a consideration for most of our participants when selecting their sources. Eighty-eight percent of participants said that they considered credibility in one way or another. Of the remaining participants, 6 % noted that they hadn't considered credibility yet but would if they were going to move forward with these sources for an assignment. This complements the findings of Bonnet et al. (2013), Komissarov and Murray (2016), and Twait (2005) who document attentiveness to source credibility among students from a variety of majors and years of study, and aligns with our previous finding that these students overall chose very authoritative sources (Dahlen & Hanson, 2017).

While only 16 % of our participants mentioned (unprompted) their use of a database filter to limit their search to scholarly sources, 72 % were observed to use this filter in one or more of their searches. Other participant comments indicated that even when the filter was not employed, they were still attentive to the database labels of "peer-reviewed," "scholarly," or "academic journal." Similar to the findings of Asher et al. (2013) regarding undergraduates from various years of study and disciplines trusting library search tools, 32 % percent of our participants noted that they trusted these database labels, or in some

Table 11
Sub-themes within "instructor influence" theme.

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Meet requirements	n = 20 40 %	Participant showed awareness of the need to meet specific requirements set forth by an instructor or an assignment	"It's basically what a lot of professors ask for, too, are more up-to-date articles. They don't mind if you slide a few older things in there, but they pretty much like up-to-date articles and do request it in their syllabus and whatnot or their scoring page for any particular project." "Unless I was told that it had to be a scholarly article, then I would look at the article other than that. It doesn't matter."
Internalize instructor priorities	n = 16 32 %	Participant's comments indicated that they had internalized or adopted the values or priorities their instructors have around finding, evaluating, or using information	"That's [publication date] very important. Maybe because professors have mentioned the importance of that. However, I know, and some professors mentioned, even some stuff that you find that may not be as current might be very useful information - that's something I have noticed as well." "Well, I made sure that they were scholarly/peer reviewed journals. That's one thing I made sure that I checked off. It wasn't just general information that I was focusing on - no books, no nothing. I was just going for scholarly journals. So that's one thing that I've been taught to do when doing research and to find credible sources."
Instruction on finding information	n = 2 4 %	Participant mentioned receiving instruction on searching for information	"My professors told me to use this [database]." "That's how we're taught by the teachers, that if… very broad articles pop up, they want you to narrow the topic down to more keywords to fit, so the right articles pop up for you."

cases (10 %), trusted the presence of the article in a library database, to determine credibility. While database filters and labels are useful features, librarians know from experience that they are sometimes misapplied, and we hope that students are not dependent on them at the expense of applying their own criteria to determine source credibility.

Relevance

Perhaps unsurprisingly, and consistent with other studies of undergraduates from various majors and years of study (Komissarov & Murray, 2016; List et al., 2016; Twait, 2005), every participant said that they considered relevance when selecting their articles, and 60 % noted that it was a top consideration. It follows, then, that many of the themes in this category reiterate those that emerged when we asked students their reasons for choosing articles. Twenty-six percent described a strategy of finding relevant articles with different angles on the topic, which echoes some of the reasons given for choosing specific articles, namely, choosing articles with a contrasting or comparative focus, and choosing articles based on their perspective. This could be interpreted as a promising counterpoint to the trend described above of participants selecting articles that they connected with, an inclination that raised concerns about confirmation bias. Another theme that reinforces findings discussed above is that students' evaluation of relevance may overrely on the presence of key words from the prompt (12 %), which could result in students missing relevant information that is described using different words or phrases. Nonetheless, our previous analysis found that these students generally chose sources that were relevant to their topic (Dahlen & Hanson, 2017).

Instructor influence

A particularly notable theme that emerged throughout the interviews, and that is not similarly evident elsewhere in the literature, was the influence that instructors have on students' information-seeking behaviors. This theme arose in a number of different contexts, with 56 % of participants making comments coded at this theme. While asking for help was not the most frequently mentioned strategy for dealing with failed searches (14 %), of those who did mention it, the majority said they would seek help from their instructor (71 %). This is consistent with findings at other institutions that looked at undergraduate and graduate students in various years and areas of study (Bonnet et al., 2013; Catalano, 2013; Thomas et al., 2017; Vinyard et al., 2017). When asked whether they considered the currency of their sources, 40 % of our participants noted that their criteria are informed by instructor guidance or the specifications of a particular assignment. Similarly, 28 % of participants indicated that instructors influenced their considerations for source credibility.

Because of the prevalence of this theme, we divided it into subthemes in an attempt to parse whether the participants were merely trying to meet the requirements specified by assignments (40 %) or whether they had internalized the priorities of their instructors (32 %). There is overlap between these two sub-themes, which we interpret as evidence that even students who have adopted their instructors' priorities are still attentive to the specifics of their assignment prompts. We suspect that the number of students who have internalized the information-seeking values of their instructors is greater than 32 %, considering that the search exercise that participants completed did not specify requirements regarding currency or credibility, yet they were still mentioned as important considerations (recall that they were not specifically asked about influences on their source selection criteria, which could have yielded additional responses at this theme).

There is not a great deal of research about instructor influence on information literacy behaviors and dispositions, though Komissarov and Murray (2016) found that students are more likely to use library databases if their instructor recommended them, and Twait (2005) described faculty influencing student source selection (both studies focused on undergraduates from various disciplines and years of study). Many of the comments from our participants that evidence their adoption of instructor priorities indicate that an instructor's repeated emphasis on the importance of something like currency or credibility can lead students to recognize that value and transfer it to other contexts. This has implications for instructors, who may or may not realize that explicitly promoting their priorities for source evaluation is more impactful than any implicit endorsement of source types made in their assignment prompts (e.g. your paper must cite five scholarly sources).

The implication for librarians is that our efforts would be well-directed toward turning instructors into information literacy advocates. Our interaction with students is often limited to single instruction sessions in which we try to cover a substantial amount of material. Not one participant in our study made a comment about librarians having influenced their information-seeking practices or values, even though 64 % of them had attended library instruction sessions or had a research consultation with a librarian. Instructors, in contrast, have frequent interactions with students, have the chance to develop a rapport with them, and have the authority to espouse the values of their discipline. Catalano (2013) has recommended training faculty who advise graduate students in advanced search techniques, and we propose that the same approach could be fruitful for faculty working with undergraduates. Considering the number of students that instructors teach every semester, converting faculty to informed information literacy advocates could have a substantial impact on students.

This is not to minimize the role of librarians in fostering helpful information-seeking behaviors in students, but rather to suggest that we ramp up our faculty outreach efforts. Armed with the information that instructors are the ones poised to make the biggest impact on student behavior, librarians could encourage faculty to take a more active role in reinforcing the information-related values of their discipline. This could include librarians providing faculty with sample language for their assignment prompts describing the reasoning for requiring scholarly sources published within a particular date range. Librarians could engage instructors during library instruction sessions in dialogue about the practices and priorities of their field. Instructors at new faculty orientation could receive a handout on "how to be an information literacy advocate." Disciplinary faculty can also deeply engage with information literacy through assessment projects (Dahlen & Leuzinger, 2020) and leadership institutes (Schlesselman-Tarango & Becerra, 2022). Some faculty have expressed interest in incorporating more information literacy into their instruction (Bury, 2016), and this has been accomplished through team teaching (Bharuthram et al., 2019) and train-the-trainer models (Lacy & Hamlett, 2021). The possibilities are many, but the unifying element is to convince instructors of the importance of their role in instilling values that lead to information-seeking behaviors that students will apply beyond a particular assignment.

The population that we studied was limited to a single major at our institution. While this may be viewed as a limitation, it allowed us to see how one academic department has passed along their information-related priorities to students. Although this was not our initial intention in selecting this major, we see throughout the interview data indications that students have internalized the priorities of the SBS faculty. This goes beyond the comments that were coded at this sub-theme to include students' pervasive attentiveness to finding current, scholarly sources. Method and theory, which also receive attention in SBS, also arose unprompted, though to a lesser extent, in participants' reasons for choosing articles. A comparison group would be necessary to determine whether these same considerations would emerge from students in a department with different information-related values, and this would be a direction for further research. As librarians who have worked with this major, however, we believe that we heard the particular priorities of this department's faculty echoed in the words of their students.

Conclusion

This case study has explored the information-seeking and selection behaviors of students by interviewing them during and after a search exercise and identifying recurring themes that emerged from their reflections on their process. This adds an additional perspective to our previous analyses of this population, which were quantitative in nature and focused on student preferences for search tools, the quality of sources they choose (Dahlen & Hanson, 2017), the influence of search interfaces on student behavior, and the relationship between search behaviors and source quality (Dahlen et al., 2020). It also expands our collective understanding of how students think about searching for, evaluating, and selecting information by employing a novel interview approach designed to elicit deeper exploration of areas that have previously been addressed in the literature. Our findings have led us to identify the following implications for database design, information literacy instruction, and relationships with non-library faculty.

Database design

If database vendors wish to retain students in their products, thereby increasing usage statistics and maintaining library customers, they must be attentive to user-centered design. Given students' tendency to change search tools when relevant results are not evident in the first few pages and to somewhat superficially evaluate relevance based on the presence of key words in the title, fine-tuning database algorithms for relevance ranking should be given the utmost consideration. An additional way to engage users is to provide a few lines of the abstract on the search results page so that students do not miss relevant sources when skimming the results.

Information literacy instruction

Our findings point to a number of take-aways for instruction. Source evaluation has long been a pillar of information literacy instruction, and should continue to be, even though database labels and filters can automate some of the process. Reliance on such database features may be expedient, but students need their own source evaluation criteria to apply outside of the library domain and even within it, as we know our tools sometimes fail to appropriately categorize information.

In teaching students to select sources, it may prove helpful to have explicit conversations about how to determine when sources are relevant and useful to the information need. Helping students understand the different roles that information from sources might play in their paper (background, definition, evidence, illustration, etc.) may allow students to be strategic when selecting sources, keeping in mind the context of how the information will be applied in their assignment. We can remind students to look beyond titles when selecting sources, and to not scan results lists for the presence of their search terms to the exclusion of related terms. We can also educate students about confirmation bias, helping them recognize and counter this tendency in the classroom and beyond.

Finally, if students do not automatically gravitate toward the library as a place to meet their information needs, we need to continue to promote ourselves and our services. The classroom is just one site for this type of promotion, but it can be a beneficial one as we connect with students through our instruction and prove ourselves to be a valuable resource that can be revisited when information needs arise.

Relationships with instructors

Our final take-away is the need to build relationships with non-library faculty. While this is not a new entreaty, ours has a particular focus, which is turning faculty into information literacy advocates. Faculty advocates do not merely give up one of their class sessions for library instruction, but also reinforce the points made throughout the semester. They try to instill the information-related values of their discipline not just by requesting certain source types in their assignment prompts, but by ensuring that students understand why these source types are valued and when exceptions can be made. While librarians must continue to engage students directly whenever possible, we can recognize our limitations and invest outreach efforts in the group that has the most sustained contact with students and thus the best opportunity to inspire students to develop lifelong habits of mind.

Funding

This work was supported by a Faculty Incentive Grant from CSUMB.

CRediT authorship contribution statement

Sarah P.C. Dahlen: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Funding acquisition. **Kathlene Hanson:** Investigation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None.

Appendix A. Search prompts

Each participant was assigned one of the following tasks:

1. You are writing a research paper on the effects of children's toys on gender stereotypes. Find 2 of the best quality articles to use.

OR

2. You are writing a research paper on the factors that affect the academic achievement of children of immigrants. Find 2 of the best quality articles on this topic.

Appendix B. Interview questions

After participant selected articles in each search tool:

- Why did you pick this article?
- Would you feel confident using this article as a source for an actual assignment?

After participant concluded searches in all three search tools:

- To what extent did you consider the date of publication when you chose your articles?

- Would that also be your approach if this research were for a class?

- To what extent did you consider the credibility of the authors or the publication when you chose your articles?
- Would that also be your approach if this research were for a class?

- To what extent did you consider the relevance of the article to your topic when you chose your articles?
- Would that also be your approach if this research were for a class?

- When searching for articles for a class assignment, how often would you say that you go beyond the first page of search results?
- What do you do when you're not getting the results you hoped for?

Appendix C. Full results tables

For those results tables longer than five rows, only the first few rows of the table appear in the text, with the full tables (including all themes) here in Appendix C.

Table 2
Themes from participant responses to "What do you do when you're not getting the results you hoped for?".

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Search term modification	n = 31 62 %	Make a change to the search terms, including using different words or changing their order	"When I don't get the results, I alter what I'm searching for. So like for 'academic achievement,' I just think of anything else that might mean the same thing, like a synonym of a phrase or something. But mostly just changing up the words and word play, adding in certain phrases. Because it might trigger other articles that have the same focus or subject, but just they'll word it differently."
Search elsewhere	n = 22 44 %	Switch to a different search tool, including library and non-library tools	"I would Google. Honestly, I'll just type that into Google, and I'll go through whatever, trying to find different key words or something—just get lost in Google." "Google Scholar as a backup. I can always go back and look in the library articles and databases, and you can look up other things that maybe will be relevant when you search. I know Sage Journals is another different one, other than these. Maybe use one of those other sources."
Use search tool features	n = 8 16 %	Use filters, drop down menus, or other features of the search tool	"On this site like [Summon], It gives you a certain checklist like do you want to find specific journals or only articles or in what language and what topic. I click those so that kind of reduces my search."
Ask for help	n = 7 14 %	Ask an instructor or librarian for help	"Usually, I'll go back and ask a professor if I can't really find anything. Maybe they might know an author in particular."
Go to further pages of results	n = 6 12 %	Go beyond the first result pages	"I usually go up to a couple of more pages, like two, three more pages and see. But, usually if you keep going, they kind of slowly start going off topic."
Satisfice	n = 5 10 %	Settle for a source that is "good enough"	"I choose something that's fairly close to it. If I didn't get something exact, then I find something fairly close to what I'm trying to get at."
Change format	n = 4 8 %	Look for information in a different format, especially books	"I'd go to see if there [are] any books. I haven't used an actual book in a while, but that would probably be my next step."

Table 3
Themes from participant responses to "Why did you pick this article?".

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Content	n = 39 78 %	Participant described the content of the article when explaining why they chose it	"I chose this one because they're talking about teacher and child relationship quality. Basically, it really depends on the teacher and the relationship with the child." "I think that would provide the information on how boys and girls are conditioned to play with G.I. Joe or Barbie."
Contrasting or comparative focus	n = 32 64 %	Article chosen because it was either different from or similar to other articles the participant picked	"So they're both looking at the same thing, but they'll have slightly different things to talk about. So I would use both of these essentially to provide more evidence for that." "The content touches on a different perspective than the other one, so it kind of rounds out the argument."
Connection	n = 31 62 %	Article chosen because participant had a personal connection to it, found it particularly interesting, or it reinforced their thoughts or beliefs on the topic	"[They studied] immigrant student[s] in a wealthy white neighborhood, or school, and that reminded me of myself. I used to live in the poor side of L.A., and then I was fortunate enough to leave that, and move into Northern L.A. Santa Clarita. Which was a pretty white neighborhood, and I feel like I can relate to it because it did have a positive impact on me. I don't think I would be in college if I didn't move out of L.A…Yeah, so I feel like that. I can relate to it."

(*continued on next page*)

Table 3 (*continued*)

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Authoritative, data-driven source	n = 30 60 %	Article chosen because it was perceived as being scientific, quantitative, qualitative, data-driven, etc.; includes positive perceptions of the methods, specifically the sample size, or that the article was peer-reviewed	"This one, it had some truth in it." "The description of the study sounds like it was a large sample group that was taken from varying samples. So it sounded more legit, scientifically." "I was looking at it because they had statistical data. They had numbers and dates and that sort of information, so I would use that to get the statistical data analysis of the situation."
Similarity to prompt	n = 26 52 %	Article chosen because it was similar to the assignment prompt or the keywords from the prompt	"Well that literally fit the prompt about as good as I could find." "Well, I read the title, and it seemed like it had a lot of what this prompt has to do with. And I read the [abstract], and it has a lot of key words that are in the search, so I picked that one."
Scope	n = 24 48 %	Article chosen either because of its broadness or its specificity	"This particular article was general enough to fit within the criteria. A number of the articles were about Latino children or Chinese children, and that doesn't fit, because we're not looking at just one ethnic group that's immigrated." "It was talking specifically. Cuz the other ones were kind of vague and it was just kind of all over the place, but this one was talking about one specific study they did with 87 kids."
Population	n = 23 46 %	Participant mentions some characteristic of the population studied as a reason for choosing article	"Well the reason I picked this article is the other articles kept specifying one ethnic background - Chinese, or Mexican, or just… children of color. This one has two - at least two - Mexican and East Asian immigrants. So it's not just one specific group; it's at least two different ones, and it's comparing both of them."
Recently published	n = 15 30 %	The recent publication date of the article is mentioned as one reason for selecting it	"And it would be more useful to read a more current article, than an article from 20 plus years ago." "It was published recently, in the past 10 years."
Visualize using article for assignment	n = 14 28 %	Article chosen because participant can imagine how they would use it in their paper	"I could definitely pull some useful information from this article to apply it to the research paper."
Older publication chosen anyway	n = 12 24 %	Participant acknowledges that publication date is older than they would like, but has decided to choose the article anyway	"I did choose this one article from 1999, but the title almost perfectly stuck with what I was searching for." "It's kind of old, and I feel that based off of this would maybe give me an idea to find a more current one. I might, might not, depending on how many sources I need for the paper."
Prominence of article in results	n = 8 16 %	Participant chose article because it came up in multiple searches/ search tools, because of its high position in the results list, and/or because it was one of the only articles in the results list	"This is the first one that came up. I'm always wanting to pick the first one just to at least read it and see if I'm going down the right path I want to keep scrolling down." "I kept on seeing it pop up as I was doing my search, and I started to think, 'Okay, well let's see…'"
Perspective	n = 7 14 %	Article chosen because of its perspective or point of view	"And I really like that we get the view of 20 migrant educators employed. It's someone who's there in the classroom who's getting their hands dirty with this information and these problems." "What I like about it is, it's from a parent's point of view."
Publication or journal	n = 6 12 %	Participant mentioned the journal where the article was published as a reason for choosing it	"Like this one comes from *Ethics and Racial Studies*. That sounds pretty up in the field, and for educational purposes and scholarship." "That one I chose because it came from a very scholarly source, *The Oxford Review of Education*…I've used a lot of other Oxford Journal reviews, and I know that they're very packed full of information."
Full text available	n = 5 10 %	Participant mentions availability of full text as a consideration in choosing an article	"I kind of landed on this one, only because the other ones that I felt probably would be better…one is written in French. I don't speak French. And the other one, I would have had to get through interlibrary loan."
Theory	n = 4 8 %	Participant mentions use of theory in the article as one reason for choosing it	"We have to have a theory in most of our papers, and this one went into depth with that. So, that would definitely be a good choice, I think."
Author	n = 4 8 %	Participant mentions recognizing the author's name as a consideration in choosing an article, either as an incentive or a deterrent	"This lady—I didn't know it was the same lady, but I kind of like when that happens because it makes me feel like—it gives a little validity. Obviously, she's devoted her whole career to this research. This is her—which gives me—makes me feel confident." "Like usually I don't choose like the same author twice. Like they say, 'Oh, you can only use three articles.' I like to have it as varied as possible."

Table 7
Themes from participant responses to "To what extent did you consider the credibility of the authors or the publication when you chose your articles?".

Theme	Participant count and percentage	Theme description	Illustrative quote(s)
Ensured article was scholarly	n = 27 54 %	Participant noted that they made sure that the articles they selected were scholarly or peer-reviewed	"I wouldn't pick anything that's not peer reviewed or a scholarly article."
			"Well, I limit to scholarly and peer reviewed, the type from journals or something that can be recognized, or I can always Google and find out if it's legit. One part of these search engines [library databases], they give you good stuff and credible stuff that I always make sure I filter to link the full text and the scholarly peer review. Because that's known to be academic, and you can use it, and you're not like going uncited [chuckles]. Yeah, I always look for that, especially that."
Peer-reviewed	n = 19 38 %	Participant specifically mentioned peer review as a consideration for credibility	"It was very important because they do have to be scholarly articles, and they do have to be peer reviewed. And, this, for me, it proves that it has been scientifically studied."
			"They're peer reviewed. I don't have a degree—who am I to challenge something that is already peer reviewed?"
Did not consider author or journal	n = 15 30 %	Participant noted that they did not specifically consider the credibility of the author or the journal, though they may have used other criteria for evaluating the credibility of the source	"I'm not familiar with the scholarly people…The last thing I look at, if ever."
			"When I first started looking at them, I didn't really think of that. All I knew was, 'Oh, academic journal, so it should be scholarly enough.'"
Considered journal	n = 12 24 %	Participant mentioned considering the journal where the chosen article was published	"I'd much rather trust something like the American Sociological Association than Fox News. So that's definitely more credible because they've got credit in their research behind the name."
			"The publication I considered a lot, I did not spend time looking at the authors."
Limited search to scholarly sources	n = 8 16 %	Participant ensured that chosen articles were credible by using database limiters to narrow search to scholarly or peer-reviewed articles	"I kind of rely on this one right here [scholarly filter] just to make sure they're scholarly at least."
Considered author	n = 3 6 %	Participant mentioned the author as a consideration when choosing articles	"There's one of the authors, like her name kept popping up, so I was really tempted to choose her again, but I also wanted to look for other authors just [for] variety."
Considered appearance	n = 3 6 %	In determining credibility, participant mentioned visual cues	"Here, if you click on this article, what you get—yeah, that seems good. This is like a big—this has got an abstract. It's got an introduction. It's got related work, prevailing rate. It's got a bunch of different—it looks very smart. It looks very professional. So that's something I take into account."

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