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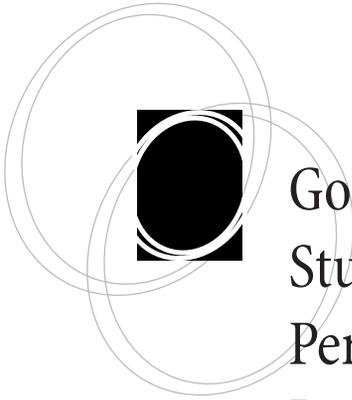
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Google vs. the Library: Student Preferences and Perceptions When Doing Research Using Google and a Federated Search Tool

Helen Georgas

abstract: Federated searching was once touted as the library world's answer to Google, but ten years since federated searching technology's inception, how does it actually compare? This study focuses on undergraduate student preferences and perceptions when doing research using both Google and a federated search tool. Students were asked about their preferences using each search tool and the perceived relevance of the sources they found using each search tool. Students were also asked to self-assess their online searching skills. The findings show that students believe they possess strong searching skills, are able to find relevant sources using both search tools, but actually prefer the federated search tool to Google for doing research. Thus, despite federated searching's limitations, students see the need for it, libraries should continue to offer federated search (especially if a discovery search tool is not available), and librarians should focus on teaching students how to use federated search and Google more effectively.

Introduction

Federated searching was once heralded as the library world's future: a one-stop-shopping solution that would rival Google, but return quality results, searching easily and efficiently across the library's subscription resources.¹ About a decade has passed since federated search technology was first introduced. How has this so-called future played out? Has federated searching turned out to be what libraries hoped for? How does federated searching *actually* compare to Google?

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The promises that were once being made by vendors about federated searching are now being made about discovery searching. For some libraries, this shift couldn't come fast enough.² However, for many libraries, discovery searching remains prohibitively expensive. For those libraries that still want to provide their students with the possibility of searching across multiple subscription resources, federated searching may be the only "affordable" option.

Yet, at Brooklyn College, a large, urban public university that is part of the City University of New York (CUNY) system, even the federated search tool is being questioned because of its cost. As at many libraries across the country, budgets are being slashed and resources are being carefully re-examined. Is the federated search tool absolutely necessary, given that it does not offer unique content and costs almost \$10,000 to subscribe to annually? Furthermore, as Google continues to improve its search algorithm and its interface, and with the possibility that some Google searches will lead users to results within Google Scholar, Google's search engine for scholarly materials, is Google now a much more viable (and free) alternative to federated search?

Defending the necessity of a federated search tool during tough economic times is certainly problematic for libraries. Even though librarians use and are proponents of Google, there are, as James Caufield puts it, "fears that the public is coming to see Google not simply as a competitor to libraries but as a substitute for them." Librarians know that students appreciate Google's ease of use, but they also know that it can come at the price of core library values such as quality and privacy.³ In keeping with these values, the reference librarians at Brooklyn College believe in offering students federated searching of the library's resources on principle. Yet they are also keenly aware that, in addition to its cost, the federated search tool has numerous drawbacks: it can be very slow, complicated for students to use, and the technology of federated search does not allow for the most thorough integration of content from the individual subscription databases that it's searching across.

Because of these limitations, Brooklyn College librarians have always struggled with how and where to present the federated search tool on the library's website and how to best teach it to their students, either at the reference desk or during classroom

Wasn't the library moving backward if it decided to discontinue access to federated searching simply because it still wasn't perfect?

sessions. Nonetheless, the belief has always been that federated search offered students the ability to find and access (via the inclusion of full-text databases) higher-quality content than that offered via Google and other search engines. As a result, shouldn't the library still provide students with an alternative, or at least a

complement to, Google? Wasn't the library moving backward if it decided to discontinue access to federated searching simply because it still wasn't perfect?

It became evident that the federated search tool needed to be more closely examined. How did students feel about it? How did they use it? If the Brooklyn College Library continued to offer federated searching, what was the best way to teach it to students, particularly undergraduates? In an age in which Google still dominates, and ten years since federated search technology's inception, how do the two compare?



More specifically, the following questions needed to be addressed:

When doing research, do undergraduate students prefer federated searching or Google? Are students able to identify relevant research resources using both a federated search tool and Google? Do students possess adequate information literacy skills to use each of these search tools effectively?

Literature Review

In 2008, Douglas King asked six librarians whether they believed federated searching was working as a way “to win users back from Google.”⁴ Their responses were mixed. Federated searching, one librarian acknowledged, was a way for students to discover which databases might be best for a particular discipline. Another librarian realized that, in polling her fellow librarians, very few of them were teaching it in the classroom. All of the librarians surveyed said that federated searching did not provide seamless searching, was slow, and definitely needed to be improved. But, in keeping with the librarians’ experience at Brooklyn College, they were reluctant to do away with their federated search tool completely. For all of its flaws, it was at least *something* that libraries could offer as an alternative to Google.

Another concern often expressed by librarians about federated searching is the risk of information overload for our students. Because of the number of databases typically included in a federated search, students who have not adequately developed their research questions or have not thought enough about their search terms may become overwhelmed by the number of results.⁵ A study by the Research Libraries Group reported that federated searching was viewed as a tool for students to “get started finding stuff,” and not a tool for “advanced research.”⁶ Dennis Warren writes that, “rather than being the promised step forward, federated searching as currently implemented may well be a step backward” and that it is “still a long way off from delivering the hoped-for seamless cross-database access to the scholarly literature.”⁷ Despite these reservations, however, there has been a wealth of usability studies on federated search tools, reflecting libraries’ commitment to providing their students with the option of searching across authoritative sources.⁸

What do students think about federated searching? Bob Gerrity, Teresa Lyman, and Ed Tallent first reported that student feedback on the implementation of a cross-database searching system was also mixed. Although students loved the convenience of being able to search across multiple resources, they did not view it as an adequate tool for more sophisticated searches.⁹ Rong Tang, Ingrid Hsieh-Yee, and Shanyun Zhang reported that students viewed federated searching more positively than librarians.¹⁰ In a study conducted by Abe Korah and Erin Dorris Cassidy, there was a high rate of federated search use but only moderate satisfaction. For most students, federated searching did not replace individual databases and online search engines.¹¹

For most students, federated searching did not replace individual databases and on-line search engines.

C. Jeffrey Belliston, Jared L Howland, and Brian C. Roberts asked a group of undergraduate students to compare federated searching to searching individual article data-



bases by having them look for articles on a pre-selected biology topic.¹² Approximately seventy percent of students preferred federated searching to the alternative.

In another comparative study of federated searching vs. single database searching (this time among a group of freshman composition students with their own research topics), students expressed only a slight preference for federated searching, thus supporting "equal promotion of single database searching and federated searching to undergraduate students."¹³ A more recent but very similar study, again asking students to compare federated searching and single database searching, produced comparable results: students indicated a slight preference for federated searching, with over half the students also stating that the federated search tool enabled them to find more relevant search results.¹⁴

What about comparisons between Google and library search tools? In a 2005 study comparing Google with individual subscription databases, Jan Brophy and David Bawden found that the main differentiating factors were quality (library databases) and accessibility (Google). Google also came out slightly ahead in terms of coverage, although "both systems are needed to achieve anything approaching comprehensive recall."¹⁵ In 2006, Xiaotien Chen compared two federated search tools, MetaLib and WebFeat, with Google and found that Google's strengths were its "speed, simplicity, ease of use, and convenience." The main advantage of the federated search tools were "superiority of search result content."¹⁶

This study presents a more recent side-by-side comparison of federated searching and Google. It is unique in that it is the only comparative study of Google and a federated search tool that focuses on the preferences and perceptions of the user.

Methodology

Thirty-two Brooklyn College undergraduate students across a range of majors, academic years, and ages were recruited, and two-hour appointments were scheduled with each one.

At the beginning of each session, students were asked to choose a research topic out of a list of six presented to them (Appendix A). They were asked to consider the topics carefully and choose the one of greatest interest to them, since they were going to be working with the topic throughout the two-hour session. Once a topic was selected, each student was presented with a series of research tasks. The librarian explained to each student that they would be asked to find one book, two articles (one of them scholarly), and one additional source of their choosing, as if they were actually doing research on that topic. Once the student understood the set of research tasks they were being asked to complete, they were told to begin with one of two search tools, either the federated search tool (also known as the BC Library Search Tool) or Google.

In order to avoid bias as much as possible, and to acknowledge the fact that "students want a clean, basic, and simple interface," the initial search screen for the federated search tool was designed to mirror the one-search-box interface of Google (Figure 1).¹⁷ In an attempt to balance comprehensiveness and search speed, eleven databases across a range of disciplines were included in the federated search tool: the Brooklyn College Library catalog, Ebrary, NetLibrary, Academic Search Complete, Business Source



Figure 1.

Complete, General Science Full Text, Humanities Full Text, JSTOR, Lexis Nexis, Project Muse, and Social Sciences Full Text.

Once each student completed the first set of research tasks, they were then instructed to complete the same set of tasks (finding one book, two articles, and one additional source of their choosing) on the same topic, but using the other search tool. While students were performing each set of research tasks, Camtasia, a screen-capturing software, was used to record their movements.

In order to further avoid bias, half of the thirty-two students were asked to begin using the federated search tool, and the other half were asked to begin using Google.

After the research tasks with the second search tool were completed, each student was given a questionnaire asking them to provide quantitative and qualitative feedback about using each of the search tools (Appendix B).

The study thus examined three distinct but interrelated aspects of the students' research experience. Students' search queries and movements were analyzed via the video data to detect meaningful patterns and habits when using each of the search tools, and to determine the level of their information literacy and searching skills. The sources students found were analyzed for relevance in order to determine how appropriate each search tool was for doing research. Finally, students' own preferences and perceptions about using each of the search tools, the relevance of the sources they found, and their opinions about their own searching skills were elicited via the questionnaire.

This article is the first in a series, and focuses on the students' preferences and perceptions when doing research using both Google and the federated search tool.

Findings

Ease of Use

When asked which search tool was easier to use, twenty-six students (81.2 percent) said Google and six students (18.8 percent) said the federated search tool. Of the twenty-six students who stated that Google was easier to use, one added, in writing: "Only because it was faster."



Efficiency

When asked which search tool was more efficient, the federated search tool came out ahead, with eighteen students (56.3 percent) responding that it was more efficient, and fourteen students (43.7 percent) responding that Google was more efficient. Again, one student added a written comment as a qualification for why they'd preferred the federated search tool: "Was more efficient regarding breaking down each source specifically."

Liked Better

In terms of which tool students liked better, the two search tools came out exactly even, with sixteen votes for each. When asked to explain why, the students who liked Google better cited its ease of use (three students), its ability to easily help them identify a particular source (three students), their familiarity with the tool (two students), its speed (two students), and the fact that it gave better and/or more relevant results (two students) as the main reasons (Table 1).

When asked to explain why they liked Google better, the following comments stood out:

"Google is smarter at finding what you're searching for. If you spell it wrong it knows what you mean whereas the library search isn't as effective. Google is also easier to manipulate in terms of putting in different word combinations to find what you're looking for. The library search seems pretty rigid and hasn't changed much since middle school."

"Google provided more relevant articles/books and was much easier for me to navigate."

"On Google I can find evidence that is easy to understand as well as the hard core scholarly articles. I can use this information to better understand the topic myself, even if I don't end up citing it in my research paper. The BC system really only offers very heavy work."

Of the students who liked the library's federated search tool better, they stated that it gave better and/or more relevant results (eight students), that it was better for articles (six students), that it gave more authoritative/scholarly results (four students), and that they liked its citation feature (three students) as the main reasons for preferring it (Table 2).

When asked to explain why they liked the federated search tool better, these were some of the stated reasons:

"I found the Google search engine to be easier to use, but I enjoyed using the BC Library Search Tool better for looking up my topic and searching for articles. I especially enjoyed the feature where I could narrow down the search results to just scholarly articles. I also liked how as the program is bringing up the search results, it checks off on the right side where it found articles (such as in Project Muse or JSTOR)."

"It was easier to limit the sources to books or articles and it was easier to find the citation."

"It provided easier (quicker) access to published journals. With Google, you get access to websites and periodicals mostly. I find the BC Search Tool more user friendly and aesthetically pleasing than Google Scholar. Also, citations were provided with BC Search Tool which made the process much easier!"



Table 1.
Students' Reasons for Liking Google Better

	Ease of use	Identifies a source	Familiarity	Speed	Better and/or more relevant results
Number of students	3	3	2	2	2
Percent	9.4	9.4	6.3	6.3	6.3

Table 2.
Students' Reasons for Liking Federated Search Tool Better

	Better and/or more relevant results	Better for finding articles	More authoritative and/or scholarly results	Citation feature
Number of students	8	6	4	3
Percent	25	8.8	12.5	9.4

Relevance of Results

When asked how relevant were the results found using each of the search tools (on a scale of 0 to 10, with 0 being not relevant and 10 being very relevant), students gave the sources they found using Google an average relevance of 7.90, and gave the sources they found using the federated search tool an average relevance of 7.59.

Likelihood of Use in Future Research Assignments

When asked which search tool they would use for future research assignments, the federated search tool came out ahead, with nineteen votes (59.4 percent). Eleven students (34.4 percent) said they'd use Google, one student said they'd use both, and one student didn't state a preference but responded that "it depends on the assignment." For a term project, the student would use the federated search tool. If they had to write a one-page summary, the student would use Google.



Several students included qualifying comments. For example, one student who voted for the federated search tool said: "I certainly find it easier to find scholarly, respectable articles. However, Google is easier for leisurely background reading which is needed in the beginning steps of a research project."

Recommend to Fellow Student

Students were also asked which search tool they'd recommend to a fellow student. The breakdown was as follows: eighteen students (56.3 percent) said the federated search tool, eleven students (34.4 percent) said Google, two students (6.3 percent) said both, and the same student who responded "it depends" for which tool they'd use for future research assignments also said "it depends" in response to which tool they'd recommend to a fellow student (with the same qualification: for a term paper they'd recommend the federated search tool, for a one-page summary, they'd recommend Google).

Difficulty Using Google

In terms of difficulty using Google, seven students (21.9 percent) responded that they had no difficulty using it to find sources related to their chosen research topic. The most common difficulties reported for Google were that it returned too many and/or irrelevant results (twelve students); that there were a lot of ads and/or students were taken to commercial sites and asked to purchase an item (five students); that it wasn't good for finding scholarly sources (four students); that it failed to provide the full citation to a source (two students); and that it was difficult to find books (two students) (Table 3). Of these students, it should also be noted that five of them specifically mentioned using Google Scholar (either in addition to or instead of Google).

Difficulty Using Federated Search Tool

Four students (12.5 percent) responded that they had no difficulty using the federated search tool to find sources (Table 4). The most common difficulties reported were that it was difficult to find books (eight students); that it was slow (seven students); that it yielded irrelevant results (seven students); that it was difficult to identify types of sources (four students); that the limits didn't work (four students); that it was hard to navigate (four students); and that it was difficult to locate the full-text of a source (two students).

Desired Changes to Google

When asked what, if anything, students would want to change about Google, seven students said they wouldn't want to change anything (21.9 percent) (Table 5). In terms of what they would change, the most popular response (nine students) was that they wanted to be able to filter or limit the results in some way (by source type, year, etc). Other desired changes included reducing the number of irrelevant results and/or providing more "research" results (six students); fewer ads and/or commercial sites (four students); and including a citation feature (two students).



Table 3
Difficulty Using Google

	No difficulty	Too many and/or irrelevant results	Advertising and/or asked to purchase items	Not enough scholarly sources	Didn't provide full citations	Hard to find books
Number of students	7	12	5	4	2	2
Percent	21.9	37.5	15.6	12.5	6.3	6.3

Table 4.
Difficulty Using Federated Search Tool

	No difficulty	Hard to find books	Slow	Irrelevant results	Hard to identify types of sources	Limits didn't work	Hard to navigate	Hard to locate full-text
Number of students	4	8	7	7	4	4	4	2
Percent	12.5	25	21.9	21.9	12.5	12.5	12.5	6.3

Desired Changes to Federated Search Tool

When asked what, if anything, they'd change about the library's federated search tool, four students said they wouldn't want to change anything (12.5 percent) (Table 6). The most cited desired change was making the federated search tool easier to navigate by either improving or simplifying the interface (eleven students). Other desired improvements included making it display more relevant and/or more varied results (seven students); making it faster (five students); displaying the source type so that students



Table 5.
What Students Would Change About Google

	Nothing	Filter and/or limit results	Fewer irrelevant results	Fewer ads and /or commercial sites	Include citation feature
Number of Students	7	9	6	4	2
Percent	21.9	28.1	18.8	12.5	6.3

could better understand what they were looking at (five students); better filtering of results (four students); and a desire to have more information displayed about each source, including a summary (3 students).

Self Assessment of Information Literacy / Searching Skills

The last set of questions asked students to self-assess their research knowledge and online searching skills. When asked, on a scale of 0 to 10, how skilled they are at finding information online, with 0 being not skilled and 10 being very skilled, the average self-rating was 7.75.

When students were asked, again on a scale of 0 to 10, how knowledgeable they are in terms of understanding research terminology (scholarly, popular, journal, article, monograph, peer-review, index, database, citation, etc.), the average self-rating was 6.28.

The next question asked students how important an understanding of research terminology was for finding relevant information online. Students gave an average rating of 7.31, thus acknowledging that an understanding of such terminology is indeed relevant when doing online research.

When students were asked how skilled they are at constructing effective online searches, the average self-rating was 7.75. When asked how important constructing effective search strategies was to finding relevant information online, students acknowledged the very strong connection between the two, giving an average rating of 9.28.

When asked if there was anything at which they'd like to be better in terms of finding relevant information online, seven students said "no" or did not respond to this question (21.9 percent). One student said they were "not sure." Of those that wished they were better at something, the most popular response was that they wanted to be better at finding authoritative, scholarly, and/or credible sources (ten students). Other responses included being faster and/or cutting down on time spent searching (four students); being better at finding more relevant sources (three students); using better



Table 6.

What Students Would Change About Federated Search Tool

	Nothing	Easier to navigate	More relevant and/or more varied results	Faster	Display source type	Better filtering of results	Display more information about each source
Number of students	4	11	7	5	5	4	3
Percent	6.3	34.4	21.9	15.6	15.6	6.3	9.4

keywords and/or constructing better searches (three students); and being better at finding articles (two students) (Table 7).

Correlation Between Students' Self-Assessment of Research Skills and Relevance of Sources

Of the thirty-two students, seventeen (53.1 percent) gave themselves a self-rating of 9 or higher when asked how skilled they were at finding information online and/or constructing effective keyword searches (on a scale of 0 to 10). These seventeen students gave an average relevance of 8.17 for the sources they found via Google, and an average relevance of 7.41 for the sources they found via the federated search tool. When compared to the overall group, this represents a slightly higher rate of relevance for the sources found via Google and a slightly lower rate of relevance for the sources students found via the federated search tool.

Of those that wished they were better at something, the most popular response was that they wanted to be better at finding authoritative, scholarly, and/or credible sources (ten students).

Correlation between Student Classification and Research Tool Preference

Korah and Cassidy found that federated search use was highest among lower-level undergraduates, and both use and satisfaction declined as student classification rose.¹⁸ With this study in mind, the data was examined to see if there was a relationship between search tool preference (for future research assignments) and the student's classification.



Table 7.

What Students Wished They Were Better At When Doing Online Research

	Nothing	Finding more credible and/or authoritative sources	Faster	Finding more relevant sources	Using better keywords and/or constructing better searches	Finding articles
Number of students	7	10	4	3	3	2
Percent	21.9	31.3	12.5	9.4	9.4	6.3

There appeared to be no direct correlation (Table 8). More sophomores and seniors preferred the federated search tool for future research assignments, but the research tool preference for both freshmen and juniors was fairly evenly divided between Google and the federated search tool, with one aforementioned student, a junior, stating that their search tool preference depended on the type of assignment.

Discussion

Although this article focuses on student perceptions of both a federated search tool and Google, in observing the students as they were doing research, it was clear to the author that the federated search tool did indeed have serious limitations. It was slow, unable to limit by source type and/or publication type (despite presenting these limits as options to students), and presented many additional and equally confusing limits that students attempted to use but did not necessarily understand, or attempted to use with varying degrees of success.

In short, many of the difficulties that students reported with regard to the federated search tool are in fact true. Rather than indicate what type of source students are looking at (on the results page), the federated search tool tells you which database the citation is from. So unless students understand that the "library catalog" is a source for books and that "Academic Search Complete" is a database that primarily yields articles, they would have no way of immediately knowing what type of citation they are looking at.

However, when students were asked what changes they'd like to see in both Google and the federated search tool, one of the most popular responses was for *both* search tools



Table 8.
Student Classification and Research Tool Preference

	Google	Federated Search Tool
Freshman	4	3
Sophomore	2	6
Junior	4	5
Senior	2	5

to identify source type. Students wanted to know that they were looking at a citation to a book by having the word “book” appear somewhere in the result. Interestingly, when students were asked what they wished they were better at in terms of finding information online, only one student responded that they wanted to be better at distinguishing between types of sources. Clearly, students believe that the onus is on the search tool to tell them what type of source they are looking at. This finding highlights a big disconnect between what librarians believe students should know and what students believe they should know.

For all of Google’s known disadvantages, its speed, the fact that one is not presented with misleading ways to “limit” a search, and its popularity as a search engine all work very much in its favor. With the Google Scholar prompt often appearing at the top of Google results lists, students can easily start by using Google and be led to scholarly articles related to their search query via Google Scholar. If a student happens to be using Google Scholar to look for books, the word “book” appears in square brackets as a preface to the citation, thus providing students with the kind of source identification many of them explicitly wanted.

Despite these known and student-reported assets and deficiencies of each search tool, the results of the questionnaire were surprising. It was certainly expected that the majority of students would cite Google as being easier to use (81.2 percent). But what was unexpected was that students found the federated search tool to be more efficient (56.3 percent), preferred it to Google for future research assignments (59.4 percent), and stated that the federated search tool was the tool they would recommend to a friend (56.3 percent). Students also really liked the federated search tool for its citation feature, and in casual observation of the students, they used this feature repeatedly. This feature is clearly marked on the right-hand side of the interface (“Cite This”) and many of the students wanted something similar in Google.

This finding highlights a big disconnect between what librarians believe students should know and what students believe they should know.



In terms of which tool students liked better, again the data was surprising. Google and the federated search tool came out exactly even. Despite the fact that students felt the federated search tool would be better for future research assignments, Google came out slightly ahead when students were asked which tool they believed produced more relevant results.

How does one make sense of such seemingly conflicting data? What it suggests is that students do not see Google as the “one-stop shopping” experience that librarians believe students see it as. Google is, quite simply, the best search tool that students

There is room (and arguably a need) for a federated search tool *and* Google, and students are open to using both.

know about, and its ease of use, its speed, and the results it produces are “relevant enough” in the students’ eyes. There is room (and arguably a need) for a federated search tool *and* Google, and students are open to using both. During a conversation at the end of one of the research sessions, one student reiterated what several students had already reported via the questionnaire:

that Google was easier to use, but that the federated search tool was better for scholarly information. “With Google,” this particular student said, “one got books on Amazon and unrelated websites.” Although “it feels like more work,” the student stated that they wanted to use both search tools. “When beginning, Google is good. For scientific articles, the federated search tool is helpful.”

Thus, although students believed that Google, overall, produced slightly more relevant results, there was an understanding that the general quality and scholarliness of the results in the federated search tool were uniformly higher. Federated search tools do not include ads, do not lead students to commercial sites, and the content has been selected for inclusion because of its high quality and scholarliness. With Google, students must evaluate content for both relevance *and* reliability of the source.

In keeping with the idea that students see the need for using more than one search tool, depending on the type of information sought, many students cited difficulties using Google. Along with the desire for Google to display and /or filter results by source type, students also wanted a Google that would make citing easier (the way the federated search tool does), that would provide more relevant results, and that would include fewer ads and /or lead students to fewer commercial sites.

But how important is student satisfaction as a factor of comparison? One might argue that the preference expressed by students for the federated search tool (for doing research) is only slightly higher than that for Google and that the perceived relevance of sources found is, overall, fairly comparable. If so, is the annual subscription fee of a federated search tool worth it when Google is free?

James Caulfield has rightly pointed out that Google’s success is in large part due to its emphasis on the user.¹⁹ Indeed, the first tenet of Google’s company philosophy is “focus on the user and all else will follow.”²⁰ During the ITHAKA Sustainable Scholarship Conference in New York City in 2010, Daniel Russell, Senior Research Scientist for Search Quality & User Happiness at Google, stated that rather than occasional overhauls of Google via usability studies, the company was constantly gathering both informal and formal feedback from users and tweaking the search engine on a small but regular basis.²¹



(Note as well that “search quality” and “user happiness” go hand-in-hand at Google.) As early as 2003, Carol Tenopir argued that library products were not as successful as they could be because of libraries’ insufficient devotion to the needs and preferences of the user.²² Sadly, this observation still holds true, despite the fact that libraries claim that the needs of its users is one of their primary values. In short, if students perceive federated search as a more valuable tool than Google for doing research, then libraries need to take this perception into account. Along with cost, libraries must seriously weigh the value of user preference.

Other factors should also be considered when comparing Google and a federated search tool. Caufield argues that because Google is a for-profit search engine, there are certain library values that it cannot embody, namely privacy.²³ Caufield states that, via Google’s attempt to “create an analog to the reference interview,” the company tracks “user profiles to identify information needs and thereby facilitate access” to what it considers to be the most relevant information.²⁴ Indeed, tailored or “personalized” searching is the default when using Google. Unless a user actively disables the “Web History” setting (which can only be done after signing in), the user will receive filtered results.

Although vendors of federated search tools (and library databases) have long had some basic tracking features, such as recording search histories within individual sessions, the user must create an

account and willingly save search histories if they wish to have access to them in future sessions (and even then, only after authentication). Vendors of library resources do not track individual IPs and user searches in an attempt to produce (or guess at) more relevant results for specific users. Thus, one might argue

that the results generated within federated search tools are more objective than the results generated within Google.

Shifting to the self-assessment portion of the questionnaire, students believed their information literacy and searching skills to be quite high, but along with asking for help interpreting a citation, several commented that the federated search tool should provide them with more information about each source, including a summary. It may have been possible that these students were referring to a citation to a book (via the library catalog), in which case no abstract would be included, but it is also possible that these students were obviously not aware that most of the citations to articles found via the federated search tool actually did include a summary: the abstract.

In casually observing the students use both search tools, it was noted that some of them didn’t appear to understand when they were leaving the interface of the federated search tool and entering another domain. For example, one student was led from the federated search tool to JSTOR, and then spent about twenty minutes in JSTOR looking for a book.

Vendors of library resources do not track individual IPs and user searches in an attempt to produce (or guess at) more relevant results for specific users. Thus, one might argue that the results generated within federated search tools are more objective than the results generated within Google.



The same can be said for students' use of Google and Google Scholar. Both search tools led students to subscription databases such as Wiley and ScienceDirect. But unless a student understands where they have been taken, they will not understand what they will find there, nor will they be able to search the interface appropriately and effectively. Furthermore, because students started with Google and were seamlessly taken to subscription databases (the research sessions were conducted on campus and did not require students to authenticate), they may not necessarily understand that *the library's subscriptions* were enabling them to access particular content. Had students been conducting the same research off-campus, they would not have been able to even access certain databases, much less locate the full-text without being asked to pay for it.

Despite this disconnect between how students self-report and how skilled they might actually be, when they were asked what other comments they had about their searching experiences, either during the research session or in the past, some of their comments were particularly astute.

For example, one student said: "Sometimes I feel like I'm only tapping into a small percentage of available information. Even with more advanced tools at my disposal I feel as if I cannot use them properly." Interestingly, when this student was asked how skilled they were at finding information online, they gave themselves a rating of 9 out of 10.

Yet another student commented:

"In the past I would avoid using library databases because it was very hard to find what I was looking for. Although Google isn't scholarly, it was easier to find what I was searching for because the database was more thorough. I felt I would struggle more using a library database so I would avoid it quite often. Even when I did find some information it was still hard finding what I was looking for – the info was only half there or it was hard to filter and decipher it."

Conclusion

For as long as federated searching stays on the scene, vendors must follow Google's example and focus on the needs and preferences of the user—and by extension, libraries should force vendors' hands to do so. As confirmed by this study, there are some easy fixes that vendors must seriously consider. If the limits do not work on non-native databases within a given federated search tool, those limits should not be presented. If it appears as though a student can limit by year or by source type, but those limits don't actually work, this is misleading and very confusing for the student. It also makes "the library" look bad, and libraries are already struggling when it comes to funding and perceived value.

It would also be ideal if search results from non-native databases within the federated search tool were not capped at a certain amount (in this case, thirty). In order for students to see the full number of results from non-native databases, they need to roll over that database in the sidebar and then, should they wish to view the full results list, click on that database to be taken to the native interface. Vendors claim that, because of the nature of federated search technology, there is no way around this. In short, federated search tools are not as interoperable with non-native databases as they could or should be. Google has no such limitations. When a student does a search on Google, that



search is as comprehensive as it can be. Such an improvement in the federated search tool would, in turn, affect the quality and relevance of results, since not all results are being presented for any given search, and so some relevant citations must necessarily be missing from the results list.

Despite these serious limitations, however, students actually liked using the federated search tool, believed it to be more efficient, would recommend it to a friend (over Google) for future research assignments, and preferred it to Google for their own research.

As a result, federated search is still a worthwhile tool to make available to our students. They want efficiency and ease-of-use, but they recognize and acknowledge Google's

They want efficiency and ease-of-use, but they recognize and acknowledge Google's limitations.

limitations. Librarians should feel comfortable introducing federated searching at the reference desk and in the classroom, along with Google, and place more weight on when to use each search tool and how to evaluate what is found.

Along with the need to teach students this higher-level information literacy concept (knowing when to use each search tool, along with how, and why), this study suggests that it may be necessary for librarians to revisit some lower-level information literacy skills as well. For example, librarians may need to spend more time helping students deconstruct the elements of a citation when analyzing search results. Since this study recruited students across a range of ages and academic years, librarians cannot assume that simply because a student is a senior, that they know how to read a citation. This is disappointing, to say the least.

It remains to be seen how much longer federated search tools will be in existence, now that discovery tools have been made available. However, just like federated search tools, discovery tools will never be comprehensive and index absolutely everything that the library subscribes to and/or owns. For example, in January 2011, EBSCO pulled its content from Primo, Ex Libris's discovery tool, because of EBSCO's development of its own discovery tool. Without the inclusion of EBSCO's content, how comprehensive can Primo really be?²⁵

Furthermore, in keeping with some of the observations made in this study, Pete Coco recently stated that just because the "googley familiarity of a singular, wide ranging search box," like that offered in discovery search tools, "improved frictionless access to scholarly sources" students will still need to "navigate a host of alien concepts, vocabularies and controversies."²⁶ And because no single tool can ever be truly comprehensive, Google and Google Scholar included, the most successful search tool will be the one that focuses on user needs and preferences. As a result, methodologies such as the one used in this study will continue to remain relevant, even as search tools are constantly evolving.

In the end, several students asked if the federated search tool was currently available on the library's homepage because they'd use it if it were. It became clear that these students had no idea that this technology already existed, and that it was available on the library's website. If libraries want their federated search tool to be used—and this study confirms that students would both benefit from and appreciate using such a federated search tool instead of or as a complement to Google—it must be featured prominently on the library's website, employ a simple interface, and be readily identifiable by students.



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Appendix A: Research Topics

Start by choosing ONE of the following topics. You will be working with this topic throughout the session, so please choose the one that's of greatest interest to you.

Topic #1: Business

In your Business class, your professor has asked you to do research on the American auto industry and how it's faring during the current economic recession.

Topic #2: American Literature

In your American Literature class, your professor has asked you to do research on a significant theme in the novels of William Faulkner.

Topic #3: Computer Science

In your Computer Science class, your professor has asked you to do research on the ethics of artificial intelligence.

Topic #4: Anthropology

In your Anthropology class, your professor has asked you to do research about the children of holocaust survivors.

Topic #5: Education

In your Education class, your professor has asked you to do research on the acquisition of English-language skills within immigrant families in the United States.

Topic #6: Environmental Studies

In your Environmental Studies class, your professor has asked you to find scientific evidence that either proves or disproves climate change.

Appendix B: Comparing Google and the Brooklyn College Library Search Tool

Questionnaire

1. On a scale from 0 to 10, how relevant were the sources that you found using Google?

Not relevant

Very relevant

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10



2. On a scale from 0 to 10, how relevant were the sources that you found using the Brooklyn College Library Search Tool?

Not relevant Very relevant

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

3. Which search tool was easier to use (Circle one)?

Google OR BC Library Search Tool

4. Which search tool was more efficient (Circle one)?

Google OR BC Library Search Tool

5. Which search tool did you like better (Circle one)? Explain why.

Google OR BC Library Search Tool

6. For future research assignments, which tool would you rather use (Circle one)?

Google OR BC Library Search Tool

7. Which tool would you recommend to a fellow student (Circle one)?

Google OR BC Library Search Tool

8. Did you have any difficulty using Google to find sources? What were they?

9. Did you have any difficulty using the Brooklyn College Library Search Tool to find sources? What were they?

10. Is there anything about Google that you would change?

11. Is there anything about the Brooklyn College Library Search Tool that you would change?

12. On a scale of 0 to 10, how skilled are you at finding information online?

Not skilled Very skilled

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

13. Is there anything you'd like to be better at in terms of finding information online?

14. On a scale of 0 to 10, how knowledgeable are you of research terminology (scholarly, popular, journal, article, monograph, peer-review, index, database, citation, etc.)?

Not knowledgeable Very knowledgeable

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

15. On a scale of 0 to 10, how important is a knowledge of research terminology for finding relevant sources online?

Not important Very important

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

16. On a scale of 0 to 10, how skilled are you at constructing effective online searches?

Not skilled Very skilled

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

17. On a scale of 0 to 10, how important is it to use effective search strategies in order to find relevant sources online?

Not important Very important

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

18. What other comments do you have about your searching experiences, either today or in the past?



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