

# Students and Federated Searching

## *A Survey of Use and Satisfaction*

This study assessed student use of and satisfaction with the WebFeat federated search tool, which was implemented by the library at Sam Houston State University. Students voluntarily responded to an electronic survey, providing feedback on how often they conducted class research using the federated search tool, individual databases, and online search engines and how well each search tool satisfied their class research needs. The study found a high rate of federated search use but only moderate satisfaction; for most students, federated search did not replace individual databases and online search engines, which also saw frequent use for class assignments. Federated search use was highest among lower-level undergraduates, and both use and satisfaction declined as student classification rose. Classification—which can be seen as the amount of experience in an academic environment—played a larger role in federated search use and satisfaction than did age or subject area of study. Students have almost unlimited avenues through which to gather information for conducting research, both in libraries and online. Recent years have seen an increase in the quantity and popularity of free Web-based resources, such as Wikipedia. Regardless of the comparable quality of data, these tools present information in a simple, user-friendly way and require little formal knowledge of information organization and searching techniques. Such straightforward

simplicity attracts many students, and academic libraries face challenges in capturing and keeping students' attention to assist them in finding authoritative and appropriate research materials in the library.

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### BACKGROUND

Federated search systems—alternatively called metasearch systems—aim to search a collection of databases from one interface and present one set of results, thereby reducing the amount of time and energy that a researcher must invest in learning and using individual database interfaces.

Although federated search systems are, conceptually, an ideal way to simplify the search process, in practice they often suffer from certain weaknesses, including slowness, fewer advanced search refinements, and poor integration of results from multiple sources. Many problems stem primarily from a lack of consistency between database systems. However, despite such common weaknesses, federated search systems can provide a relatively quick and simple mechanism for conducting a broad search of multiple resources in one step.

In spring 2007, several teams of students in John Newbold's class in strategic marketing management at

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## FEATURE

Sam Houston State University (SHSU) were given the assignment of producing a marketing plan for the university's Newton Gresham Library. Some of the teams surveyed students on campus, asking how the library could better market its online resources, while other teams relied on their own preferences and suggestions.

The opinions from the teams and survey respondents showed a desire for a more Google-like approach to searching library resources; students were accustomed to using Google and other Internet search engines to search once and retrieve a single, simple list of results from many websites, ranked by relevancy. That familiarity created the expectation that the library should provide a similar capability for quick, convenient academic research. In response to this finding, the Newton Gresham Library researched metasearch options and finally implemented the federated search product WebFeat, which was marketed on the library's website under the name E-Z Search.

The federated search tool was released in a beta version on the library website in August 2007. E-Z Search was marketed through the library website, library instruction sessions, and handouts available at the library reference desk. In addition to the new E-Z Search tool, students still had access to the library's online catalog (branded Sam-Cat) and the native search interfaces for approximately 180 subscription databases. After about six months of use, the library collected information about how many users were searching with E-Z Search and whether it was satisfying their academic search needs. The library conducted the inquiry through an electronic survey, which was designed to answer the following questions:

1. Which students are using E-Z Search? How are they using it, and how often?
2. How do students perceive E-Z Search, and how well does it satisfy their academic search needs?
3. In student opinions, how does E-Z Search compare to other library search tools (the online catalog and

individual database interfaces) and Internet search engines?

This article highlights the Newton Gresham Library's findings concerning the use and perception of the E-Z Search federated search implementation.

## LITERATURE REVIEW

Much of the literature on federated search discusses creating and implementing federated search tools and compares various tools and usability studies.<sup>1</sup> At the time this article was written, there was not a large pool of quantitative data about user desires and satisfaction with federated searching in an academic environment.

Students have multiple tools at their disposal when conducting research for academic purposes, including their library's catalog and databases as well as websites and Internet search engines. The Electronic Publishing Initiative at Columbia (EPIC) online survey concluded that almost 50 percent of students started searches for class assignments using a commercial search engine.<sup>2</sup> Jillian R. Griffith's research found that "45 percent of students use Google as their first port of call when locating information, with the university library catalogue used by 10 percent of the sample."<sup>3</sup> Helen Laurence and William Miller believe that this is because "library patrons expect to find it all in cyberspace . . . , but for the purposes of academic research, such expectations are unrealistic and even dangerous."<sup>4</sup>

Libraries have tried adapting to the expectations of users by providing a single search box interface that mimics popular Internet search interfaces. Morgan asserts that commercial websites' characteristics, such as aesthetics and navigation, are the benchmarks that patrons use to judge the viability of a federated search interface.<sup>5</sup> Students want a simple interface, and they have no desire to read instructions before starting a search.<sup>6</sup> For instance, Google does provide advanced tools for more experienced searchers, but an individual with only average or limited

search experience can begin searching with Google almost instantaneously; it requires virtually no instruction to begin searching and interpreting results. In fact, Jung et al. concluded that providing interfaces similar to commercial search engines is crucial to getting undergraduates to use federated searches because their familiarity will increase their confidence in starting their search. Users also expect relevance, speed, and spell-check functions that are comparable to popular search engines.<sup>7</sup>

Meeting these expectations can be a challenge. Users often perceive federated searches as slow: a federated search generally takes longer than a search in the typical Internet search engine because data is gathered across multiple databases from various vendors, some of which may respond very slowly.<sup>8</sup> Compared to the repetition of a search in multiple tools, however, a federated search can actually save time: The user does not have to repeat the process of finding each individual database, opening or logging into it, constructing a search, and evaluating the results. Instead, the user only has to open or log into one interface (the federated search), construct one search string, and evaluate one set of results. The process is streamlined: Belliston et al. found that "federated searching was, on average, 11 percent faster" than repeating the same search in multiple databases.<sup>9</sup> Unfortunately, such time-savings may be difficult to convey to some users as they wait for their federated search results. A search that may take only 0.1 seconds in Google may take 30 seconds, 60 seconds, or more in a federated search tool, even when using a high-speed Internet connection.<sup>10</sup> Even though the federated search condenses the tedious process of interacting with multiple search interfaces, the search itself may still seem to take too long, especially for student users who are accustomed to the rapid response of Google and other Internet search engines.

In addition to issues of speed, usability testing shows that users also find results confounding and are underwhelmed by the design of the result

page.<sup>11</sup> In a 2007 study by Tang et al., 69 percent of student respondents found that federated search was “useful but complex and hard to figure out.”<sup>12</sup> Users tend to experience difficulty with navigating results pages and confusion with library-specific terminology and icons.<sup>13</sup> Because of this confusion, Elliot concludes that students also have trouble accessing full-text content from a federated results page.<sup>14</sup> In stark contrast to common Internet labels, which are clear and concise—“Get it now,” “Download it,” “Read it now,” for example—and usually accompanied by familiar pictorial icons, the links that lead to full text in federated search engines are usually textual. They are sometimes labeled with library jargon; other times vague labels such as “View” may fail to distinguish between functions that produce very different results, such as searching for full text with a link resolver versus opening the citation record in its native database interface. And on occasion, the full-text link may simply be overlooked in the vast jumble of text on the screen.

Most of the existing literature focuses on undergraduates. Graduate students, according to Ponsford and vanDuinkerken, seek a higher level of searching capability: “If libraries are going to ‘trump’ Google . . . we will need to provide a default search that works much like Google for our less experienced users, but also a more advanced, fielded, and Boolean-capable search for those of our users who know more about what they are doing.”<sup>15</sup> Warren provides a concise summation of most research conclusions on federated searching: “[it] is still a long way from delivering the hoped for seamless cross-database access.”<sup>16</sup>

## METHOD

The librarians at SHSU gathered data via an electronic survey: An e-mail invitation to participate was distributed to a random sample of university students, faculty, and staff. The university’s Office of Institutional Research supplied the population sample using the enrollment lists for the fall 2007

semester. The sample included 1,008 students from a list of enrolled freshmen; 3,026 students from a combined list of enrolled sophomores, juniors, and seniors; and 1,029 students from a combined list of enrolled masters and PhD students.

Survey participation was not mandatory. A drawing for several prizes—including an Apple iPod Shuffle as the grand prize—was provided as an incentive to promote survey participation. The original survey invitation was distributed on March 20, 2008, with a reminder after two weeks and closure at the end of a month. A total of 475 student survey responses were analyzed.

The survey contained a maximum of twenty-seven questions; however, the electronic format allowed “skip logic” to be used, whereby certain questions were presented or skipped on the basis of responses to previous questions. Therefore a given user might be asked to complete anywhere from nine to twenty-seven questions, depending on his or her class level, experience, etc. A student who had used all the different search tools referenced in the survey would probably be presented with the maximum number of questions, whereas a faculty or staff member who had not used the referenced tools would probably be presented with the minimum number of questions.

The survey collected demographic information and then explored the respondent’s experience using E-Z Search, individual electronic databases (e.g., JSTOR, EBSCO’s Academic Search

Complete, or any of the approximately 180 databases to which SHSU subscribed at the time), the library’s online catalog, and Internet search engines. The authors also investigated comparative satisfaction levels and preferences between these various search tools. Personal information for the prize drawing could be entered, but was not required for survey submission. A copy of the survey questions can be found online at [http://library.shsu.edu/libfac/EZSearch\\_Survey.pdf](http://library.shsu.edu/libfac/EZSearch_Survey.pdf). Red asterisks indicate questions where an answer was required; bracketed notes preceding a question indicate any “skip logic” that determined when that question was shown or not shown to the respondent.

## RESULTS

### Using E-Z Search

Almost 75 percent of students stated that they use E-Z Search in completing class assignments at least some of the time (figure 1). At the undergraduate level, freshman, sophomores, and juniors relied on E-Z Search approximately 80 to 82 percent of the time for coursework. Use of E-Z Search by seniors was lower, approximately 65 percent. Seventy percent of masters students reported using E-Z Search at least sometimes, while 32 percent of these students used it often or always. Doctoral candidates also were prominent users of E-Z search, with 62 percent reporting use for academic initiatives.

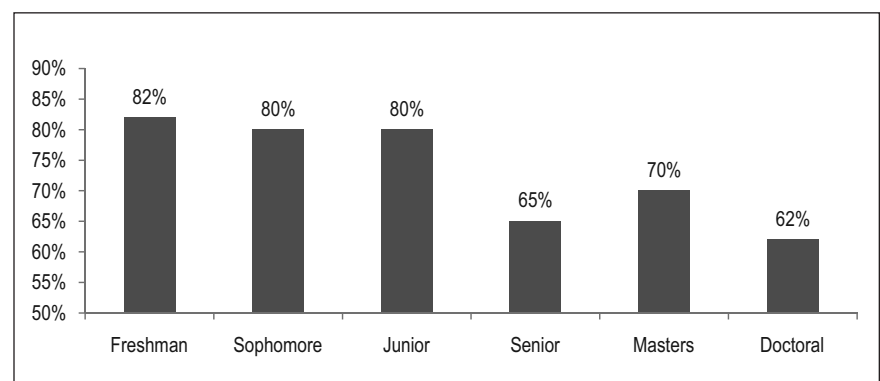


Figure 1. E-Z Search: Use “At Least Sometimes” by Classification

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### Differences Between Colleges

The survey also measured differences in the use of the federated search engine between students from various colleges within SHSU (figure 2). The range of students who responded that they used E-Z Search at least sometimes fell between 70 and 80 percent, depending on the college. College of Criminal Justice students landed at the top of the range (80 percent) while College of Business and College of Humanities students were at the bottom of the spectrum (70 percent).

### Demographic Differences

The authors also tabulated gender differences in the use of E-Z Search. While 75 percent of all students used E-Z Search at least some of the time, this varied from 64 percent of males to 80 percent of females. This difference in use between genders narrowed when considering use “often” or “always.” Thirty-seven percent of females and thirty percent of males used federated searching “often” or “always.”

Age variances between E-Z Search users were also analyzed. In the age range of 16–19, 84 percent of students used E-Z Search sometimes, and 50 percent used it often or always. The percent of students who used it often was 51 percent for 20 year olds and 37 percent for 21 year olds. Nine percent of 22-year-old students used it often. When broadening the range to include students who used it at least sometimes, the percentages increased to 91 percent (20 year olds), 70 percent (21 year olds), and 52 percent (22 year olds).

When looking at students outside of the traditional age range, 69 to 88 percent reported that they use E-Z Search at least sometimes. Respondents age 40–49 reported the most use (88 percent), followed by those age 30–39 (73.8 percent), students 50 and above (71.5 percent), and students age 23–29 (69 percent). Students who reported using it often or always ranged from 29 (students age 23–29 and 50 and above) to 44 percent (40–49 year olds).

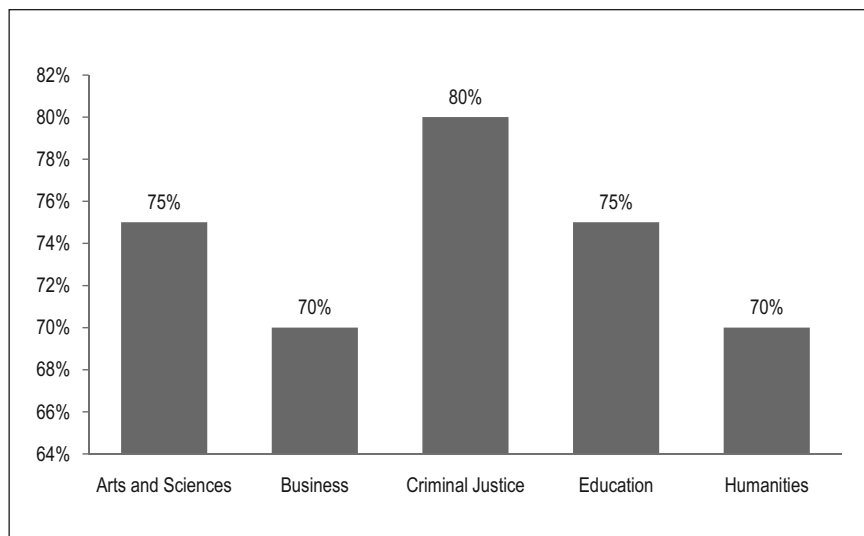


Figure 2. E-Z Search: Use By College

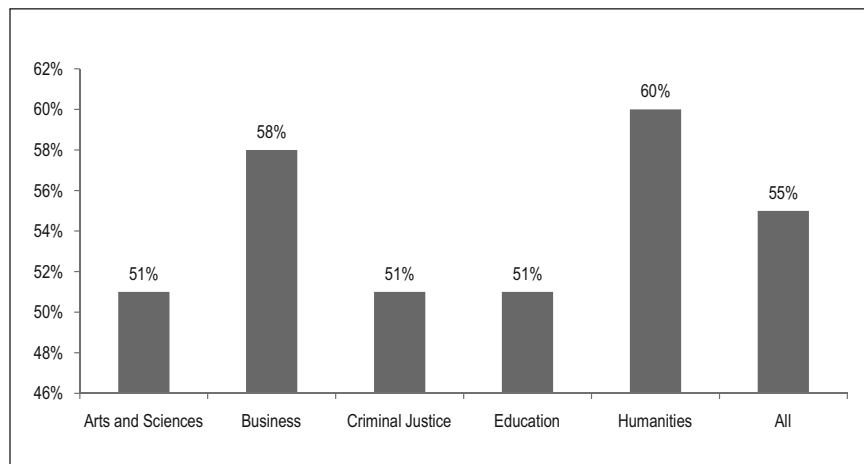


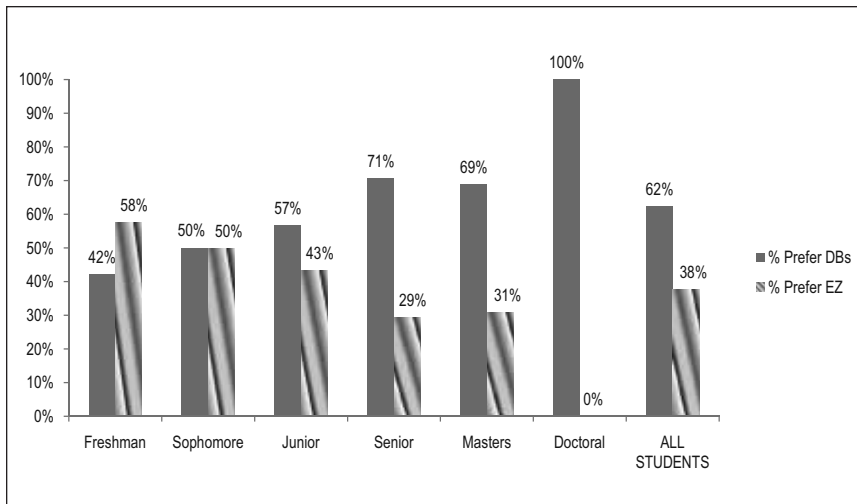
Figure 3. E-Z Search: Results “Mostly to Always Easy to Understand” by College

### E-Z Search Results

When considering E-Z Search results, 55 percent of students stated that results were mostly to always easy to understand. The results ranged from 51 to 60 percent, when broken down by college (figure 3). When considering the percentages by classification, the results ranged from 52 to 63 percent, with sophomores finding it the easiest. Between 52 and 54 percent of students in other classifications reported that results were mostly to always easy to understand. Only 2 percent of

students found the results never easy to understand.

The number of search results were “just right” approximately 41 percent of the time, ranging from 36 to 52 percent for undergraduates. When considering the percentages by college, the range went from 30 percent in the College of Humanities to 40 percent in the College of Arts and Sciences. Six percent of students felt there were too many results. When also factoring in students that thought there were somewhat too many results, this percentage increased to 28 percent. Five percent, meanwhile, felt



**Figure 4.** Search Tool Preferences Among Students Who Frequently Use Internet Search Engines for Class Assignments

that there were too few results, and 25 percent of students felt that the number of results was somewhat too low.

E-Z Search satisfied the needs of 35 percent of students most or all of the time. When looking at these percentages by classification, they ranged from 17 percent of doctoral students to 52 percent of sophomores. The average satisfaction for undergraduates was approximately 43 percent. When considering the rates by college, 30 percent (Business) to 40 percent (Arts and Sciences) of students were satisfied most or all of the time.

### E-Z Search Versus Other Resources: Preferences

Among students who were familiar with both E-Z Search and individual database interfaces, the preference for individual databases over E-Z Search rose as the student's classification increased. Doctoral students showed the strongest preference, with a ratio of almost 7:1 preferring individual databases. Masters students shared this preference almost 4:1, while senior-level undergraduates showed a more modest preference of 2:1. Junior, sophomore, and freshman level undergraduates reported close to a 1:1 ratio across the board. The freshman respondents actually reported a

slightly higher preference for federated searching with E-Z Search.

Within the entire group of 257 respondents who had used both E-Z Search and individual databases, 66 percent of students preferred individual databases over E-Z Search. If one focuses only on frequent Internet users—the subgroup of students who ranked their use of Internet search engines for class assignments at 4 or 5 on a 5-point scale (1 = Never, 3 = Sometimes, and 5 = Always)—then preference for E-Z Search followed the same trend across classifications: Preference for E-Z Search declined and preference for individual database interfaces increased as classification advanced (figure 4).

Fifty-two percent of students reported that Internet search engines satisfied class assignment search needs most or all of the time. This number differed at the doctoral level, where only 25 percent of students reported the same level of satisfaction with Internet search engines.

When looking at college rather than classification, an average of 46 percent found Internet search engines most satisfying, compared to 41 percent most satisfied by other library resources and 13 percent most satisfied by E-Z Search. These averages did not vary significantly according to college affiliation.

## DISCUSSION

### Use of Federated Search and Other Search Tools

The survey responses show that E-Z Search was used frequently during the first year of implementation. However, given the weak levels of satisfaction reported for E-Z Search, the researchers suspect that the frequent use of E-Z Search use may be due in part to the tool's prominent placement, bright color, and "one-search-box" simplicity, rather than to students specifically seeking out a federated searching tool.

Undergraduates showed a greater likelihood of use of federated search tools compared to graduate students. This result was expected because of the varying specificity of research needs between undergraduate and graduate students. Nonetheless, the number of masters and doctoral students that used federated searching was still higher than initially expected. This may be because of the prominent placement of the tool, but it also may point to a lack of resource knowledge by students or a need for continued training of all students about research methods.

The specificity of research needs and knowledge level of students also are important factors when considering the use of federated searching versus other resources. Doctoral, masters, and senior undergraduate students are more likely to have a greater familiarity with their subject area, a greater knowledge of which individual databases are best for certain topics, and a higher comfort level with research and database interfaces in general. They also are more likely to perform in-depth research in a specific area. They can benefit from the more specialized and specific array of search options available via individual database interfaces as opposed to the necessarily limited search options available in a federated search interface.

In contrast, freshmen are likely to have less familiarity with research in a specific discipline and are likely not researching at the same depth as more advanced students. With less need for discipline-specific advanced search



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options and less time spent becoming comfortable with complex and varied database interfaces, freshmen may be drawn to the federated search tool's visible placement and apparent simplicity. Some may be attracted to the greater efficiency of searching multiple sources at once: With less practiced knowledge of which specific databases are best for certain topics, they prefer instead to cast a wide net via federated search. Others may simply use the most visible tool (which closely resembles familiar Internet search engines) and are not making a reasoned, deliberate choice to engage in federated searching; they may not even recognize that the E-Z Search tool performs a unique function.

Use of federated search by undergraduates was similar between classifications, although senior status had an impact on use. While approximately 82 percent of freshman reported using E-Z Search at least sometimes to conduct research, this number dropped to 65 percent of seniors. Similar to what one would expect of graduate students, seniors with a greater familiarity of library resources and more specific search needs may have bypassed federated searching for specific tools.

Although there were differences between the colleges in the use of federated searching, it was not as dramatic as one might expect when considering the varying research stipulations of each college. At least 70 percent of students from each college used federated searching at least sometimes. This went as high as 80 percent among Criminal Justice students. The general consistency of the responses implies that students at each classification level tend to approach their searches in similar ways, regardless of the subject area of their inquiries.

The library implemented E-Z Search in an attempt to respond to the students' request for a simple, "Google-like" one-box search. Therefore one might expect a correlation between students who frequently use Internet search engines for class work and students who prefer E-Z Search over individual databases. However, such a correlation was not found in this survey. The preference for

E-Z Search declined and preferences for individual databases increased along with the complexity of the student's search needs as they got further into their given area of academic study. Internet use did not predispose student respondents to prefer E-Z Search, even if it aims to be a simpler, more Google-like search option. In this study, more experienced students demonstrated a preference for individual databases over federated searching, even if they also regularly use Internet search engines for class assignments.

### Satisfaction with Federated Search and Other Search Methods

Although federated searching proved to be a popular method of access, satisfaction with results was shown as fairly weak—approximately 35 percent of all students surveyed reported satisfaction with search results. This weakness correlates to conclusions reached by others who have researched federated searching.

When further considering satisfaction with results, variances by college were less than by classification. The range of satisfaction by college ranged from 30 to 40 percent, which is lower than desired. When considering satisfaction by classification, the range was between 17 and 52 percent. Sophomores were the only group to report satisfaction above 50 percent. The satisfaction of doctoral and masters students came in at the very low end; this fit with researcher expectations that highly focused, graduate-level research would be less suited to E-Z Search's lack of search limiters and abundance of search results.

Compared to the relatively few students (35 percent) who reported that E-Z Search satisfies their class assignment search needs most or all of the time (4 or 5 on a 5-point scale), satisfaction with Internet search engines was surprisingly high. Internet search engines satisfied class assignment search needs most or all of the time for 52 percent of the student respondents.

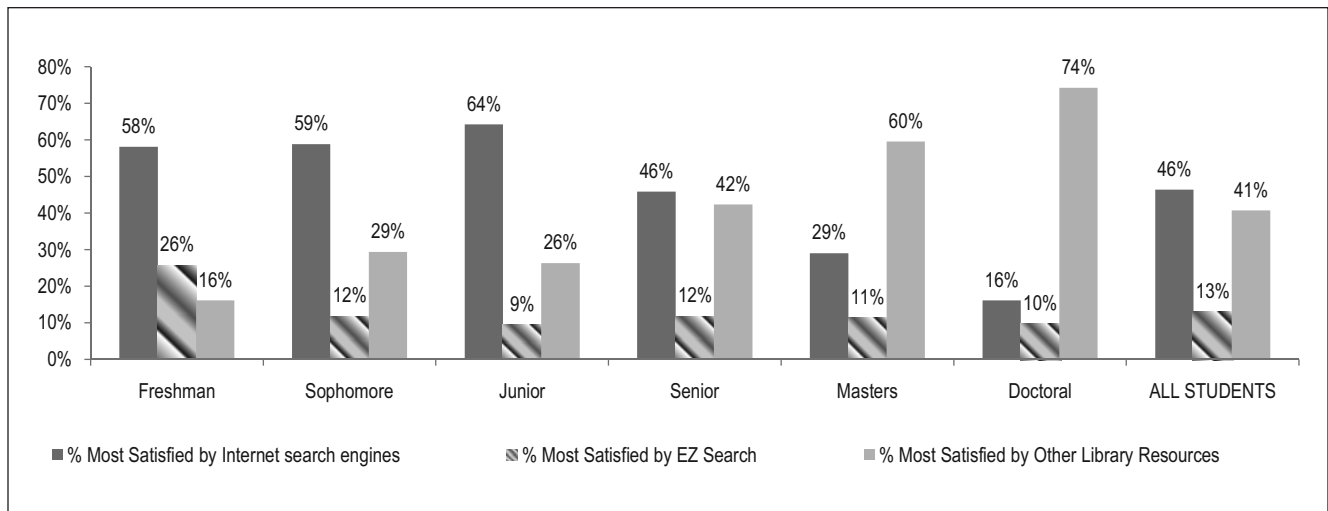
This number drops noticeably at the doctoral level—to 25 percent—but otherwise is consistently high, especially compared to the levels of satisfaction with E-Z Search.

Forty-one percent of students found that the number of results returned by E-Z Search was just right. Approximately 32 percent found that there were too few results, and 28 percent believed there were too many. When comparing colleges, the percentage of students who believed the results were "just right" ranged from 30 to 48 percent. The variation between colleges was greater in this measure than in the use of, or overall satisfaction with, federated searching. There was also greater variance (25–52 percent) of satisfaction with the number of results between classifications than with use and overall satisfaction. Doctoral students and seniors reported the least satisfaction with the number of results, which is consistent with what the research team expected.

When looking further at federated search results, 55 percent of students reported that results were mostly to always easy to understand. The research team initially believed that this could potentially be an area of dissatisfaction and confusion for students, given that the federated search tool is supposed to bring together disparate chunks of information into a format that can be understood with no further guidance. Only a slight majority of students found the results relatively easy to understand perhaps because of the challenging task required of the federated search tool, a subjective lack of visual appeal, and minimal guidance for interpreting the content of the search results page.

### Search Tool Preferences

In a comparison of E-Z Search, Internet search engines, and other library search resources (including individual databases and the online catalog), undergraduates showed the greatest preference for Internet search engines, while graduate students preferred library resources other than E-Z Search.



**Figure 5.** Most Satisfying Search Tool By Classification

Only among freshmen did E-Z Search even rank second; in every other classification, it took a distinct third place (figure 5).

When student respondents were broken down by college rather than classification, no significant differences in preferences could be seen: An average of 46 percent found Internet search engines most satisfying—compared to 41 percent for other library resources and only 13 percent for E-Z Search—regardless of college affiliation.

## CONCLUSIONS

### Areas for Further Study

The researchers observed interesting differences between males and females in the data regarding a preference for federated search. Studying gender differences was not a goal of this study; however, it is an area of research that could be further explored to determine whether the findings in this study were an anomaly or if there is a pattern of preference by gender for the use of federated search tools.

Age also was not a factor that the researchers intended to thoroughly analyze, but this survey found that a substantially higher percentage of students outside of the traditional college age range were using federated search

regularly. Additionally, the highest levels of satisfaction with the use of Internet search engines for class assignments was seen in “traditional” college-age students (16–22 years old) and “non-traditional” students 50 years and older. Though E-Z Search is still not the most satisfactory tool in any group, it too saw a higher level of satisfaction among the youngest and oldest groups of students. For students between 23 and 50, library resources other than E-Z Search seemed by far to be most satisfactory for class assignment search needs. Given all of these factors related to age, further consideration should be given to attitudes toward federated search and satisfaction with searching tools based on age or generation.

### Recommendations

If federated search engines are made available to students in a prominent location, they will use them. Students generally feel comfortable with searching and reviewing results. However, the level of satisfaction with the usability of federated search results is lower than what one should expect for such a tool or service, especially when it is made available to patrons in such a central and visible manner. The level of satisfaction with search results should be raised by improving the precision,

relevancy, and ranking of the results, as well as the readability of their display.

Libraries need to continue to educate students on information literacy and help them understand contexts in which federated searching is the most useful course of action—and where other tools may be more appropriate. Prominence should not be the sole factor in why a student chooses a particular search tool.

New products frequently appear on the market with new features and enhancements. For instance, Summon from Serial Solutions attempts to improve slowness issues by searching one regularly updated index of data harvested from multiple resources as opposed to performing a real-time search of each resource and waiting for those individual responses. Every new product seeks to make some new progress toward a better federated search tool. However, a truly effective federated search engine will likely not appear until we see further improvement in the use of common standards between vendors (for metadata and querying or harvesting), as well as improvement in federated search algorithms and relevancy rankings. Until that day comes, it will be up to libraries to voice their needs to vendors and to continue to educate students on how to use the other search tools available to them.

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