

Student Searching with EBSCO Discovery: A Usability Study

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Abstract. The researchers conducted task-based usability testing of the EBSCO Discovery Service (EDS) with 20 students. While most participants felt positively about EDS, a few usability issues emerged. Confusion arose regarding source types and icons, facets/limiters, relevancy ranking, integrated search connectors and more. Students encountered difficulty with spelling corrections and a failure to understand terminology, and they demonstrated an unwillingness to view additional pages of search results. Findings indicate the need for changes to the local implementation of EDS as well as to features and structures under EBSCO's control.

Keywords

Web-scale discovery; EBSCO Discovery Service; Usability; higher education; information-seeking behavior

Authors' Footnote

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In the fall semester of 2012, researchers at the Newton Gresham Library of Sam Houston State University (SHSU) conducted a usability study of the EBSCO Discovery Service (EDS). *This web-scale discovery service*, colorfully branded as “Engine Orange,” employs user-provided terms or phrases to search an online catalog and selected databases by using metadata from a single index. The use of the single index, similar to other web-scale discovery services, purportedly improves discovery, because users do not have to search with multiple tools or in separate silos of information and results are provided in a single interface with advanced relevancy ranking. Recent implementation of a single-index discovery service prompted researchers at SHSU to determine the usability of the tool by testing user behavior. This article describes the task-based usability testing and discusses the study’s findings.

Terminology

The concept of a *discovery service*, which searches against a single index, must be distinguished from *federated searching*. A federated search tool takes a user’s query and sends it out concurrently to multiple sources, where it is subjected to separate algorithms, indexes, relevancy rankings, and any other necessary processes in each source, in addition to the same or similar operations in the tool itself. Although many federated search tools ultimately aggregate results into a single interface, the process of federated searching can become fraught with performance difficulties, including the speed with which results are returned, the ranking of results, and the removal of duplicate records.

Additionally, since the terms *limiter* and *facet* are sometimes used synonymously and sometimes distinguished, a clarification of usage in this paper is warranted. EBSCO distinguishes between *limiters*—which allow globally defined values to be selected during the search-building process and included as part of the search string—and *facets*—which allow select values (determined by what is available in the existing result list) to be added after a search, affecting only the result list. However, this distinction is murky and does not seem to be consistently upheld in the broader search industry; furthermore, both limiters and facets ultimately achieve the result of narrowing a search. Therefore, in

the context of this paper, the term *facet/limiter* is regularly used to refer broadly to any methods that allow a user to limit the initial search or results based on item metadata or characteristics (EBSCO representative, personal communication, May 2, 2013). The use of either term, *facet* or *limiter*, by itself in this paper should not be interpreted with any specific distinction.

Literature Review

Web-scale discovery is the latest library vendors' solution in search technology, which incorporates a history of trial and error in search design, usability studies, and mimicking what works, particularly mimicking the centralized indexing and relevancy rankings of Google Search (Breeding, 2005). Google Search wields an enormous influence on library discovery services, both in raising the expectations of users and in training them on how search works—at least, the Google way to search (Anderson, 2005; Ponsford & vanDuinkerken, 2007).

Overall, the use of web-scale discovery services has been an important step in library search systems. For example, web-scale discovery services have increased the discovery and usage of library content holdings (O'Hara, 2012). Additionally, users have responded favorably towards using web-scale discovery. Williams and Foster (2011) noted that all six participants for their usability study responded positively to the questions of whether they would use EDS again or recommend it to other users.

However, some authors have made contrary observations. Ford (2010) reported a decrease in journal usage following implementation of the Serials Solutions Summon service. Interestingly, Ford observed a slight increase in usage of journals on the EBSCO platform, a web-scale discovery competitor. Comeaux (2012) discusses how the increase of usage brings more attention to ongoing challenges and problems with library systems such as terminology, complicated services like interlibrary loan, and cataloging practices. Furthermore, web-scale discovery products offer other potential pitfalls through the introduction of complex elements outside the basic Google Search paradigm, such as facets, federated search connectors, detailed metadata for search results, and different resource formats.

Powers of Mississippi State University recognized that not all users are the same and that they bring different demands to web-scale discovery (Thornton-Verma, 2011). She describes three different user types categorized from their EDS implementation. Entry-level users, such as first-year undergrads, found EDS easy to use for locating those few articles needed for assignments. On the other end, PhD students and faculty found it useful by allowing skilled searchers to search cross-disciplinary topics with specificity. In the middle, however, upper-level undergraduates and master's students found more success in specialized databases. Powers attributed this middle difference to the need for inexperienced searchers to find content on more specialized subjects (Thornton-Verma, 2011).

All web-scale discovery products share the capacity to limit search results with facets, making facets an important element for testing in usability studies. Olson (2007) demonstrated the importance of facets in teasing out more resources for a search inquiry in an OPAC. Nine out of 12 dissertation students found more resources related to their research subject with facets than without. Nonetheless, the use of facets appears inconsistent. Ford (2010) showed a lack of user awareness of the facets in Summon until the facets were pointed out to users. Williams and Foster (2011) observed users employing facets in EDS without any encouragement, but this occurred primarily at the beginning of a search. In fact, of the six participants, only one did not make use of a facet to refine the search. Overall, Williams and Foster noticed that the peer-reviewed journals limiter was a popular choice. Fagan, et al., (2012), likewise observed the use of facets, though often not appropriately, whereas Philip (2010) reported during a usability study of Summon that users did not make use of the facets. A possible explanation given for this was the user's impatience, both with analyzing the search results and learning how to use the facets to refine a result set. Philip suggested, however, that this may have been because of the amount of time allotted for the questions, because users were limited to 20 minutes. This study suggests an interesting correlation between Google's non-use of facets and users' search behaviors, including the hypothesis that, should Google ever make use of facets, facets may become more widely

used within discovery products. However, Google Scholar does include a few facets, including limits for legal, patents, and date, and advanced Google searchers may be aware of many other built-in tools and tricks that allow users to limit results. Nonetheless, Google's decision to not use or to hide facets indicates that such facets, in Google's opinion, may be too complex and distracting for most users.

Compared to Google, web-scale discovery products remain complex, so mixed results in user experiences are unsurprising. Gross and Sheridan (2011) noted the challenges faced by students who attempted to locate a course-reserves reading. Summon categorized course reserves as "web resources," leading to greater difficulty in locating the correct resource. Overall, students had difficulty understanding the search results, particularly the difference between items such as a book and a book review, or a journal and a newspaper article. Cockrell and Jayne (2002) likewise documented user confusion regarding key terms such as *serials*, *periodicals*, *magazines*, and *journals*. Williams and Foster (2011) made another observation regarding users and search results: during testing, no users commented upon the massive amount of search results and, for that matter, no users ever looked beyond the first page of results (each page displayed 30 results). Williams' and Foster's users appeared to handle basic format types better than Gross' and Sheridan's users. Nonetheless, questions did arise concerning the difference between *peer review* and *reviews* (as in book reviews).

Other challenges regarded testing a user's skill at constructing an appropriate search. Web-scale discovery attempts to address this by simplifying and eliminating navigational choices with a centralized location for search (Gross & Sheridan, 2011). Spelling remains a challenge for users in any discovery system and illustrates the value added by Google's spell-correction features (Beall & Kafadar, 2007; Jung et al., 2008; Turner, 2002; Willson, 2010). Fagan, et al. (2012), noticed that users had trouble finding journal titles when limited to searching with EDS. Dixon, et al. (2010), conducted a usability study for the discovery of article citations with Google Scholar, journal portals, and link resolvers. The results of the study showed improved success in article discovery for users, resulting in a favorable response from the

users towards Google Scholar. The authors noted, however, their concern regarding how much metadata for a subject area was available in Google Scholar. The lack of such knowledge could lead inadvertently to a researcher missing important information. Nevertheless, they recognized users' tendency to pursue the easiest route. Future research may be warranted concerning whether users are as concerned with exhaustive metadata and high-quality search results as librarians are. Dudek, et al. (2007), discovered a relationship between a user's favorability towards a search engine and its "results, precision, recall and reliability" (p. 232). This suggests that users' perceptions regarding search success influence their opinions about the search engine, and consequently influence whether they are likely to return to that search engine. Another study by Jeong (2011) reinforces this observation by showing similar results with elementary school students. The students' experience and positive response to search relevance and ease of use led to favorable views of the library's interface, in this case with e-Library. Flavian, et al. (2006), also demonstrates that web usability leads to a favorable experience for the user.

Lastly, EDS uses what it calls *integrated search connectors* to describe federated search links to resources outside the central indexing provided in EDS. In this way, the web-scale discovery process re-introduces the complexity and problems of federated search. At the time of testing, EBSCO placed these search connectors towards the top right corner of the search-results page—web real estate that, in other search engines and websites, is often reserved for advertising. A question arises as to how effective the search connectors are for users. Williams and Foster (2011) had only one user who noticed the search connectors. However, later in the usability testing, this same user had to be reminded to use the search connectors when related to the assigned task; other users had difficulty even noticing the search connectors. Furthermore, once they recognized the connectors, users still had trouble making use of the search connectors and their related search results. This appeared to be, at least in part, a consequence of the steps needed to isolate the results, including de-selecting EDS from the results list

and then selecting the databases with results to be displayed, followed by clicking the Update button. Instead, at best, users might select the databases with EDS and search connector results. The large set of results from EDS, drowning out the search connector's results, made it appear that the results were not updated. Fagan, et al. (2012), reported no use of the search connectors unless users were asked to use them. Likewise, the authors found that their EBSCO usage report showed only 1% of all EDS sessions making use of the search connectors. Following the usability test, Fagan, et al., removed the search connectors and replaced them with static links such as Ask-a-Librarian, subject guides, and research database lists.¹

Methodology

Usability testing for EDS was conducted during the month of October, 2013. An invitation to participate in the study was sent to all SHSU students' official campus email, and announcements were also made through the library website, Facebook, and Twitter. To ensure comprehensive detection of usability problems, the researchers enlisted 20 student volunteers; this sample size satisfied both the traditional five-user recommendation (Nielsen & Landauer, 1993) and the 10 ± 2 rule proposed in recent literature (Hwang & Salvendy, 2010). In order to avoid bias, the researchers accepted the first 20 participants who volunteered. The Think Aloud protocol was employed to fully capture students' thought process, while screen capture software recorded students' search steps and verbalizations.

All students were asked to complete the same search tasks. However, each student was randomly assigned to use one of three different starting points for their search (see Figure 1). Test Group 1 was shown the library's actual homepage and asked to use the prominent EDS search box. Test Group 2 used a modified EDS search box, which allowed researchers to assess the effectiveness of radio buttons for Keyword, Author, and Title in improving students' searches. For Test Group 3, the EDS

¹ For an expanded literature review of the subject of web-scale discovery see Thomsett-Scott and Reese (2012).

search box was removed to allow comparison of EDS searches with searches not aided by the discovery service.

[place Figure 1 about here]

The four search tasks were adopted from common reference inquiries and class assignments. The tasks included a search for books by a named author, two known-item searches for a book and an article, and a search for articles and books on a given topic (see Figure 2). Testing was conducted in a quiet office space inside the library. A copy of the tasks was placed beside each student during the study. A researcher also read each question before the participant began a task. At the end of the last task, the researcher followed up with questions regarding students' overall impression of EDS and whether they noticed the Integrated Search Connectors on the EDS results pages.

[place Figure 2 about here]

Results

General Observations

Of the 20 students who participated in this study, seven each were assigned to Test Groups 1 and 2, and six were assigned to the non-EDS Test Group 3. The average study completion time was 9 minutes and 53 seconds, with no significant differences between each test group.

Overall, fewer than half of the students were able to successfully complete each task, although one student in the non-EDS Test Group 3 finished all four tasks correctly. The success rates for the four tasks were 40%, 30%, 25%, and 45%, respectively.

Even so, students were much more confident about their own performances. Eleven of the 20 students felt they completed all four tasks correctly. The percentages of students who felt they were able to complete each tasks were 80%, 95%, 60%, and 85%, respectively.

Facets/Limiters

When provided with an EDS search box with simple radio buttons for keyword, title, and author in Test Group 2, most students noticed and used this search option correctly. However, students were less successful at using the many facets/limiters on the EDS results page. Although almost half of the students noticed the facets/limiters during each task, many had trouble determining which facets/limiters would improve their search results. For instance, during the first task, three students used the *Full Text* facet/limiter to narrow their search results to books. Although the use of this limiter does retrieve some ebooks in addition to articles and documents, it does not retrieve print books and could not retrieve the records needed to complete the first task successfully. It was an inaccurate choice of limiter in this context and demonstrated students' lack of complete understanding about the meaning and proper application of the *Full Text* limiter.

Also, while many facets/limiters are available on the EDS results page, students mostly relied on options they could view readily without having to scroll down or click to expand the choices. Therefore, the presentation orders of search facets on the results page greatly influenced students' search behavior. For instance, a *Books* facet is available, but most students never noticed this option because it is listed below other options such as *Full Text* and *Catalog Only*, and it required scrolling to view.

Similarly, 17 of the 20 students never advanced past the first result page in any of the searches they performed. When students could not find desired information in the first result page, most would opt to modify the search rather than review the next 20 records on the second page.

Observations by Task

Task 1: Author Search. Students had more success completing Task 1 using the library catalog (56%) than using EDS (27%). Moreover, although all 14 students in Test Groups 1 and 2 were instructed to use EDS, three of them still selected the library catalog for their search; it is unclear whether this choice reflects a deliberate preference or the misconception that *Engine Orange* referred to the entire set of search tabs.

Students who used EDS for Task 1 seemed overwhelmed by the large result set, especially if they started with a basic keyword EDS search instead of an author search for Warren Buffett. On the results page, the *Catalog Only* facet was listed just below the *Full Text* facet; however, while three students tried to use the Full Text option to narrow their search results to books, only one chose the *Catalog Only* option.

This task also elicited the most spelling errors in the whole study. Nine of the 20 participants misspelled *Warren Buffett*, even though a print copy of the search tasks sat beside the computer. More alarmingly, six of the students who made spelling errors failed to notice and correct them. When spelling errors affected the quality of the search results, students usually sensed the need to edit their search; however, instead of reviewing and correcting the original search terms, most tried adding search words or changing other search parameters.

Task 2: Known Item Search – Book. Two out of 14 students found the correct book using EDS, while four out of six students located the item using the library catalog. Of the 14 students who failed to find the correct item, seven competently performed a title search for *I Know Why the Caged Bird Sings* by Maya Angelou but failed to interpret the results correctly.

A major factor contributing to students' struggles was the result ranking. In an EDS title search, records of criticisms or reviews of a work, in both book and article formats, often appear before the actual book record. Consequently, when students performed a title search for Angelou's book without also specifying the author name, they had to scroll to page three of the search results to locate the correct book record. As a result, students often mistook items with a similar title on the first result page, such as *Maya Angelou's I know why the caged bird sings: A casebook*, for the book they sought. Nonetheless, students' higher success rate using the library catalog was not due to any superiority in the catalog's method for ranking results, but because the catalog simply had fewer records. Since a title

search for this item in the catalog only returns one page of results, students are more likely to identify the correct book record, even though it is not listed first.

Task 3: Known-Item Search – Article. Ten of the 13 students who used EDS for Task 3 successfully located the correct citation record. In contrast, only two of the seven students who used other library resources were able to locate the item. In fact, half of the students in the non-EDS Test Group 3 were so overwhelmed by selecting a database for their article search that they gave up before performing any search at all.

Unfortunately, five of the ten students who found the correct EDS article record were unable to locate its full-text PDF file. Since the purpose for a known-article search is to locate a full-text copy, not just an instance of its citation, it must be concluded that fewer than half of the students (5 in the EDS groups, 1 in the non-EDS group) were able to complete this task.

Even though a *Find full text here* link appeared in the article's detailed record, students seemed too distracted by other information on the page to notice the link. Moreover, not all the students who clicked the link were able to navigate the resulting database interface and find the full-text icon. Admittedly, however, this challenge of navigating database interfaces is not unique to searches begun with EDS.

Task 4: Topic Search. Most students were able to find either articles or books on the given topic, but fewer than half (nine out of 20) successfully found both. Of the three students in Test Group 3 who struggled to complete Task 4, all had trouble finding an article. More specifically, none of them could determine where to start searching for articles from the library's web site, a similar issue already highlighted in the Known-Item Article search task.

As for the seven students who had trouble finding both a book and an article in EDS, their struggles can be primarily attributed to the EDS relevancy ranking setup. Specifically, book records dominated the first 100 results from a keyword search for *global warming*, while article records

dominated top results from a subject-term search for *global warming*. Although EDS facets/limiters enabled students to refine their search results by source type, as observed previously, many students struggled to select the facets best suited to their needs. In some instances, students paired conflicting facets together, such as *Scholarly (Peer Reviewed) Journals* and *Books*.

Student Impressions of EDS

Eleven students had used EDS before the study, although their experience did not appear to give them an advantage in completing the search tasks. Nonetheless, when asked, two-thirds of students indicated they preferred EDS over other search tools from the library, and all but one indicated they would use EDS again for future research.

A number of students believed EDS is best suited for “broad” or “undergraduate” research. One student noted he would prefer “a database” other than EDS when searching for “a narrow, narrow thing,” even though he was able to complete known-item searches for both a book and an article in EDS.

Over 50% of students noticed the item-type icon that appeared with each item record and used them during search. Unfortunately, these icons were inconsistent at times, which hindered students’ success. For example, the icon for book reviews is an image of a print book with the title *Book*, and a number of students mistook those review articles as monographs while looking for books about global warming. Moreover, a few students also expressed confusion over article records that had *Periodical* icons versus *Academic Journal* icons.

Integrated Search Connectors

In this study, the EDS Integrated Search Connectors did not improve search outcomes. Four students did voluntarily notice the EDS Integrated Search Connectors, but they only did so after exhausting other options to improve their searches. Furthermore, none of them successfully used content from the Integrated Search Connectors to complete their tasks. More importantly, even after all

the students were made aware of the Integrated Search Connectors and encouraged to experiment with this tool, the great majority could not deduce its function and purpose on their own.

Discussion

This EDS usability test suggests a variety of issues for libraries to consider, and certain changes have already been made or are being planned in the researchers' library as a direct result of this study.

To begin, the design of the EDS search box with the library's local "Engine Orange" branding was misleading to some participants (see Figure 1, Test Group 1). The search box's position beneath a large logo, with instructional text inside it, caused some students to simply overlook the box. Instead, several students indicated that they interpreted *Engine Orange* as the branding for the entire set of search tabs. To address this issue, the EDS search box was redesigned after testing ended. The search box was moved up to the right of the logo, so that the logo clearly labeled the box itself, and the instructional text was removed from inside the search box (see Figure 3). The library is still collecting data to determine whether these changes result in a statistically significant increase in searches initiated from this search box.

[place Figure 3 about here]

Source Types

The identification of source types in EDS appeared during testing as a two-sided issue, mirroring the mixed results of previous studies highlighted in the literature review. On the positive side, the large and visible icons identifying the item types of individual results acted as a visual cue to students tasked with finding a specific item type. These icons assisted some students who may not otherwise have known how to recognize a journal article; in other cases, they reinforced a student's confidence in an answer. However, on the negative side, the item-type icons were sometimes confusing or actually misleading. Most troubling to the researchers was the pairing of the *Book* icon with some book reviews;

this almost certainly occurred because the book review was part of a book, such as *Magill's*, but this method of identification contributed to misunderstandings.

The test also made it apparent that a book-cover image alone was not a clear indication to students that the item was a book; researchers noted the need for the label *Book* even when a cover image was also included. At the time of testing, electronic books from the EBSCO eBooks Collection were identified by both cover image and the label *eBook*, but print books and ebooks from other vendors, which were pulled into EDS from library catalog records, might be identified by a generic blue book icon with the label *Book* or simply by an image of the book cover with no text label at all (see Figure 4).

[place Figure 4 about here]

Additionally, several students verbally expressed confusion about the *Periodical* icon; although appropriate library jargon, this term is not part of the average undergraduate's vocabulary. They asked aloud whether *Periodical* counted as a *journal article*, indicating that they recognized some relationship between both results being articles, but did not understand the distinction made between the publications which contained those articles. Confusion about the *Periodical* icon was exacerbated by two additional facts. First, although the icon says *Periodicals*, the *Source Type* facet/limiter instead uses the term *Magazines*; for students, this seems to create a distinction between two terms which, in fact, seem to be used synonymously in EDS (see Figure 5). Secondly, and far more worrisome to the researchers, applying the *Source Type* facet/limiter for *Academic Journals* retrieves results which are labeled with the *Periodical* icon as well as those labeled with the *Academic Journal* icon (see Figure 6). Even students who thought they had understood the difference between the two source types seemed to lose confidence when viewing these confusing results.

[place Figure 5 about here]

[place Figure 6 about here]

The issues that these tests reveal with regard to source-type icons and labeling in EDS are, regrettably, outside the scope of what an individual library can change. The researchers hope that EBSCO developers will address these issues in future updates to EDS. Happily, this may be starting; in the months since testing concluded, text labels have been added to book-cover images, just as the researchers hoped (see Figure 4). Perhaps this small change is a sign that EBSCO is paying attention, and that librarians simply need to continue conducting user studies and voicing the issues they uncover.

Finally, the researchers noted a general confusion among students in distinguishing between the terms *journal* and *article*. Some students treated them as interchangeable: when tasked to find a *journal article*, they simply clicked on the first place where they saw either of those words. Unfortunately, this included limiting a search to the *Journal Title* field when the term was actually an article title, which caused search failure. Students testing without EDS further exhibited this confusion when choosing between library search tabs labeled *Articles & More* and *Journal Titles*. After observing this confusion and consulting usage statistics, the library removed *Journal Titles* from the search tabs available on the homepage (see Figure 3). The complete A-Z list of journal subscriptions is still available in the site menu; however, the researchers hope that its removal from the highly visible homepage search tabs will decrease the amount of student confusion and the attempted use of this tool to locate articles.

Use of Facets/Limiters

The recognition and application of facets/limiters during testing has significant implications for both individual library implementation and EBSCO's overall design. Within the first few seconds of each testing session, the researchers noticed a striking difference between students using the simple EDS search box and students using the EDS search box with added keyword, title, and author radio buttons. Overwhelmingly, the students noticed the added facet/limiter options, used them, and almost always employed them correctly, leading to generally better results than those found by students without the

benefit of such facets/limiters. This observation led the library to promptly update the EDS search box on the library homepage to include the keyword, title, and author radio buttons (see Figure 3).

However, following the unquestionably positive student performance with these radio buttons added to the simple search box, the employment of facets/limiters on the EDS results page was less encouraging. More than half of the students asked to complete tasks with EDS did not notice—or at least did not attempt to use—the facets/limiters provided. These observations contradicted the findings of Williams and Foster (2011) in student testing of EDS. At least one student, after scrolling to the bottom of the page and not seeing a source of the type he needed, proceeded to scroll up and down the entire page five times; during this scrolling, not once did he make even a hesitant move toward the facets/limiters in the left sidebar. This leads the researchers to wonder whether the facets/limiters sidebar ought to occupy a larger space, use larger font, employ colors more visibly different from the surrounding theme, or in some other way be redesigned to facilitate greater visibility. Additional research is needed to investigate what changes might draw more student attention to this tool.

Among those students who noticed and attempted to use facets/limiters, three trends stood out. First, students often incorrectly interpreted a facet/limiter; for instance, several selected *Full-Text* with the expectation that it would limit results to books. Interestingly, none of the students selected *Catalog Only* when attempting to limit their results to books, further supporting what has already been demonstrated for at least a decade: the term *catalog* is part of professional library jargon but is not meaningful to the average user (Kupersmith, 2012). Such issues of vocabulary indicate a need to rethink EDS interface labeling, much of which—including *Catalog Only*—can be customized by the individual library. However, libraries are left to determine the most appropriate label for both the local collection and population. For instance, is it accurate to replace *catalog* with *books* in this context, even if the catalog also provides records for ebooks, periodicals, government documents, websites, and videos? Is it more appropriate to use *catalog* in some libraries than in others? Questions like these are not simple to

address, but clearly the answer which seems the most technically correct to library personnel is not proving friendly to all users.

The second trend noted was that students were disinclined to expand a collapsed facet/limiter and focused instead on those facets/limiters which were expanded by default, making the individual options readily visible (see Figure 7). This suggests that individual libraries should give careful consideration to the ordering and the default state (expanded or collapsed) of the facets/limiters in their interface. This aspect of EDS, too, can be customized; the researchers' library intends to carefully evaluate the facets, labels, order, and which should be expanded by default to make options more accessible.

[place Figure 7 about here]

The final trend noted was that the majority of students were disinclined to click to additional result pages, reinforcing the findings of Williams and Foster (2011). The researchers believe this may be attributed to how students search in Google and to their expectations that the results on the first page are likely the most relevant. However, due to the quantity and variety of items in EDS, and the variance in metadata quality, this expectation is often not met. Students in testing were more likely to modify a search than to click through results pages. As previously discussed, however, students were also unlikely to employ facets/limiters, meaning that search modifications were generally achieved through rewording the search. Although this was sometimes effective, in many cases it decreased the overall quality of the search and the results retrieved. With all of this in mind, the researchers wonder if it might be beneficial to increase the number of search results shown on a page, thereby increasing the likelihood of the student seeing a relevant result on the first page.

Relevancy Ranking

The researchers noted some weaknesses in EDS relevancy ranking, as illustrated by three issues that appeared during testing. First, searches for *Title: I Know Why the Caged Bird Sings* found as the first

result a critical review of this work, rather than the work itself. All but one of the 20 students tested selected this title to complete the task, because their natural assumptions—which the researchers assume to be built on or at least reinforced by experience with Google—indicated that the first result should be the most relevant one and, therefore, the correct one. Since students also showed little inclination or ability to carefully read and critically interpret citation information, this failure of ranking to conform to their expectations made their source selection worse.

Second, searches for *Author: Warren Buffett* found some records where Buffett was indexed as the main author (the field labeled *Author*) and some records where Buffett was indexed as a secondary author (the field labeled *Other Authors*). What struck the researchers as odd was the ranking and ordering of the various records: Although one might expect main-author indexing to be weighted more heavily than secondary author indexing, this was not the case, and consequently items with an *Other Authors* listing for the “Warren Buffett portfolio” appeared higher in the results ranking than items where Buffett himself was the main author.

Finally, in searches for *Keyword: “global warming,”* results were dominated by book records, whereas in searches for *Subject: “global warming,”* results were dominated by article records. This meant that with either search strategy, most students saw only half the picture on the first results page. When one recalls the previous observations that students do not click forward to additional results pages and often do not recognize or use facets/limiters on the results page, one may become concerned about students—or, at least, inexperienced searchers—not easily seeing the diversity of results that are available. However, despite this concern, the researchers concede that students testing EDS were more confident and satisfied than the control group, and that article discovery in particular seemed more clear-cut for students with the use of EDS than without.

Spelling Suggestion

The frequency of misspelling in search terms was very high, despite the students having a written copy of the tasks to consult, but the alarming part was how few students noticed their misspellings, even when their searches produced zero results. The EDS interface does include spelling suggestion features—both pop-up suggestions while typing and a list of suggestions after searching, labeled as *Results may also be available for*—but none of the student testers used or even appeared to notice these features (see Figure 8). The researchers wonder if EBSCO could draw more attention to the spelling suggestions in the interface design. For example, a larger font might be used for the label, which might be reworded to the more familiar *Did you mean...?*, especially following a search with zero results.

[place Figure 8 about here]

Integrated Search Connectors

Admittedly, this study did not investigate the Integrated Search component of EDS in great detail. However, observation and direct questioning of students during testing, combined with the researchers' own experiences with and opinions of Integrated Search, lead us to conclude that this is not the most intuitive or useful of the many features in EDS. After usability testing, the researchers discussed whether the tool should be removed entirely, but decided that, even if it wasn't helping most students, it likely wasn't hurting them either, and so it was retained (see Figure 9). Going forward, however, the library plans to experiment with a more elegant "Extended Widget" solution, modeled after that of Tri-County Technical College in Pendleton, South Carolina, a description of which was shared to members of an EDS Users listserv in February 2013.

[place Figure 9 about here]

Performance of EDS versus Other Library Resources

Some of this study's most interesting findings relate to the comparison of students who were tested with EDS and students who were tested without EDS. In general, students were more efficient and more successful at finding books using the local library catalog. They recognized the *Books & More*

tab, as it was then called, as an appropriate place to search for books, and they navigated the catalog in a more or less competent manner. Therefore the researchers have opted to maintain a catalog search tab on the library homepage, in addition to the EDS search tab (see Figure 3). However, one exception to student success with the catalog is worth noting. When searching for books by a known author, students were often unaware of the need to invert the author's name in catalog searching. In EDS, although the best items were more obscured by the large result set, the students did benefit from not needing to invert names. This relaxing of the need to structure searches according to formal indexing rules did seem to be a point in favor of the discovery service over the catalog.

In contrast, students were more efficient and successful at finding articles using EDS, compared to the control group who searched without EDS. This, in conjunction with the issues of source type icons, raises the question of whether including books from the library catalog is the best way for academic libraries to use EDS. Perhaps a discovery service would better serve students—and be easier for them to interpret—if it simply aggregated articles and documents, thus simplifying the process of navigating a multitude of library databases.

Conclusions

The researchers found that students did not read or refer to instructions, despite spelling errors in their search terms and unsuccessful results. The majority of students did not go past the first page of results, even if they could not locate the item they were searching for; they chose instead to reword search terms, or in some other way amend the search. Students often did not understand the vocabulary used in library tools; Terms such as *serials*, *periodical*, *article*, *journal*, and *magazine* all blurred together into an amalgam for students. Students' confidence in their search performance was significantly higher than their actual success rates; students perceived that they performed search tasks much better than they actually did, particularly when searching in EDS. Students had better results finding known-article citations using EDS, but not necessarily in accessing the full-text articles

themselves. Students were not successful in using limiters and facets within EDS; while the keyword, title, and author radio buttons added to the simple EDS search box (Test Group 2) proved to be highly used, only half of the students noticed the facets on the results page, and they had difficulty interpreting the significance of the facets or their correct usage. Overall, users were more satisfied with EDS results than with the library catalog and databases; this was true even though students using the library catalog had more than twice the success in finding a book by a known author, compared to students using EDS.

Web-scale discovery tools such as EDS have an important place for students performing library research. These tools provide students with a Google-type experience, that is, a vast amount of results with prioritization; however, web-scale discovery tools are not Google, and students often have a difficult search experience in this more complex environment.

Several students stated that EDS was more suited to a general search and that library databases would be better for subject-specific searching. The researchers definitely agree with this statement. The large number of results often overwhelmed students, whereas subject-specific databases can yield results with a great deal of specificity when facets/limiters are used.

Further Research

One point identified for further research was the *Guest Access* feature of EDS. At the time of testing, the researchers' library was using Guest Access, which allows any user—whether or not he is affiliated with library—to search the library's EDS index; user login is not required until the user attempts to access an item. However, this usability study revealed some negative aspects to this setup. Certain content vendors do not allow their metadata to be displayed via Guest Access, so not even an article title appears; the user sees only a message that they must login for access. During testing, only two students encountered this message, when authentication to the wireless network expired. However, these two students exhibited confusion related to the missing metadata, creating some concern about the possible negative impact of using this feature. On the other hand, Guest Access is

beneficial in that it can demonstrate the scope of the library's collections to unaffiliated users, perhaps those who are considering an affiliation with the institution. Overall, the impact of Guest Access on both authorized and unauthorized searchers warrants further study.

A second point presents itself for further research as well. While observing student attempts to locate a known article citation without the benefit of EDS, the researchers noted a curious phenomenon. Probably because of prior experience with Google, a tool which more often produces too many results rather than too few, student searchers seemed stumped when faced with zero results in a database. They did not seem to have a search strategy for addressing this outcome, and therefore many of them resorted to the same strategy that a smart user might employ with an overly large result set in Google: they added *more* keywords to their original search. One student, after failing to find an article in JSTOR with the title alone, proceeded to add more and more metadata in search after search, including journal issue number; the student stated, "If I'm a little more precise, maybe it will give it to me." This anecdote highlights a weak spot in student search strategies and suggests a fundamental problem in understanding Boolean search logic, which perhaps warrants further investigation.

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