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2013

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Beth S. Bloom and Marta Deyrup, "The Truth Is Out: How Students REALLY Search" (2012). *Proceedings of the Charleston Library Conference*.

<http://dx.doi.org/10.5703/1288284315103>

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The Truth Is Out: How Students REALLY Search

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In their presentation, Beth Bloom and Dr. Marta Deyrup, two librarians from Seton Hall University, a mid-sized, Catholic university located 14 miles west of New York City, discuss the results of a two-year study of students' online research behaviors, funded by Google.

Observation of our students' search strategies, most of which were developed in middle and high school, provided most of the motivation for our grant. Having had little research experience with print resources, our students had developed their research habits using Internet search engines, primarily Google, and carried these habits over into their college years. Their online research behavior was oriented by Google's organization and information methodology, which, simply put, is keyword responsive and full-text document-inclusive, employing a transparent Boolean AND. This prioritizing of keywording ostensibly supports student research but tends to discourage hierarchical thinking in the research process.

Inundated with teaching faculty members' complaints about the increasingly poor quality of student research, and students' expressed frustration during the research process, particularly when required to use scholarly databases, we decided to find a way to study students' research in detail. Our ultimate goal was to find a way that would ease student frustration by improving the efficiency and quality of their research behaviors, and also by honing the online skills that the students had developed over the years. Given the fact that many scholarly databases are changing their simple search screens to conform to Google, we appreciate the fact that many libraries, as well, are changing their approach to information organization in deference to this Google pattern.

For our investigation, we decided to use OpenHallway, an unobtrusive tracking tool that records voice and keystrokes. This is a subscription product that allows participants to

log in at their own convenience, unobserved, in a venue of their choice. We conducted preliminary studies during summer 2011 with six students, but rolled out the official project during the 2011-2012 academic year. Each semester, we sent a request through our Blackboard course management system for sophomores, juniors, and seniors enrolled in courses that required a substantial research project. We asked them to log into OpenHallway and record their online research for their class. OpenHallway records in 20-minute increments; we required three 20-minute research sessions per student. We also required that they "think aloud" while they were researching. After we received their completed research tasks, we sent them a brief survey that probed their own perceptions of their research history and level of success. A total of 42 students participated; each received \$125.

We encouraged the students to do research using methods they found comfortable—that our understanding of their online research habits would inform us in a way better to help them and their peers in the future. They did not have to perform to please us. OpenHallway took the place of research logs and allowed students the freedom of time and place, so the students openly expressed themselves, indicating frustration and/or sense of satisfaction during the research process.

Similar studies have employed Internet usage logs (Judd & Kennedy, 2010), log analysis (Broder, 2002), scripts read in person to participants (Cockrell, 2002), long interviews (H. Lee, 2008), discussion groups (Head & Isenberg, 2009), semi-structured interviews followed by information literacy tests (Gross & Latham, 2009), diaries (J. Lee et al., 2012), and have even used online tracking (Morae) software while videotaping participants (Holman,), etc. However, we have found no similar study that has allowed researchers the same freedoms; thus, we are confident that our research results most precisely

reflect students' research behaviors. Whereas most studies have limited empirical evidence, we have the statistics that prove online searching behaviors.

Our discussion includes examples of successful and/or less efficient research methods; however, we also focus on tactical ways better to help undergraduates do "scholarly" research. Indeed, in our study and others, students often indicated that they do want trustworthy sources that are easy to access (Bartlett, 2012, para. 7). Although students may often feel satisfied with the search strategies and results, the general sense in academia is that students actually are not doing "scholarly research." For the most part, students gravitate toward such general Internet sites as Google and Wikipedia for their scholarly research. Faculty and librarians are frustrated when students bypass the vast resources of a university library, which include multi-million dollar databases that, if searched efficiently, would enrich the quality of their research. Since students tend to focus on product rather than process, only highly motivated students would be interested in developing their database search skills (Gross & Latham, 2009, p. 336). If students are satisfied with open-web results, it would be highly unlikely that they would also pursue "hidden web," that is, subscription paid information, despite the fact that proprietary databases are useful for scientific patents, legal research, and so forth.

This complements the findings of many other researchers. For example, Taylor (2012) has found that students search erratically through resources and make weak attempts at evaluation. Sorenson (2008) found that students mostly start with Google and other search engines, and then may go to library web sources (p. 487). Holman (2010) studied students' mental models of the Internet and traced many retrieval problems to an inability to understand the structures behind Internet search engines (p. 24). Curie (2010) found that even though they may have had library instruction, students were unable to identify relevant terminology, did not understand correct use of Boolean phrasing, and had difficulty evaluating search results. Finally, Cockrell and Jayne (2002), enumerated several universal

research shortcomings: they found that students often carried over Web searching strategies to library databases; they would become lost and give up easily; they would use the first record in search of citations; they did not scroll down a page for explanation of results (p. 129). Many only skimmed through retrieved pages and few paused to investigate options/descriptions. Most disturbing was that students generally were unable to articulate criteria they would use to determine the credibility of sources.

In our research, we observed similar problems, little understanding of value/difference of electronic formats and a cut-and-paste approach to doing research, with little or no research plan. We found that students had limited attention spans when confronted with myriad results, "a central problem in information gathering and sense making is the allocation of attention" (Pirolli & Card, 1999, p. 643). We found five general behavioral patterns in our study participants which produce poor-quality search results: (1) Foraging; (2) Google dependence (or preference); (3) Reliance on a single search strategy; (4) Habitual topic changing, and (5) Overuse of natural language and search stringing.

Foraging: The tail wags the dog...attempts to build thesis from material s/he stumbles upon; scans pages for keywords, whether relevant or not; does not differentiate among information formats; copies and pastes segments from the web to create structure of the paper.

Google dependence: always returns to Google when confused; repeatedly asserts that "Google is my friend"; demonstrates the belief that Google has everything; uses Google as all-inclusive tool.

Reliance on a single search strategy: illustrates limited understanding of search syntax; exhibits confusion and frustration by differences among databases; and has difficulty in narrowing, for example, limits by peer-review journals rather than by concept.

Habitual topic changing: changes topics at the drop of a hat; keeps searching until something matches his or her preconceived idea of what is

expected; claims “there is nothing out there on my topic.”

Overuse of natural language and search stringing: strings search terms together; uses natural language in all venues; indicates a limited understanding of information structures; treats every box as a search engine, and keeps “anding” terms in an attempt to use Boolean logic/operators.

As mentioned above, we also found that all students have carried over into academic research Google strategies they have probably used since childhood, which make it very difficult for them to negotiate the library databases. Nevertheless, our survey results indicate that students are confident about their online research skills; clearly, this has little to do with their success in finding relevant scholarly sources.

It should be noted that librarians and faculty value paid information above that accessed in the open web. The assumption is that you get something for your money. Open web venues such as Google Scholar index an enormous amount of scholarly information. However, the full text is generally accessible only when higher education institutions provide link resolvers to their paid subscriptions. Much of this accessibility is transparent; thus, students assume that information provided by Google Scholar is free, and do not see a reason to start their research within the library websites. Our research provides evidence of this assumption, as will be seen in some of the following examples of student research behaviors.

Student A

This is an example of a student who does not approach his topic hierarchically and thus uses keywords as a search technique. His research technique suffers from several of the problems mentioned above. He tends to wander around his topic of China and strategic trade but gets waylaid by various ideas and keywords. Clearly, he loves the Google search engine:

He types his topic into Google simple search, without explanation but uses + sign. He finds first article and doesn't look further but changes topic

immediately. He then types “New york times china and solar energy,” and again changes topic three times. He tends to choose articles at random. He then tries the SHU website, “Sometimes they have good stuff.” He then says he is going to the book catalog but ends up in the articles and journals link, ending up in free web journals, bypassing our subscriptions. He types in “china control + ethics.” He finds nothing so ends up in government e-periodicals. He then tries “strategic trade” in the journal topic area and looks for the word “strategies”. Frustrated, he says, “I don't want to use this” and goes back to “Good old Google.” He then goes to Wikipedia even though told he shouldn't use it. He types in “strategic trade policies” and finds the word subsidies, goes back to Google and types, “China and subsidies,” looks for pertinent words within article and gets waylaid by that. He returns to Wikipedia and then back to the New York Times, where he types “China + Google”. He returns to Wikipedia where he types “Chinese censorship”. He will look at several pages and narrow down to what he thinks is good. He claims that Wikipedia simplifies facts that he doesn't have and that he “May even quote them but will not cite.” He then goes to Facebook and proceeds to the Chinese version of Facebook, at which point he praises Google Chrome because it can translate into English. He then gives SHU another try regarding social media (he is “not a fan of SHU anything”). He goes to the library catalog and types “China.” Knowing he needs to be more specific, he types “China strategic.” Back at Google, he looks for “strategic analysis for the market trends in China.” He finds a “bunch of charts that are not doing anything for [him].” Finally he tries “hybrid car china” and ends up in <http://www.hybridcars.com>. Starting again, he tries China and strategic trade and narrows the search down to “ethics.” He declares that Google is best in terms of content, and SHU library content is a waste of time. Nevertheless, he accesses JSTOR and opens an e-book. He comments that “Answers.com is sometimes helpful but often ridiculous answers by people who write in Wikipedia.” He compares Bing.com to Google, typing “Chinese strategic trade” Google yields over 3 million; Bing yields 51,000, but his method of evaluation is only to look at the first couple of hits in each website. He

discovers a document from Santa Clara University on ethics, which is “Short but some good stuff.” He finds charts, which “cites a lot of people which would be a pain to cite.” According to this student, Google has the most information so far, but it is a little less specific. He knows he needs more specific with his terms, whereas Google “narrowed it down, other sites narrowed it down more.” Google will continue to be his first search engine, “Then Yahoo and then Bing and then JStor.”

Student B

The student does not have a clear understanding of what she is looking for and tries similar search strategies in a variety of databases. She starts with Google in order to enter the New York Times, even though our library has a subscription. She is looking either for articles on women and girls or for Michelle Bachmann. She is not sure of context and doesn’t seem to understand Boolean phrasing. She types “Sara Palin sexism” in Google. Then she types “Sarah Palin Michelle Bachmann Hillary Clinton sexism in media portrayal,” after which she types “Newsweek Michelle Bachmann”. She discovers a blog about Newsweek’s choice of cover images portraying Michelle Bachmann. She then goes to the SHU library databases and chooses the Opposing Viewpoints database, typing “Newsweek Michelle Bachmann” with no results. After a brief return to Google, she switches back to Opposing Viewpoints after which she tries Gender Watch, typing the same three words. When she clicks on the Communication and Mass Media Complete database, her search strategy leads her to only two articles. As a last resort, she types “Newsweek” as a keyword, and the recording ends.

The following three examples show students who have relatively good search skills or who find a way to emerge from a search quagmire:

Student C

The student is investigating sports journalism. He goes to the right databases but doesn’t understand that he has to narrow down, thus typing “sports journalism” in the search boxes. The results are far too many and ultimately

confusing. He finds some good articles but then goes to Google and Wikipedia. He finds two articles he likes and explains that he looks at external links in Wikipedia, which lead him to a sports journalist association website. Then he goes to Google Scholar to find an article he had stumbled upon earlier. He goes to Bing and finds many of the same sources. He locates a job bank at <http://www.cubreporters.com> and then finds New World Encyclopedia online. He discovers a link to ESPN. (Ironically, he uses Google as a verb when he describes his search in ESPN.). He searches “investigative reporting” in <http://sportsillustrated.cnn.com> and then returns to the library website, where he opens JSTOR and eventually LexisNexis, where he searches for “toy departments of journalism.” (toy department implies sports journalism.). He looks for the “ethics” subcategory. He likes Lexis because of “subdivisions.” He finds relevant articles in LexisNexis and is satisfied with his results.

Student D

This student copies and pastes assignment steps to her Word document so she can complete each step chronologically. Her assignment is to investigate opening a travel agency in Jordan. In this case, Google helps her solve her problem: she chooses <http://travel.state.gov> and narrows her search down to Jordan. She uses Google both as an encyclopedia and a dictionary, looking up information about the term “visa.” She determines that the State Department website is a legitimate source and adds the link to her notes. She creates her outline from ideas and organization in the website. She competently evaluates information in this site, bookmarking pages as she goes along. She goes to the Jordan Commonwealth website and looks for local laws and customs, so that she can get appropriate advice for travellers to Jordan. She is pleased with the results and prepares to write her paper.

Student E

This student is successful, in that she understands how to find the best databases for her topic, and that she must use advanced search options. She is looking for information on Paul Crutzen, Nobel Prize winner in chemistry. She immediately goes

to the Science Direct database and selects the advanced search. First she types in the scientist's name and "chemistry," limiting the years to 2000 to the present. She then changes "chemistry" to "ozone layer." She is not yet satisfied with results. She eventually goes to Google Scholar, using advanced options, typing Crutzen as author. She ends up in the Wiley Online library and tries to register for it, but still cannot access full text. Back in the SHU library and ACS, she finds articles, downloads them, and then goes back to Science Direct, Proquest Science, Greenr, back to Wiley online, and then to Academic Search Complete. She is successful in accessing the various science databases, because she has chosen the correct database list on the library homepage. After finding several pertinent articles, she returns Google, typing "Crutzen, Nobel Prize 1995 impact," after which she says she is "good to go."

In several cases, faculty members misled students in planning their research. One professor told students to go to Ebsco, without identifying the specific database. Upon opening the library webpage and subsequent database page, his student tried to find Ebsco in the list of databases starting with E. The only Ebsco database she could find starting with E was ERIC, which was far afield of the desired information about a security company. In another instance, an instructor showed the students how to get to the Seton Hall e-journals list and then told them to search within one given title, thus severely limiting the effectiveness of their research.

However, several faculty members at Seton Hall are partnering with librarians in the delivery of information literacy training. One example is a history professor, who describes the historical method as "both knowing how to find appropriate sources and how to evaluate those sources" (Hoffer, 2012), certainly reminiscent of a librarian describing information literacy. He provides hierarchical understanding of sources that would address a historical topic; he also scaffolds his assignments, building skill upon skill:

Whatever the type of course is, there are a few general rules about creating research assignments. The first is to break up the assignment's tasks into manageable steps or stages. For example, if one wants a student to find history journal articles, the instructor needs to break that process down into (1) locating the appropriate searchable databases; (2) brainstorming search terms for those databases; (3) discussing how to configure a search for the largest number of manageable results; (4) how to sift through a results list; and (5) how to retain the results worth keeping. Research assignments must build on one another so that the student's skills develop and the student can trace his or her development over the course of the semester (Hoffer 2012).

With this support from teaching colleagues, librarians can address many of the online research issues that students experience. Faculty can help us enforce critical thinking habits when we address the search process in our teaching. Critical thinking may perhaps be the most important function of information literacy skill building. The classical ways of teaching information retrieval must evolve with changing modes of information delivery. Research habits that students develop through years of Google searching will not go away. Librarians must honor those and help students use them more effectively and efficiently. Indeed, our study indicated that students are motivated to find reputable resources; they are not lazy—they are often lost. However, many participants in our study found nontraditional and perhaps more creative ways to find desired resources. Now it is up to us to combine all the above with our knowledge of research structures and re-spoke the wheel.

We hope that our audience will express experiences similar to ours. Our goal is to find commonality with our colleagues such that we can begin to think critically about how to fix this burgeoning problem. Our presentation will conclude with a community discussion with the audience.

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