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# Still Desperately Seeking Citations: Undergraduate Research in the Age of Web-Scale Discovery.

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**Still Desperately Seeking Citations:**

**Undergraduate research in the age of web-scale discovery**

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**Abstract.** Web-scale discovery services promise fast, easy searching from a single Google-like box, pleasing users and making library resources more discoverable. Some librarians embrace the concept of giving users what they have come to expect from Google, while others are concerned that this will "dumb down" searching and undermine information literacy. In this paper we explore the potential impact of web-scale discovery tools on information literacy, focusing particularly on undergraduate research skills. We review the existing literature and present findings and experiences from two mid-sized academic libraries that have adopted EBSCO Discovery Service as their library home page portal.

In May 1996, Gloria Leckie published an article entitled "Desperately Seeking Citations: Uncovering Faculty Assumptions about the Undergraduate Research Process" (Leckie, 1996). It is sobering to realize how relevant her observations remain almost 20 years later (e.g., see Buschman & Warner, 2005; Badke, 2013). Undergraduates still come to the reference desk seeking information sources for broad topics such as "cancer," which we try to help them refine and focus. Less commonly they come with implausibly narrow topics which require the opposite approach. The driving force behind this quest for information is almost always a course assignment – typically one among many and always due too soon. The assignments range from the open-ended "discuss both sides of a controversial issue" to the highly constrained "find three peer-reviewed articles published in a nursing journal during the past 5 years where one of the authors is a nurse." Some students have assigned topics; others are given choices or must devise their own topic. The latter often poses the greatest challenge for freshman unused to such intellectual freedom. Whatever the assignment, the common thread is that students must find those pestilential "sources" in order to complete it. Yes, our undergraduates are still desperately seeking citations, and they still have little understanding of how or even why they need to find them.

When the next student tells you that she or he needs to find peer-reviewed articles, try asking why. Chances are the response will be "because my instructor said so" or to simply hand you the assignment. Some will respond "to support my argument," a frightening prospect for the future of research. These responses will (or should) provoke a long discussion of the research and publication process. Ironically, part of the problem is our own advanced information retrieval systems. In many academic databases, it is easy to limit a search to "peer-reviewed articles" or "research articles" without knowing what that means. Fulfilling the conditions of

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the nursing assignment mentioned earlier can be done quickly and easily by checking boxes on the advanced search page of CINAHL.   However, most undergraduates do not understand the research process, how information is structured within a discipline, or the various formats of publication.  Most do not enter college with well-developed information-seeking skills but are accustomed to having information immediately available online and have little experience or patience with developing a robust search strategy.  They also have difficulty navigating library web pages and quickly turn to their "familiar friend" Google in frustration (Bloom & Deyrup, 2012; Georgas, 2013).  The challenges involved in choosing, refining, and researching an unfamiliar topic may be overwhelming, especially in today's information-rich, time-poor environment. It can be easy to "find" citations thanks to a wealth of online resources and search engines, but naïve undergraduates (and even graduate students; see Allen & Weber, 2012) struggle to identify those that are appropriate, relevant, and important for the research assignment at hand.

These issues are not new and will not surprise any librarian who has spent time at the reference desk.  In the preface to his insightful and highly readable book *Teaching Research Processes: The Faculty Role in the Development of Skilled Student Researchers,* William Badke presents his "revelation" as a professor and librarian that "students do not know how to do research." (Badke 2012, p. ix).  He notes that:

> Today's university students in the main have little grasp of the world of information itself – where it comes from, under what conditions is it published, what types of information exist, what tools are available to help them discover it, how to use these tools, how to critically discern what is accurate/useful information, and how to apply information to the research task at hand (Badke 2012, p. 27).

Badke also echoes Leckie's (1996) and Buschman and Warner's (2005) conclusion that there is a substantial disjoint between faculty expectations for student information literacy

(which we might simply call "research skills") and actual student competency.  Students

typically have a very different disciplinary background from faculty, and most vastly over-rate

their own research skills.  While acknowledging this important issue, we focus here on the

potential impact of discovery tools on student research processes and our approaches to library

instruction.

**Early Discovery Tools:  Federated Searching**

In the dimly remembered era before the internet, the main sources of information for

academic assignments were print journals and books.  Most students soon learned to navigate the

card catalog, book stacks, and periodical shelves, and the more advanced mastered cumbersome

finding aids such as the Biological Abstracts.  Online catalogs, indexes, journals, and ultimately

full-text databases made search and discovery faster and easier, but choosing where to begin a

search and evaluating the results became more challenging, especially for inexperienced

researchers.

Federated searching attempted to bridge academic library information silos by providing

a single interface from which to search multiple online resources.  Heralded as Google-like one-

stop shopping (Luther, 2003), federated searching seemed a promising way to lure digital natives

back into the fold of library resources.  Unfortunately, federated search products largely

disappointed librarians and users. They were difficult to customize and cumbersome to use,

provided incomplete coverage, were slow to provide results, and suffered from frequent time-

outs (Xu, 2009; Fagan, 2011*a*; Thomsett-Scott & Reese, 2012; Lown et al. 2013). Although

popular with some students (Williams et al. 2009), many librarians expressed concerns that

federated searching would "dumb down" search skills (e.g. Luther, 2003; Frost, 2004; Badke,

2007;  Lampert & Dabbour, 2007; Georgas, 2013).

Cox (2006) and Labelle (2007) analyzed federated search products using the ACRL Information Literacy Competency Standards for Higher Education (ACRL, 2000). Cox (2006) concluded that *with proper instruction* (italics ours) federated searching products would not negatively affect student information literacy and may offer "an entrée into our collections and the research process" (p. 265).   However, he noted that librarians would need to spend more time teaching students how to use and evaluate information, publishing detailed ideas on integrating federated search tools into library instruction in a later paper (Cox, 2009).  Labelle (2007) agreed that federated searching would have little impact on information literacy but also stressed the need to "modify current instruction practices" (p.250).

**Web-scale discovery Services**

While federated search products "crawled out" to search within individual databases and bring back results, Web-scale discovery searches a centralized index of metadata obtained from many publishers and database vendors as well as the subscribing library's OPAC, institutional repository, and other selected resources, returning results almost instantly.  Web-scale discovery has been described as "a large, vendor-supplied index of all kinds of materials coupled with a simple interface, giving patrons the ability to search across a library's entire collection quickly and easily" (Hoy 2012, p. 324). Vaughan's (2011) series in *Library Technology Reports* provides a detailed introduction and discussion of web-scale discovery and the products offered. Wisniewski (2010) speaks with enthusiasm of its promise to "overcome the limits imposed by the technological basis of federated search" (p. 57).  Wikoff (2011) refers to commercial discovery products as "MetaPortals [which] try to be everything to everyone and a portal to all, like federated search on steroids," but adds "the concept is terrific, but these products are still in their infancy" (p. 24).

The major web-scale discovery products available today are Summon from Serial Solutions (now part of ProQuest), EBSCO Discovery Service (EDS) from EBSCO, Primo from ExLibris, Innovative Interfaces Encore Synergy, and OCLC's WorldCat, recently incorporated into its WorldShare Management Services.   Additional specialized and open-source discovery services have also been developed (Yang &Wagner, 2010). Google Scholar may also be considered a major web-scale discovery tool (Asher et al. 2013), but it does not cover all library sources or publishers and provides very few limiting or refining options.  Summon and EDS seem the most well-known, grabbing early headlines through presentations like the "EBSCO Discovery Service (EDS) vs. Serials Solutions Summon Faceoff" at the 2010 Charleston Conference (Hadro, 2010).

One might well dispute vendors' claims that discovery services search all of a library's collections (Fagan 2012), but libraries are increasingly investing in them. Hofmann and Yang's (2012) study showed discovery tool use almost doubled between 2010 and 2011 in United States and Canadian academic libraries.  There are several explanations for the popularity of discovery services beyond a desire for librarians to provide a better experience for our users. First, librarians hope that the simple, Google-like search interface will wean undergraduates away from Google and back to academically appropriate library resources, allaying concerns that academic libraries are becoming marginalized and may ultimately become redundant (Vaughan, 2011).  Second, improved discoverability of and easier access to library-provided content promises to increase usage statistics (e.g. Way, 2010), providing data to support the funding needed for academic libraries to keep providing quality resources.  Third, librarians hope that making discovery more intuitive will help relieve the pressure to provide basic library instruction to an ever-expanding number of undergraduates and allow them to focus more on the much-

needed higher level skills such as evaluating and using information effectively (Cmor & Li, 2012). Finally, there is a sense that web-scale discovery is the latest hot technology and that libraries should embrace it in order to maximize their usefulness and appeal to digital natives. Indeed, the expectations echo those for federated search. Unfortunately, so do many of the concerns, particularly librarians' concerns surrounding discovery services and information literacy.

## Literature Review

Thomsett-Scott and Reese (2012) provide an excellent survey of the literature on academic libraries and discovery tools, and only a sample of relevant studies is represented here. It is noteworthy that because discovery tools are relatively recent, most of the published literature compares or evaluates products (Rowe, 2010; Yang & Wagner, 2010; Luther & Kelly, 2011; Gallaway & Hines, 2012; Hoeppner, 2012; Vaughan, 2012; Asher et al. 2013) or describes implementation or usability studies at individual institutions (Gross and Sheriden, 2011; Howard and Wiebrands, 2011; Williams and Foster, 2011; Comeaux, 2012; Fagan et al. 2012; Kaufmann et al. 2012; Kornblau et al. 2012; Fyn et al. 2013). Several specifically discuss librarians' reaction to discovery tools (Buck & Mellinger, 2011; Howard & Wiebrands, 2011; Boyer & Besaw, 2012) and how students use them (Meadow & Meadow, 2012; Mussell & Croft, 2013). A great deal of discussion also takes place on various wikis and listservs such as those provided by EBSCO Discovery Service and Summon, but the topics are primarily technical.

The emerging consensus is that "discovery tools offer mixed blessings to libraries and library users" (Thomsett-Scott & Reese, 2012, p. 138). The perceived advantages are variations on the theme that discovery services make search and discovery faster and easier, especially for naïve users. They cut across most resource silos, so there is no need to begin a search by

choosing an entry point such as the library catalog versus a database listing, or by finding and learning to use subject-specific databases from the outset. Customizable features and facets facilitate linking and limiting, and web-scale discovery interfaces incorporate the usual big database bells and whistles such as citing, saving, emailing, or exporting results. Discovery services are primarily aimed at undergraduates who have grown up with Google, rather than librarians and experienced searchers. For most undergraduates the simple Google-like "search everything" box with its rapid return in relevance-ranked order is not only familiar but expected.

Technical issues aside, the most commonly cited disadvantages of web-scale discovery are what one would expect from a tool designed to make searching simple: lack of precision yielding too many results and irrelevant results, gaps in coverage, problems limiting or refining results, and general information overload. Many students find it difficult to distinguish between source types such as books, journal articles, and news items and do not find or do not understand how to use a discovery tool's facets or advanced search features. Important for librarians (but probably ignored by most users) is the lack of clarity regarding just what is being searched and how relevancy is determined. Inevitably, web-scale discovery services fail to index at least some important content and have been shown to perform poorly in some subject areas such as law and music (Woods, 2010; Newcomer, 2011). A common finding is that librarians as well as students want more instruction on how to use discovery tools, suggesting that web-scale discovery is not as intuitive as vendors boast (e.g. Williams & Foster, 2011; Kaufmann et al. 2012; Kornblau et al. 2012).

A frequent concern raised by librarians about web-scale discovery is the same as that discussed in regard to federated searching and every development in online information tools since the emergence of the online public access catalog: "they impinge upon the development of

critical research skills" (Lampert & Dabbour, 2007, p. 257). There seems to be a similar division

between librarians who support web-scale discovery's Google-like ease of use despite imperfect

results and those who place a higher value on students learning effective search strategies and

research skills as part of a lifelong learning regime. A few key quotes capture the issues:

Librarians want to teach tools that work, which they understand, and that will help students gain valuable information literacy skills …. Users want tools that are easy and fast. For librarians to want to teach this tool, it needs to meet their expectations, not just that of students (Buck & Mellinger, 2011, p. 176).

It is the behaviour of our information seekers that should drive our services [but] this desired experience sits somewhat uncomfortably within the world of the risk-averse librarian (Howard & Wiebrands, 2011, p. 1). We spend far too much time training students to use complicated systems that many will not encounter or have access to once they have left the university (Howard & Wiebrands, 2011, p. 5).

A recent comparison of discovery tools at Illinois Wesleyan University and Bucknell

University (Asher et al. 2013) found that EBSCO Discovery Service outperformed conventional

library resources, Summon, and Google Scholar in almost every category. However, the authors

noted that "students showed a marked inability to effectively evaluate sources and a heavy

reliance on default settings (p. 464)". In concluding, they suggest that "the relationship between

discovery tools and information literacy should be evaluated" (p. 477).

**Web-scale discovery and information literacy**

During a 2011 Charleston conference presentation, Will Wheeler noted "the fundamental

desire faculty and administrators have that students learn to think, and think critically, about

what they are doing" and that "no discovery layer mitigates that mission" (Wheeler, 2011, p.

520). Brians and Pencek's (2011) Charleston conference presentation title, "Discovery Systems

Are No Different: We Must Still Teach Searchers How to Become Researchers" captures the

crucial point: discovery services may have little or no effect on information literacy. However, there has been considerable discussion of this issue in the recent library literature.

Jody Condit Fagan analyzed discovery tools in relation to ACRL Information Literacy Standards. She concluded that discovery tools "support some traditional information literacy outcomes, while failing to support others" (Fagan 2011*b*, p. 177). She found mixed support for Standard One (determines the nature and extent of the information needed). By blending a variety of sources and subjects in their results, discovery tools work against a student's understanding of the way that disciplinary knowledge is organized (Outcome 2b) and differentiating between primary and secondary sources (Outcome 2e). They provide stronger support for Standard Two, "accesses needed information effectively and efficiently," but the simple search box may work against developing an appropriate research plan (Outcome 2a), by suggesting that "no plan is needed or that one plan fits all" (p. 176). Finally, Fagan asks "how might a discovery tool play a role in new approaches to information literacy?" (p. 177).

Buck and Mellinger (2011) surveyed librarians at Oregon State University to see how they felt teaching Summon affected information literacy. The most common response (38%) was that the effects were mixed or neutral, but 23% (11 of 48 comments) thought Summon was "detrimental to student information literacy skills to various degrees" (p. 171). The main concerns were that students were confused by search results, had difficulty refining searches, and problems distinguishing between source types. Some librarians commented that Summon promoted the concept of "good enough" (i.e. "satisficing … a judgment that the information is good enough to satisfy a need" (Prabha et al. 2007, p. 76). A small number (8%) responded more positively that by reducing the time spent on individual databases, Summon allowed them to spend more time to focus on selecting and evaluating results. Among the many negative

responses, this positive response seems particularly promising in terms of the joint mission of librarians and teaching faculty to promote higher-level skills that are so vital in today's world of information overload.

In similar vein, Cmor and Li (2012) hoped that "this simpler and more direct way of information retrieval would actually free up time for instruction librarians to teach about information itself and how to engage with it in a useful way" (p. 451). They report that after implementing Summon at Hong Kong Baptist University, librarians revised their learning outcome objectives, moving away from "explanations and procedurals" and focusing on "understanding and evaluating information – how information is produced, types of information and their uses, how scholars and researchers communicate, and how to evaluate quality and relevance of information" (p. 452). Cmor and Li anticipate that Summon and the revised learning outcomes will be well received by undergraduates.

Meadow and Meadow, (2012) examined student search queries through the Summon web-scale discovery service at Montana State University. They found that students did not use Boolean operators, and that the most common query was facebook.com, which suggests that students did not differentiate the search box from a web browser. Unsurprisingly, they concluded that students needed more instruction on how to form effective search queries. It is unclear whether Summon had an effect on search-query quality that one would not find in traditional databases, but the authors note that the single-search box with relevance ranked results encourages the principle of least effort – choosing "the most convenient path with the least amount of work in order to accomplish a task." (Meadow & Meadow, 2012, p. 164).

A related finding from a recent study of a single-search-box design for in-house discovery tool (Lown et al. 2013) is that users almost always chose the default option and then

expected the tool to perform like an open-web search engine.  About 23% of searches were for administrative information, course reserves, and other library services rather than searches for books or articles.  The authors concluded that "a single-search box communicates confidence to users that our search tools can meet their information needs from a single point of entry" (p. 240).  To the extent that this study can be generalized, it suggests that students may be more confused about the structure of scholarly information and take the convenience of being able to "search everything" far more literally than librarians had anticipated.

The importance of convenience was confirmed by two multi-year IMLS-funded projects that found convenience as "central to information-seeking behaviors," especially "among the millennial subjects" (most undergraduates) and that "information seekers will readily sacrifice content for convenience" (Connaway et al. 2011, p. 188).  This demand for convenience is not new; it was central to rational choice theory and to satisficing theory. Without specifically referring to web-scale discovery systems, Connaway et al. (2011) conclude that "librarians need to adapt or seek to purchase services and systems that are designed to replicate the web environment [and] are perceived as convenient and easy to use" (p. 187).  This echoes the position that "it is the behaviour of our information seekers that should drive our services" Howard & Wiebrands, 2011), but leaves open the questions of whether web-scale discovery promotes satisficing behavior, and to what extent it actually affects information literacy.

Mussell and Croft (2013) examined the use of Summon by online students at Royal Roads University in Canada, a primarily graduate-level university.  Survey responses indicated that 22% of students began their research with Summon, 20% began their research with Google, and 22% began with Google Scholar.  The desire for a Google-like search experience is not limited to millenials but "extends from undergraduates through to upper-level students and spans

generations" (p. 19). Another key observation was that students expect or demand to "outsource the relevancy that they may place on research results to someone or something other than themselves" (p. 33).  They rely on Google, a database, or a discovery service to determine the relevance of their results – an important aspect of the critical thinking and evaluative aspect of research – in the interest of time-saving and convenience.

A useful addition to the case studies reports is a "best practices" guide for librarians teaching discovery tools.  The goal is to "take advantage of digital natives' ability to intuitively navigate a "Google-like" search interface, while focusing on the need to teach them the critical thinking skills that will serve them in their university years and beyond" (Fawley & Krysak, 2012, p. 211). The recommended practices include focusing on developing search terms, teaching limiters or facets, emphasizing critical thinking, using the discovery tool as a scaffold to subject-specific databases, developing supplemental subject guides, and emphasizing interlibrary loan.  The most striking recommendation, "emphasize critical thinking" is facilitated by librarians needing to spend less time teaching the ins and outs of individual databases and focus more on limiting and evaluating results, distinguishing between information formats and teaching "how they fit into the information cycle, and their appropriate use in various course assignments" (p. 212).  In short, explaining the research process.

As an extension and development of their "best practices" paper (Fawley & Krysak, 2012), the authors co-presented a recent ALA Tech Source webinar "Teaching Information Literacy with Discovery Tools" (Fawley & Krysak, 2013). The webinar drew more than 100 attendees, and the number of chat questions clearly showed a high level of interest and uncertainty surrounding this topic.

**Our Observations and Experiences**

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Both Rider University and Seton Hall University implemented EBSCO Discovery Service in 2012, placing the infamous single-search box on our home pages shortly before the start of the fall 2012 semester. We invested substantial time and money in the process, and it was not until our discovery services had been launched on our home pages that we realized the impact on our library instruction practices went well beyond simply having to redo large numbers of class-specific Power-Point presentations.  In the hope of garnering feedback from other librarians in similar situations, we conducted a joint presentation (Rose-Wiles et al. 2013) and ACRL Roundtable (Rose-Wiles & Hofmann, 2013). The latter was particularly informative because we asked specific questions of our 15 attendees.  In answer to the question "do we need to rethink our emphasis on traditional IL skills (such as search construction) in more intuitive, Google-like search environments," several participants agreed that the answer is an emphatic "*yes*."  One librarian's non-Boolean method is to tell students to keep trying different keywords in different combinations, to search, search again, and search again, instead of refining the initial search; another criticized the fact that librarians routinely bypass the single-search box in favor of the advanced search page, thus sending mixed signals to the student about the discovery tool's effectiveness and perhaps dissuading its use by a student who prefers Google's simplicity. These librarians suggested working with, not against, students' actual searching behavior. However, few wanted to eliminate teaching Boolean techniques, arguing that doing so would "dumb down" instruction and a student's skill set.

Regarding the question of whether discovery tools promote information literacy more effectively than subject databases, the answer seems to be context-specific: Are we teaching a one-shot session, a scaffolded sequence of sessions, or a semester-long course where there is ample time for exploratory and active learning? Comparing the keyword results of a discovery

tool and a subject-specific database, for instance, shows the importance of domain-specific vocabulary, such as the meaning of the terms stress, strain, and cleavage in geology. Without instruction on how to effectively limit or use controlled vocabulary in a discovery tool, a student searching on these terms will encounter many irrelevant results

Perhaps the most difficult question was "how do we simultaneously promote the virtue of a discovery tool's relevancy ranking (as compared to Google), but still get students to evaluate and go beyond the first page of results?" Participants agreed that the motivation must be built into the assignment by the faculty member, where critical, reflective thinking about sources and the research topic is a scaffolded and graded component of the whole.  An interesting follow up to this question came during discussion with a faculty member in the Biological Sciences at Seton Hall University: Have students compare the results of a simple search on Web-scale discovery with an advanced search on both Web-scale discovery and a subject-specific database to demonstrate the power of advanced features.  The results may help convince students that it is worth the extra effort because the results are more relevant to the assignment at hand.


## Discussion

Librarians' concerns that web-scale discovery negatively affects students' research skills "date back to pre-Google days," (Lampert & Dabbour, 2007, p. 257) but are amplified by the ever-increasing amount of information available electronically, tools such as web-scale discovery that provide ever-increasing numbers of results, and the increasing difficulty that students seem to have in evaluating those results.  Discussions with teaching faculty members at both Rider University and Seton Hall University indicate that they are frustrated and perplexed

by their students' inability to provide relevant and appropriate citations for the papers and would welcome librarians' help with this issue.

As in many academic institutions, our library instruction sessions are typically limited to general library orientations and assignment-focused, one-shot sessions. In the latter, we focus on showing students how to locate and access library resources, how to search key databases relevant for their discipline or assignment, and optionally how to use some advanced features. Allowing for questions and a little hands-on practice-searching quickly exhausts the time we are allotted. As previously noted, Web-scale discovery may help with this issue because we can spend less time teaching how to find and use individual databases and more time focusing on higher level activities such as developing a topic and choosing good search terms or limiting and evaluating results; that is, developing an information-seeking strategy. Even so, it is unlikely that a one-shot session can adequately address the research process. Many students may have to rely on their own exploration of library resources and tools, and/or follow up visits to the reference desk for further help. It is important to keep in mind that most undergraduates "do not think in terms of an information-seeking strategy but rather in terms of a coping strategy" (Leckie, 1996, p. 202). It is not only that most do not know how to do research and are overwhelmed by the process; many of today's students are trying to balance coursework and research assignments with work schedules and responsibilities such as childcare and housework. When and if they find the will and time to consult a librarian for help, students typically want a quick solution to their problem rather than a detailed explanation of the research process and how to apply it to their particular assignment.

This returns us to the concept of satisficing, a behavior which will not change unless there is tangible pay off for what is seen as extra work and time to learn and perform better

searches. Marroum (2004) notes that "if students can be comfortable with the struggle and the tension involved in inquiry, they can slowly move away from instant understanding and allow themselves the necessary time to grasp the material (p. 526). This echoes Kuhlthau's (2004) emphasis that part of the information-seeking process is working through a period of uncertainty and doubt. Unfortunately, millenials tend to be uncomfortable in this situation and seek instant answers, even if they are not the best for their particular question. They lack the confidence and/or motivation to simply explore but rather are anxious to complete a given assignment as quickly as possible within precise parameters set by their instructor. It is clear that "students need the desire to go beyond satisficing or they never will" (Cmor & Li, 2011, p. 453). All but the most highly motivated students (or those with ample time on their hands) will need incentive to go beyond the easiest route to obtain the sources that they believe they need. Discovery tools have the potential to make the reward more likely and the work less onerous by making choices easier, and librarians can help by showing students how to search and evaluate results more effectively. However the main reward for "going the extra mile" in terms of thorough and critically reflective research should come from teaching faculty in its most tangible and valuable form: recognition of better research papers and improved grades.

As both Leckie (1996) and Badke (2012) stress, the primary responsibility for teaching the research process lies with the regular teaching faculty. However, teaching faculty at most institutions are under great pressure to provide quality teaching, advise students, stay current with developments in their subject area, conduct research and produce tangible scholarship, and fulfill a variety of institutional service obligations. The adjunct faculty we often rely on to cover introductory courses tend to have multiple teaching assignments but often lack substantial teaching experience. Despite the multitude of tasks demanded of most academic librarians –

especially those with faculty status – we are in an excellent position to help students formulate clear research statements, work with databases to optimize results, and evaluate the results that they find.  Badke (2012) urges teaching faculty that "librarians think about process all the time, and they need to be considered crucial allies in your own journey into effective teaching of research processes" (p. 141). He also advocates for a "grass roots" approach of beginning at the individual class, instructor, or department level and working upward to "begin establishing philosophies of instruction that actually carry weight" (Badke 2012, p. 176).

Librarians should keep in mind that teaching faculty are often inexperienced with new search tools such as web-scale discovery, so they tend to use the databases and search strategies that they are familiar and comfortable with (Badke, 2012, p. 45). This is particularly pertinent to older faculty members who completed their research and dissertations in a pre-Google environment. Discussions with teaching faculty elicited the information that having librarians instruct faculty in the latest developments and tools such as web-scale discovery would be immensely helpful, because they could then instruct their students. Comments from a very library-literate faculty member at Seton Hall University that "I didn't 'get it' that search everything was a web-based discovery tool and "Why do we pay to subscribe to ScienceDirect if we can find Elsevier articles through Google Scholar?" indicate a glaring need for librarians to better communicate our resources and tools to teaching faculty.

**Information Literacy at Rider University and Seton Hall University**

At Rider University, librarians and classroom faculty are collaborating to better engage students in the research process, where reflection on and evaluation of sources is key. For example, English professor Megan Titus and librarian Melissa Hofmann have experienced success with Titus' succession of scaffolded assignments that culminate in a research paper for a

freshman/sophomore research writing class (Hsieh et al. 2013). An annotated bibliography and subsequent exploratory essay, in which students arrive at a thesis, are separate, graded assignments that require students to articulate why and to what degree the sources they chose are appropriate, how they relate with each other, and how they contribute to the students' thinking on their topic. This approach forces students to search for relevant sources and defend their inclusion, which discourages padding a bibliography after the paper is written or picking the first five full text articles found, regardless of relevance. Because it is a requirement of the assignment, the librarian emphasizes how to identify and evaluate sources. The discovery tool, with its inclusion of multiple source types (format and content) from different content providers (databases, publishers, open-access repositories) allows for a rich overview of the resources available and for a practical demonstration of searching, choosing, identifying, and evaluating a source. In the example above, the librarian was able to focus more heavily on evaluation, even though it was a one-shot session, because it was the second library session for the class and because students were assigned sections of the Research Guide to read about source types and database searching prior to the library instruction session.

At Seton Hall University, information literacy is one of the core competencies that students must complete in their programs prior to graduation (Bloom 2007; Loesch 2010). More recently, a group of librarians began working with English faculty to establish consistent information literacy goals and assessments for first and second semester freshman English classes (see Table 1). We spent a full-day session evaluating student papers in order to identify the key problem areas and met several times to discuss collaborative approaches to help students address them. The extent to which we teach searching EDS versus subject databases in these classes and what evaluative skills we stress is a key part of our ongoing discussion. We are also

following Rider's example of working at a grass-roots level with individual instructors to incorporate librarians into the design of course curricula that specifically focus on the research process.

**[Figure 1 about here]**

Lampert and Dabbour (2007) observe that "one key area that digital natives seem to have lost is the ability to reflect" (p. 273). But good research begins and ends with critical reflection. Information literacy begins with "understanding the nature of our knowledge base" and "all good research starts with epistemology … the study of how we know what we know, i.e., what are our sources of knowledge, where do they come from, in what forms are they transmitted to us and why would we find one source more credible than another" (Badke, 2012, pp. 11-12). This idea of understanding "how we know what we know" echoes Bernard Lonergan' cognitional theory of knowing based on reflexive understanding of "what I am doing as I am knowing" (Marroum, 2004, p. 535). Marroum (2004) specifically applied Lonergan's general empirical model (GEM) to science education, stressing the need of not just "educating students in their subject matter" but teaching them "how to think for themselves and discover themselves as learners" (p. 520). She also notes that "knowing is not a single activity but a dynamic process that consists of three distinct, but functionally related components": experience, understanding, and judging (Marroum, 2004, p. 522). This translates extremely well into teaching the research process from a library standpoint: *Experience* = locate and browse sources; *understand* = read and comprehend the articles that seem relevant; and *judge* which articles are the most relevant and appropriate for the research paper.

At Seton Hall University we have recently completed a pilot Praxis program for integrating Bernard Lonergan's General Empirical Method (GEM) into course curricula and

library instruction. This is a university-wide project involving teaching faculty, administrators and one librarian. The project has broad-based institutional support, a key component of any undertaking, to include understanding the research process as an integral part of an institution's education mission (Badke, 2012). Librarian Lisa Rose-Wiles will be working with faculty members in biology, occupational therapy and anthropology to incorporate GEM-based library instruction and research process skills into individual courses during the coming academic year.

This rather philosophical approach to librarians co-teaching the research process seems at odds with those who urge librarians to meet the expectations of users, and that "tools should also be designed to fit into the user's way of thinking and operating rather than trying to force them into the traditional library system" (Thomsett-Scott & Reese, 2012, p. 139). However, a bridge between these two apparently conflicting viewpoints is that the role of instructors is to acknowledge and honor the students' expectations for easy search and access, and then lead them into the process of deeper thinking about their research assignments and search results as a path toward developing a set of generalizable research skills. The convenience of web-scale discovery tools and the time saved on teaching multiple databases can help us to help students broaden their way of thinking to encompass actively and reflectively coming to know the research process in various disciplines and understand how to do research. This is surely our ultimate aim in graduating information-literate students who are able to take their place in today's work force and contribute to the future of our society.

## Conclusions and future work

Despite a great deal of review, discussion, and speculation we have little actual evidence of how (or if) web-scale discovery services affect information literacy. This is largely because there are no reliable "before and after" discovery service measurements on which to base an

assessment and because busy academic librarians rarely have time to develop and conduct such a complex study.  However, we and several other New Jersey academic libraries are working on a collaborative project to investigate students' use of EBSCO Discovery Service using a similar approach to that of Bloom and Deyrup (2012), with a view to establishing best practices and ways in which to promote critical thinking and evaluation skills in our students -- our future researchers and practitioners.

We are modestly optimistic that Web-scale discovery may help our information literacy efforts. Discovery tools alone cannot solve the problem of information overload in the one-shot session—and their use may not always be appropriate for the class level or topic—but deployed with other pedagogical strategies, such as a flipped classroom and librarian-classroom faculty collaboration, they can help us highlight and demonstrate skills and issues that will be relevant to the student in their post-assignment, Google-infused lives. We are especially conscious that the overarching need is for teaching faculty and librarians to collaborate in seeking the long term goal to "establish reading and writing courses in every major" and "ensure that every department has a comprehensive plan to integrate the teaching of research processes into the curriculum" (Badke, 2012, p. 176).  By working together, we truly hope that our future students will no longer be "desperately seeking citations" but be diligently and passionately exploring appropriate and relevant citations to inform their research projects.

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**Figure 1:  Desired information literacy outcomes for English 1201 & 1202**

**at Seton Hall University.**

**ENGLISH 1201**
- The student should learn how to find and use general sources (e.g. Library Research Guides, Credo Reference, Opposing Viewpoints) to help begin the research process, particularly if he or she is unsure where to start or how to narrow their topic.
- The student should develop the basics of locating assignment-related sources using SHUsearch.
- The student should learn the basic differences between source types (e.g. a book chapter, a journal article, and a news item).
- The student should understand how to tell whether an item (book or article) is available and how to download electronic items if they are.
- The student should understand what plagiarism is and why and how to cite sources.
- The student should understand that most of the resources found on the library website are paid for by the library (and ultimately through their tuition) and that these sources are not normally available to the general public and will not show up in a standard web search. The student should also understand that he or she may need to log in if they are accessing the databases remotely.

**ENGLISH 1202:**
- The student should learn the basic principles of database searching through an introduction to one or two discipline-specific databases with a focus on the similarities many databases share for greater knowledge transfer.
- The student should learn how to move beyond keyword searching in order to use more focused, discipline specific search terms and learn how to effectively broaden or narrow search results.
- The student should develop proficiency in finding, refining, and evaluating library resources using SHUsearch.
- The student should learn that research often requires re-searching, which means coming up with alternative search words in order to find relevant results.
- The student should understand the difference and relationship between an abstract and a full-text article and why it is not appropriate to base research only on the former.
- The student should understand the difference between scholarly and popular sources, and when it is appropriate to use each type for research.

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