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Research was conducted to develop a clear picture of user preference at the University of North Carolina at Chapel Hill by having representative users answer questions about their use of the library in a questionnaire and following-up with a usability test. The usability testing involved two main goals: first, participants compared two search pages, one with tabs similar to the current library homepage and one without that is similar to a Google interface. This first goal also tested the library's new combined search known as Articles + Catalog. The second portion of the tests involved having the participants respond to a proposed library homepage in order to gather feedback for a redesign project. The resulting data showed users preferred the tabbed widget, but overall participants were not averse to the use of the simple widget on the proposed library homepage since the information they found most important was still available.

Headings:

Academic Libraries.

Web Scale Discovery Tool.

Online Public Access Catalog.

Web Site -- Design.

Usability Testing.

Questionnaire.

QUICK SEARCHING AT THE LIBRARY: A USABILITY TEST ON COMBINING WEB SCALE DISCOVERY TOOLS FOR THE ULTIMATE SEARCH INTERFACE

by
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of the School of Information and Library Science
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Approved by

_____

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Introduction

With academic library users turning to online search engines like Google instead of the library's website and search tools, libraries have had to adjust their tactics. The trend has become to focus on meeting users where they are with the types of search interfaces that they are accustomed to seeing and using. Similarly, the constant growth of library resources and the overwhelming amount of information available to users needs to be addressed in a way that allows for easier access and organization. Swanson and Green (2011) state the true purpose of a library homepage "is to add value to all of our resources by making them findable" (p. 227). The virtual space that a library inhabits needs to be just as accessible, friendly, and comfortable as its physical spaces. Web scale discovery tools attempt to fill the gap between library users' knowledge from their use of the Internet and technology and their use of library resources. As Michael Kelley (2012) put it:

> "There is great hope that these rapidly maturing products will not only promote information literacy strategies but also deliver what metasearch (or federated search) has failed to achieve—a Google-like interface that provides a fast, single point of entry to an institution's relevant and vetted scholarly content" (p. 34).

This single point of entry that allows users to access the entirety of a library's collections, both print and electronic, will remove much of the guess work that users face in our virtual environments. What is not shown as commonly are the results of combining two of these powerful tools into a single search option. The research

conducted for this study will provide a unique look into what users prefer about this approach compared to searching other ways. Furthermore, the academic librarian still has a responsibility to fulfill in both creating virtual spaces that users can manage and in training users how to use these spaces.

Purpose of Study

By conducting a usability test with a representative group of library users at the University of North Carolina at Chapel Hill Libraries (UNC Libraries), the plan was to discover how users compare two different search interfaces that utilize the library's Articles + Catalog search (see Figures 1 and 2 below). The Articles + Catalog search combines Serials Solutions' Summon web scale discovery service with Endeca, a faceted search tool that operates as UNC's online public access catalog (OPAC) and a discovery layer over its integrated library system (ILS), Millennium. This combination will create a more streamlined search tool that incorporates what librarians like to see for indexed and cataloged resources and what users are used to seeing from their experiences in a broader online environment. In addition, users will find the search easy to use due to quick results that they have come to expect based on years of using non-library search engines widely available on the Internet. By combining web scale discovery tools and online public access catalogs, libraries will increase the use of their resources due to the more powerful search interface. Users will be able to effectively utilize the library as not only a physical space but also a virtual one.

The overall purpose of this study will be to parse out certain aspects of the users' opinions on using the library's new Articles + Catalog tool as well as their preferences for search widget layout. These aspects include, but are not limited to:

- whether or not users are comfortable using the library's Articles + Catalog search,
- if they find the results that they expected and are satisfied with them,
- their opinions on how easy the search widget was to navigate, and
- if they plan to continue using this type of search in the future.

It will also be interesting to get feedback on the unique layout of the Articles + Catalog search's results, which will have articles and related database materials in one column and books and related items from the library's catalog in another. This standout feature of the Articles + Catalog search could be what makes or breaks this new search tool for users because it is the one feature that truly sets this search interface apart from its non-library competitors like Google and Amazon.

Figure 1. Current UNC Libraries search widget with Articles + Catalog search selected for display. The catalog tab is the default search option that users see when visiting the homepage.

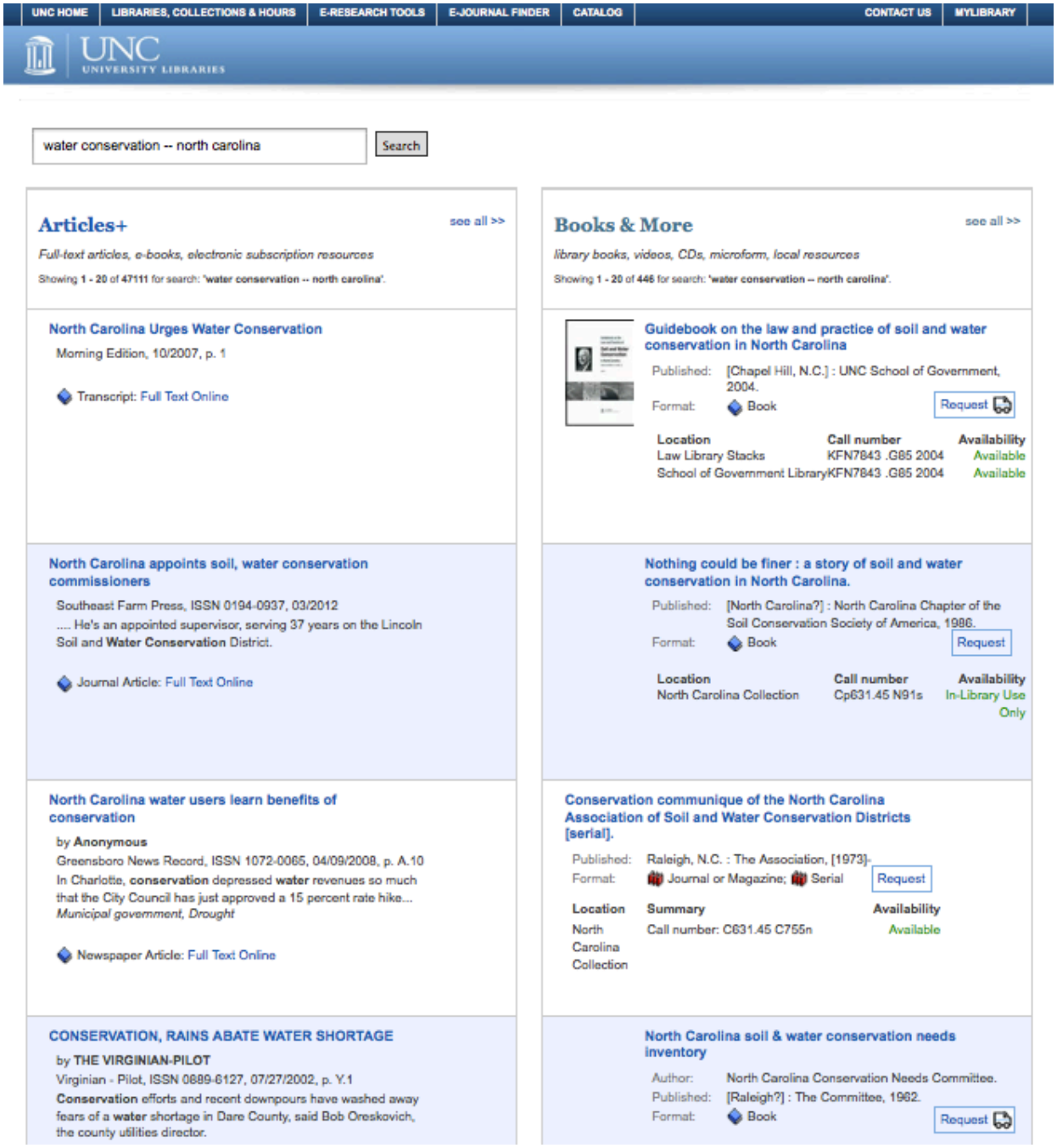

Figure 2. Screenshot of the search results page for "water conservation -- north carolina" in the Articles + Catalog search. The alternating colors of each resource are meant to help users in differentiating among them.

Environment at UNC-CH

The University of North Carolina at Chapel Hill is a four-year, public institution that is classified as a research university with very high activity by the Carnegie Foundation for the Advancement of Teaching (2010). According to UNC's News Service (2013), the entire student body totals 29,278 with 18,503 students classified as undergraduates (Students section, para. 1). The University offers "77 bachelor's, 109 master's, 66 doctorate and six professional degree programs through 14 schools and the College of Arts and Sciences" (Key Statistics section, para. 1). There is a full-time faculty of 3,221 (Key Statistics section, para. 5).

The libraries themselves hold 7.2 million volumes and subscribe to 92,483 serial titles, both electronic and in print (Key Statistics section, para. 6). From March 1, 2012 to February 28, 2013, the library's website had 168,457 unique views per month (an average of 5,538 per day) according to the site's Google analytics tool. Since the release of the combined search known as Articles + Catalog on January 14, 2013, the search has logged a total of 8,119 searches (an average of 142 per day) up to March 12, 2013.

Literature Review

Though a review of the literature revealed hundreds of articles on both web scale discovery tools and ILS OPACs, few were updated on the latest findings and uses of these tools due to their constant changing nature. While this literature review is not comprehensive, it does focus on recent articles published since 2010 that discuss the issues raised in relation to web scale discovery tools and their use at academic libraries and by their users. This review also focuses on issues related to library websites in general, single search options versus tabbed searching widgets, and the impact these issues have on library resources and their use by patrons.

Background

Web scale discovery tools are being used more and more by libraries. They are the next big move for library resources if libraries are to remain in the game with search engines like Google and online bookstores like Amazon and Barnes & Noble. Web scale discovery tools are viewed as being user friendly due to their similarities to non-library search tools like Google. In other words, library catalogs and databases in their current form are considered to not be easily accessible by users who are accustomed to Google and other popular search engines for the majority of their research needs. The reasons for this vary widely, but most come back to the issue of complicated search strategies and the wide array of database and catalog styles and interfaces. Web scale discovery tools combine the user

desired "Google-like" interface with the library's resources, essentially combining the best of both and thus making access to information smoother overall (Thomsett-Scott and Reese, p. 123-124). While it is easy to compare web scale discovery tools to Google, it should be noted that this type of search "can be considered as deep discovery within a vast ocean of content" (Vaughan, 2011, p. 5) due to its gateway-like nature for library holdings.

According to Vaughan (2011), Serials Solutions' Summon, the web scale discovery tool used at the UNC Libraries, currently contains a large index of over 94,000 journals and 6,800 publishers totaling over half a billion individual items; most of which are journal and newspaper articles that customers have access to. The chief aggregators partnered with the Summon Service are ProQuest, LexisNexis Academic, and Gale (p. 122). The volume of items and the credibility backing those materials due to their sources puts Summon on par with the likes of Google and Amazon if not above them. Serials Solutions itself releases updates for Summon every three to four weeks (Vaughan, 2011, p. 22).

Increase in Use of Library Websites and Search Tools

According to a Pew Research Center's Internet & American Life Project's survey on how teens research (2012), 65% of Advanced Placement and National Writing Project teachers agreed "that the internet makes today's students more self-sufficient researchers" (Purcell et al., p. 3). Further, 76% of these teachers "'strongly agree' with the notion that 'search engines have conditioned students to expect to be able to find information quickly and easily'" (p. 17). The most insightful and impactful finding was that middle and high school students today are using Google,

Wikipedia, and other online search engines more than ever to research their class assignments. Truly for these students, research means "googling" (p. 33-34). These findings create an impetus for academic libraries, and libraries in general, to provide search tools and websites that are user friendly and reliable.

Against this backdrop of teenage "googling" stands the decreasing use of library websites by college students who have developed their research habits much like the teens discussed above. A 2010 report from the Online Computer Library Center (OCLC) found that since its 2005 report there had been a decrease in the use of library websites (p. 52). In addition to this finding, 83% of college students begin their "information searches using search engines," a decline from 92% in 2005 (OCLC, 2010, p. 53). This finding displays the opposite of what libraries would like to hear about the use of their resources. Part of the issue has to do with students feeling overwhelmed by the complicated mazes created by library interfaces, which tend to be organized more for the resources than for the users who need to access them. Non-library search engines then become a go to for students since they are convenient, unintimidating, and easy to use and access, despite their lack of reliability and accuracy. These latter characteristics are most often cited as being related to library resources, but seem trivial in comparison to the ease of use factor (OCLC, 2010, p. 53). The literature also suggests that web scale discovery tools and OPACs are more frequently used for university library websites as separate ways of accessing library resources, a trend that shows libraries are attempting to change the declining use of their resources.

While the use of library sites has been declining, the implementation of web

scale discovery tools and next generation catalogs has been increasing. This increase is most likely due to the previously discussed symptoms and to the user demand for ease of use. According to Hofmann and Yang (2012), "discovery tool use has almost doubled" in a matter of two years from 16% in 2009/2010 to 29% in 2011/2012 at the 260 libraries that they studied (p. 257). Included in these numbers are the implementations of discovery tools that offer a single search box interface and those that have next generation catalog features such as a faceted interface (Hofmann & Yang, 2012, p. 263). Numbers like these do not lie – libraries are attempting to move in a direction that users want in order to provide search tools that are more in line with what users have come to expect from their experiences in other non-library virtual environments.

In a 2009 study at Grand Valley State University in Michigan, Way looked at how the implementation of Summon affected the use of their library's electronic collections. He pulled usage statistics from September to December of that year. Way (2009) found the drastic "increase in full-text downloads and link resolver click-throughs [to suggest] Summon had a dramatic impact on user behavior and the use of library collections during this time" (p. 219). He concluded that the implementation of Summon did in fact increase the use of library resources, an exciting find for all academic libraries that have implemented these tools (p. 219). Based on these findings and the similarities between web scale discovery tools and sites like Google, it is unsurprising that users will take to using search tools like Summon because of the connected reliability and ease of use.

Combining Multiple Search Tools

The unique nature of studying the Articles + Catalog tool comes from the lack of research into the user perspective on combinations of these types of search tools. UNC Libraries are not the first to develop a customized search interface that combines multiple platforms and source types. Hofmann and Yang (2012) found that a majority of the libraries they studied "use their discovery tool in conjunction with their classic ILS OPAC" (p. 259). This is a finding that shows the flexibility and potential of discovery tool and catalog combinations. For example, North Carolina State University has developed a multilayered search that incorporates Summon, Endeca, and other search tools into one seamless interface. [1] Similar approaches to combined search interfaces are being developed at Villanova, the University of California in San Francisco, the University of Michigan, and the University of Virginia (Lown, Sierra, and Boyer, 2013, Background section, para. 6).

The three current team members of NCSU's QuickSearch revealed interesting statistics on the use of this type of combined search interface in a pre-published article. Lown, Sierra, and Boyer (2013) used transaction log files to gather data on the frequency of use of the various sections on their QuickSearch interface (Methodology section, para. 1). They found that the majority of hyperlinks used were in the articles and catalog sections at a combined use of almost 80% (Lown et al., 2013, Results section, para. 2). Further, they discovered that the direct links to articles or catalog items were used more frequently than the links to view more results (Lown et al., Articles & Catalog Module Pattern Use section para. 1-2). This is

[1] http://www.lib.ncsu.edu/search/about.html

an issue that I believe will be corrected with UNC's two column layout plan, though users most likely will not go beyond the first page/two columns of results.

Usability Testing of Library Websites and Search Tools

The approach used in the study to gather data, a questionnaire and follow-up usability test, will allow for in-depth discovery of how and why users turn to non-library resources and potentially lead to findings that will allow libraries to change this trend. Not only will insight be provided on how users understand these types of search tools, but investigators will also be able to observe how they are using the tools first hand and begin to understand the issues that keep users from taking advantage of the library's curated sources.

One of these issues is user confusion over what exactly the one search box is meant to do. Majors (2012) found that the single search box interface was used "for many kinds of things not supported by the discovery interface" such as "'interlibrary loan,' 'help,' and 'chat with a librarian,'" which could be due in part to the lack of "transparency about what is being searched and/or indexed" (p. 191). In their usability test at James Madison University, Fagan, Mandernach, Nelson, Paulo, and Saunders (2012) found that "students had trouble determining what is searched by various systems," which is unsurprising based on past research findings. However, it is still troubling because web scale discovery tools are meant to meet users where they are by bridging the gap between what they expect and what is possible based on past systems. As long as the goal of reaching out to users and creating tools that they find easy to use and understand remains unmet, this issue will hopefully begin to die out. I would like to confirm this finding with my own usability test in this

study.

Furthermore, based on the usability test of Gross and Sheridan (2011), students tended to maneuver through the discovery tool's interface easily, "but [were] somewhat perplexed by the search results" (p. 242). Based on their observations, the students struggled to differentiate among the various source types. For example they "were confused between the record of a book, and the record of a book review" (Gross & Sheridan, 2011, p. 242). Fagan, et al. (2012) discovered similar findings over student source type confusion. This issue is one that I hypothesize would become less of a hindrance with the UNC library's proposed Quick Search results organization. The dividing line between source types will be clearly separated between the two columns.

One concern that has arisen deals with the ease of access to the library's resources via the combined search. Users will perform a search, receive the Summon and Endeca results on a single page, and then either scroll through the results or decide to jump out into the individual interfaces of one or the other depending on their needs. This concern was addressed by a 2009 usability study at Moraine Valley Community College when they tested the ease of use of their library's website. Their site varies from others by not including a search bar on the homepage. Unlike other academic institutions pushing for a more Google-like appearance with their search tools, Swanson and Green (2011) wanted to know if users were able to access the MVCC library's resources since databases and the catalog were accessed via links from the homepage rather than through a search option on the homepage (p. 222). Their findings suggest that users had no difficulty

in accessing resources located on a secondary page (p. 227), which provides relief over the concern that the combined search results page being utilized at UNC will cause undue obstacles for users.

In Spring 2010, Teague-Rector, Ballard, and Pauley organized a usability test of the North Carolina State University's tabbed search interface, which is similar to the one currently used at UNC Libraries. The stated purpose of using a tabbed search tool was to create a search interface capable of allowing access to multiple silos of library information such as articles, books and media, journals, and the library's website (p. 81 and 85). A combined "All" option is also available. In their results, Teague-Rector et al. (2013) found that most of the usability participants did not immediately stick with the "All" search, but utilized the tabs when beginning on search tasks (p. 88). Moreover users seemed to struggle with tasks involving journal articles and databases, but found searching for books and library services much easier to complete (p. 88-9). Overall they concluded that the tabbed search widget worked well for both user access and the organization of library resources and services; yet, they also came upon common user frustrations with library search interfaces (p. 91). Despite these frustrations, library website users will hopefully find ways to interpret the search interfaces in front of them based on their ever growing knowledge from other online interactions.

Still, Swanson and Green (2011) bring up an interesting point regarding the library's homepage and the importance of balancing the resources available in limited space available. They found that "the more items that are added to the site the less findable each item becomes" (p. 227), which could deter some users from

ever taking advantage of all that the library has to offer. By providing a balance of library resources and services for the user to peruse, libraries can begin to create websites that are more user friendly. The proposed homepage that UNC's User Experience department has created strips away much of the content that can currently be found on the site (see Figures 5 and 6). The fact that this study found evidence supporting exactly what the UNC Libraries are attempting to do further justifies the need for this move.

Methodology

Based on findings from the literature, a usability test with common, but specific tasks for participants to complete will be the best method of gathering data for this study. This approach will draw out user preference for the type of search page used to access library resources as well as for the two-column results display. As previously mentioned, the Articles + Catalog tool will combine Serials Solutions' Summon, a web scale discovery tool, and Endeca, an OPAC that operates as a discovery layer on top of UNC's ILS, Millennium. A web scale discovery tool is a library search engine that envelops the features of traditional online library search tools (facets, uniform/indexed keywords, etc.) with the ease of use provided by popular Internet search engines that users tend to gravitate toward for simplicity. The types of materials indexed include journal articles, newspaper articles, online e-books, book reviews, theses and dissertations, and reference materials. The purpose of such a tool is meant to pull users back to the library and its resources by making access easier while still maintaining the credibility and trustworthiness of materials found through library search engines.

Similarly, an integrated library system online public access catalog (ILS OPAC) provides access to a library's physical and electronic holdings mainly in the form of books, journals, and media, which allows for narrowing of results using factors like date, location, author, and subject through faceted navigation. Typically,

an OPAC is the main search option featured on a library's website as it currently is for UNC-CH's library website as of March 2013. Once the Articles + Catalog has been vetted over a period of months, it will eventually become the default search for users.

For the purposes of this study, a locally developed search interface was examined that combines the two described types of searches above into a single search interface. This search tool came about based on the findings of a previous usability study of the library's Articles+ tool performed in Spring 2012. A task force recommended the development of a combined Articles/Catalog search option that displayed results from Summon and Endeca in a two-column display. This search tool was released in January 2013, but not made the default search option.

The goals of this study were to determine the perception of users and their research habits in regards to the library's search options (Articles+/Summon, Catalog/Endeca, and combined) as well as the usability of the combined search tool described previously. A further goal that developed as the study progressed was an examination of the search widget employed to allow users to access the materials needed to fulfill their research objectives (see Figure 1 for live version of UNC's search widget and Figures 3 and 4 for the widgets used during testing). The following sections detail the ways that this study accomplished these goals.

Questionnaire

A questionnaire was made available from January 14th through February 13th, 2013 using UNC's Qualtrics survey tool and the campus mass email system. Survey logic was applied via Qualtrics. For example, if someone had not used the

library's website to search for books, they would not be asked a follow-up question about how often they had searched for books in the past month. The questionnaire had a twofold purpose: first to collect responses about the information gathering habits of users and their use of existing search tools, and second to screen for potential participants in the usability testing portion of this study. While the literature does cover most of what the questionnaire will find about user preferences, the importance of gathering this information on the specific population that will be studied for this paper will build a better foundation for the second stage of the process – the usability test. See appendix A for the final versions of the cover letter and questions.

Usability Test

While the study had 13 participants for the usability test, the findings will be generalized in an attempt to apply the results to the overall population represented by these selected users. Jakob Nielsen stated that usability testing is comprised of three components: (1) representative users, (2) representative tasks for the users to perform, and (3) observation of the users performing these tasks including their successes and failures with the search interface (as cited in Gross & Sheridan, 2011, p. 238-239). Through the UNC-CH libraries, this study utilized Techsmith's Morae usability testing software to record a participant's actions via screen capture and audio recording. This allowed for the gathering of hard data on study participants' use of the Articles + Catalog tool. At the same time, the principal investigator and a note taker observed and questioned them on their experiences with and preferences for the two interfaces and their reactions to the combined search results. The

mixture of qualitative and quantitative data gathered from this study provides a fuller understanding of the needs and wants of users when it comes to library search tools. It is also worth noting that what a participant says and what they do can speak volumes in regards to how they are perceiving their use and how they are actually using these types of tools.

After establishing the three criteria above, the first step of selecting representative users was completed through the use of a questionnaire, which is discussed in detail in the previous section. The representative tasks will be laid out for the chosen users in order to test the system and not the users themselves. If the users were to be tested, it would be better to have them decide their own search tasks, but in the case of this study they were given a list of specific tasks to complete and then asked about their reactions and preferences. The observation guide and tasks including the handout that each participant received are laid out in detail in Appendices B and C.

While performing these tasks, participants were asked to share their opinions on the results and whether or not the results met their expectations. They were also asked about their preferences based on the layout of the search interface including the two columns of results and the simple versus tabbed navigation of the initial search widgets. For this second part, two wireframe search pages were set up for the participants to use during the usability testing. Both pages used the same search tool as their default option. One search page had tabs that allowed users to select among the following options: only searching Articles+, only searching the catalog, searching both at the same time via the Articles + Catalog combined search,

or searching Google Scholar. Each tab option provided advanced search and other related options listed as links below the search box. This tabbed widget is representative of the UNC Libraries' current search options that have been used for approximately 5 years. The other search page was a simple version that only had one main search box option with other choices for Articles+, the catalog, WorldCat, Google Scholar, etc. linked underneath. Figures 3 and 4 show what each page looked like for the testing.

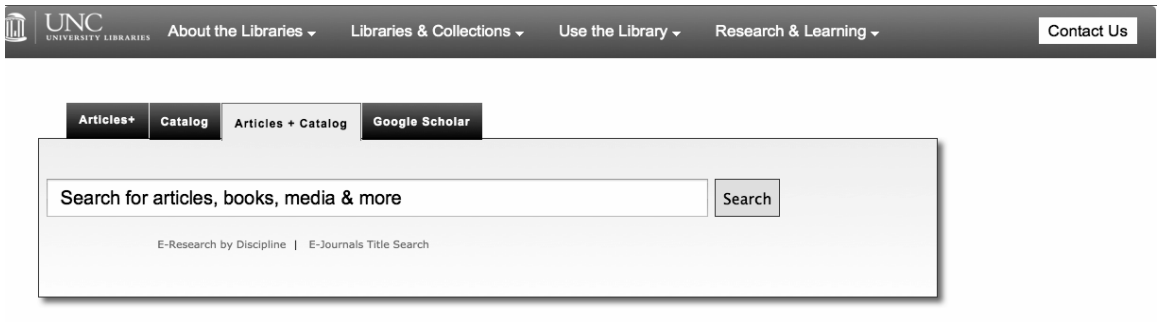

Figure 3. Tabbed search page option for usability test.

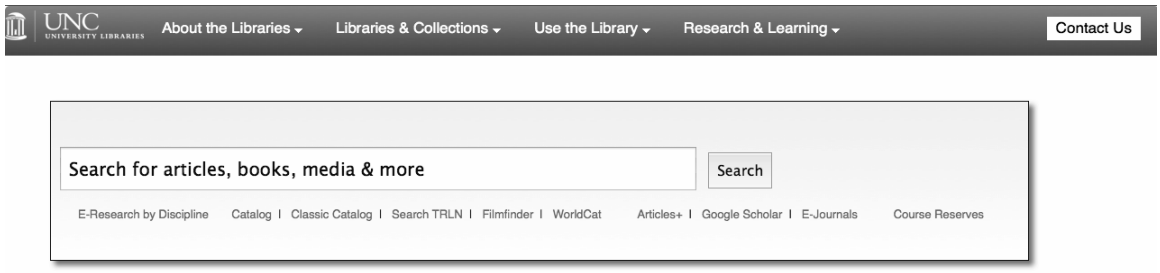

Figure 4. Simple search page option for usability test.

The second half of the usability test involved asking participants about a possible redesign of the library's homepage (see Figure 5). Participants were shown a wireframe of the proposed new site and asked for their input. The librarians in UNC's User Experience department will use the data gathered from this portion of

the usability test to build a more user friendly and streamlined homepage for the libraries. For the purposes of this study, some of the data gathered during this portion will be examined in the Results and Discussion sections though the majority is not applicable and thus will not be covered in depth. See Appendices B and C for the observation guide and participant handout information and Figure 5 for a screenshot of the proposed library homepage wireframe, and Figure 6 for a screenshot of the library's current homepage for comparison purposes.

Figure 5. Screenshot of the proposed library homepage wireframe that was shown to usability test participants.

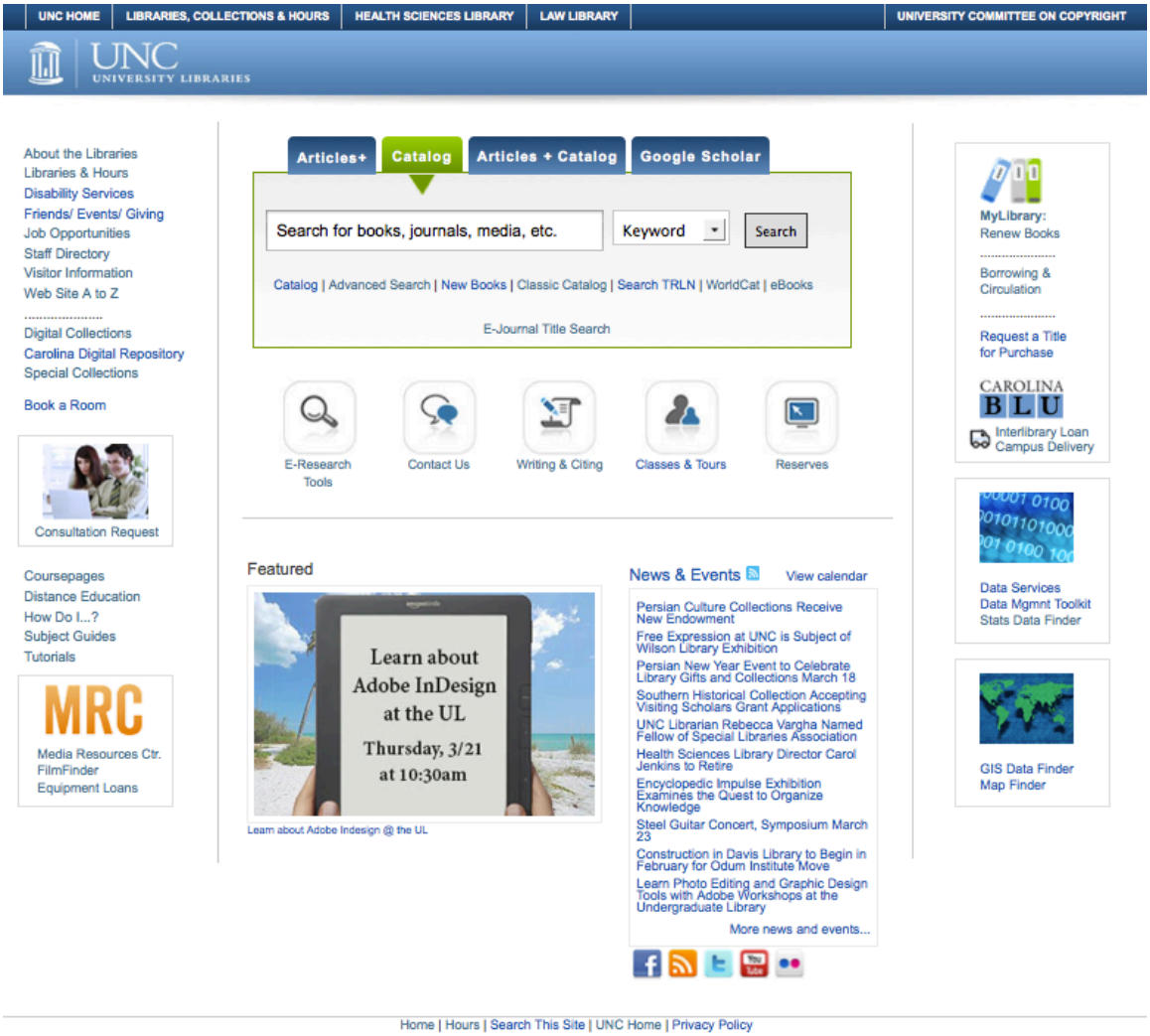

Figure 6. Screenshot of the UNC Libraries' current homepage as of March 2013.

Results

Questionnaire Responses

Over the course of the 31 days that the questionnaire was active, 132 respondents began the questionnaire with 125 completing it, a response rate of 95%. Of these 125, the majority stated that they were faculty members (42%) with undergraduates (28%), graduates (17%), and doctoral students (13%) following. The majority of respondents were female (65%). Respondents were given the opportunity to fill in their area of study, which resulted in numerous variations on specific sub-disciplines. To condense these various responses, the UNC Academic Departments list[2] was used along with UNC's listed Schools[3] to determine the final list (see Appendix D for complete results).

After the basic demographic questions, the questions focused on library experience and use of the respondents. When asked if they had attended a library instruction session while at UNC, 57% responded in the affirmative. The purpose of this question was to determine the experience level of users, which means over half of the questionnaire respondents have had some exposure to the UNC libraries and their resources and/or services.

In regards to library resource use, 97% of respondents had used the library's website to search for books or other print materials. While 17% used it 0-1 times,

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[2] http://www.unc.edu/academics/depts-a-z/
[3] http://www.unc.edu/departments/

22% 2-4 times, 14% 5-6 times, 7% 7-9 times, and 39% used it 10 or more times in the previous month. Comparatively, only 45% of respondents had used the library's Articles+ feature to search for journal articles from the library's electronic holdings. With 20% using it 0-1 times, 32% 2-4 times, 20% 5-6 times, 9% 7-9 times, and another 20% of those respondents had used it 10 or more times in the month prior. When asked about the percentage of the library's resources they thought was covered in Articles+, 3% of respondents thought it was less than 5%, 9% thought it was somewhere between 5-24%, 29% thought 25-49% was covered, 26% thought 50-74%, and 24% thought 75% or higher was being searched through Articles+. This question had an 85% response rate, or 112 out of 132 respondents.

One interesting question that seemed to almost split the respondents dealt with their go-to source to begin researching. When asked this question, 53% responded with Google while 45% said they use the library's website. Only 1% use Wikipedia or print materials each. Contrary to the response of the previous question and what was expected based on library literature, 57% of respondents said they prefer a library-style search with multiple options like keyword, title, etc. while 43% would prefer a Google-style interface with one search box. Bias of respondents may be an issue with these responses due to library branding on the questionnaire as well as the information provided to respondents in the questionnaire's consent dialog.

Of the 125 who completed the questionnaire, 71 respondents were interested in being contacted for the follow-up usability test of the library's search tools. Six more potential participants were recruited via a flyer posted around UNC's

campus, making it a total pool of 77 potential usability test participants. Of those 77, 19 participants were selected based on their stated areas of study in order to cover the wide breadth of disciplines and the perspectives they bring to library research. 13 of them responded and participated in the final testing.

Overview of the Usability Test

For the usability test, participants were asked basic demographic and library use questions followed by a series of six tasks involving two search pages. Finally they were shown a proposed library homepage wireframe and asked for their input on it. While each of the six tasks followed an ideal path that illustrated what the investigators wanted to find out about the tools, participants were asked to behave as they would normally and were given free range to search the mocked up widgets as they saw fit to begin each task. If a participant's path differed from the ideal path, they were simply asked to go back and test out the search page in that ideal way.

The breakdown of the 13 participants is as follows: 31% undergraduate, 23% graduate, 8% doctoral, 38% faculty. The broad range of disciplines covered by these 13 provides an accurate representation of today's academic library environment. Five came from a social science discipline (social work, journalism and mass communication, two from psychology, and political science), three came from the humanities (art history, classics, and comparative literature), three from the hard sciences (physics and engineering, environmental science and engineering, biology and environmental studies), and two from the medical field (nursing and health policy and management).

In order to get participants comfortable with the testing environment and to gather more background information on their library website usage, some basic questions were asked regarding the types of tasks they had attempted on the library's website in the past month (see Table 1 below). To accomplish these tasks, seven participants used Articles+ and four used the library's catalog. Most of the participants followed paths they were comfortable with. They started by going to the library's main site or via their disciplines branch library site or course site to access E-Research Tools, E-journals, and specific databases like Web of Science, JSTOR, ARTstor, and PsycInfo.

Table 1.

Tasks attempted by participants in the month prior to usability testing.

Attempted Task	**Total**
Looking for an article	10
Looking for a book	7
Other information or materials like government documents, e-journals, and specific research on animation	3
Looking for films	1
Looking for library hours	1
Researching a topic	1

Participants were also asked about their preferences regarding print versus electronic versions of items in order to determine whether or not they would want to see one version or another listed first in their search results. The findings here are not easily broken down due to the mixed preferences of each individual participant. The majority would prefer books in print for pleasure reading or for

classes, while they would select electronic articles and e-books to fulfill their research needs. Those who wanted electronic versions of articles preferred them for their ease of access and the ability to print them rather than having to track down the original print version, copy or scan and print it.

Tasks 1 and 2: General Subject Search

Tasks 1 and 2 involved a general subject search on a preselected subject that did not directly apply to any of the participants and their areas of study. The object here was to control the results and to provide the investigators with easy to compare outcomes. The search page that each participant used first was randomly chosen (see Figures 3 and 4 to view each search page). Participants were asked to complete the same task twice, once on each search page in order to create a baseline of comparison between the two pages. Each participant was asked the same two questions regarding their expectations based on each search widget and their use (or not) of autosuggestions on whichever search page was tested first. For a breakdown of what each participant searched for and other results from the usability test, see Appendix D.

Upon first viewing of a search page, the majority of participants (9 out of 13) stated that they expected to search "articles, books, media, and more," which is the language used to describe the default, or combined, search. For those who landed on the tabbed search page first, a minority described what they could search based on the tabs available. While one participant stated that the default search on the page appeared to search "mainly books, but I guess it says articles so maybe it would be both." On the other hand, participants who landed on the simple search page first

expected to be searching anything and everything. One participant who was asked this question after using the tabbed search first thought aloud: "this to me seems more general. It doesn't necessarily say articles, books, microfilm, anything like that and now that I think about it that might be kind of nice especially in comparison to the other one" – a sentiment that was shared by many when comparing the two search widgets.

Out of the 13 participants, only eight noticed the autosuggest options that appeared. Five utilized them for their searches and six stated their search was affected by the suggestions. Thoughts from participants who stated they were affected were in line with others:

> "[The library] must have something regarding this topic if it drops down."
>
> "I do use what drops down to help guide me to where I'm going."
>
> "I guess this is what's being recommended to me."

Based on the numerous suggestions received:

> "I thought this is something reasonable to search."

Combined Search Results

Part of tasks 1 and 2 were questions aimed at drawing out the thoughts each participant had on the new layout of the combined search results page (see Figure 2). The questions were repetitive in a way to draw out the various reactions of each participant with the goal to gain as much insight into each participant's inclinations.

Most of the initial reactions of participants involved the separation of resources based on type and being accessible all in one place:

> "First reaction is, for a topic that I don't know very much about, it's neat to have them side by side because I might be more interested in an article or be more interested in a book, and I don't have to do any clicks."
>
> "Actually like this a lot because it separates it into articles and books depending on what you really need."
>
> "Something I'm not used to seeing – I'm used to seeing one column… but then I saw the two titles and thought 'oh, I like that'… I like that they separate it."
>
> "It's interesting seeing them split. I'm so used to seeing the list across that for a second it was a little overwhelming."
>
> "It's different, but not bad. There's more information than the other way that I search."
>
> "A little odd having the articles and the books separated, but I guess it's actually kind of convenient."
>
> "For a very general interest kind of thing, having both the articles and the books I liked. For one it showed me there were both and it showed me the difference between the two."

While some other participants commented on the adjustments they would need to make to use a tool like this:

> "It would take a little bit of time to get used to it. I think my natural inclination is to read left to right, so you focus on the articles section rather than the book section, so it takes a little while to realize that this is a column and the Books & More is a column."
>
> "I think that I would prefer to see a single column as opposed to two columns, but I may get used to that. It's like computer software when they cram an update down your throat, you get mad at first, but then you learn to like it or don't."
>
> "If not used to this page, it may be difficult, but once you expect this when you search it is going to be a lot easier."

Some of the more seasoned researchers felt the two-column layout would be too much if they were going through their usual research routines:

> "If I knew what journal I wanted, it would be kind of superfluous."

> "I think in general it would be useful to someone looking for an overall inclusive… anything article or book related to this topic… but for my usage, I usually am looking for journal articles so it might be a little bit more distracting for my daily use."

> "If I were looking for a book or a local resource, I'd really like it. Since I'm used to only looking for articles, I wouldn't be annoyed, but there is a lot more scrolling down…" *Clicks on "See all results in Articles+" link.* "That's really nice to have that breakout and then still be able to get to if I just want to see [articles]."

One participant showed concern for their students and the issue of source credibility, an issue that would need to be considered when introducing novice researchers to a tool as powerful as the combined search:

> "First thing that would strike me are the different columns. At first it's pretty convenient, but then I would worry especially with having to deal with some of my undergrads… I could see them thinking that these are all equivalent"

Though many mentioned being overwhelmed by the layout and large number of results, of the 13 participants, only one mentioned the immediate lack of facets to narrow their search results:

> "An embarrassment of riches… I would wonder how to sort through 66,409 articles and 450 books and I would probably begin to cast about on the screen looking for ways to refine my search."

Many of the participants commented on the two column layout being too cluttered looking. They suggested widening the columns as well as making the headings larger. One participant even mentioned adding a line down the middle to distinguish them that much more. The majority of participants stated they were satisfied or somewhat satisfied with the results that they saw on after performing tasks 1 and 2. As each participant examined the combined results page, they tended

to become more pleased due to its all-encompassing nature and easy access to the Summon (Articles+) and Endeca (Catalog) interfaces.

Simple Search Page versus Tabbed Search Page

Contrary to what was expected, a 69% majority of participants (9 out of 13) preferred the tabbed search page to the simple one and chose to use it for tasks 3-6. Of these nine, eight used the tabs to complete at least one of the four tasks. What is interesting here, however, is that when completing tasks 1 and 2 five participants did not notice the difference between the search pages until it was pointed out to them when being asked about their preference.

Participant comments varied, but overall the response was positive in regards to the tabbed search page:

> "It had the three options that I really wanted. So, I like the tabbed better because it gives me the flexibility that I want, which is to see articles, catalog and book options, and then together."
>
> "If someone isn't accustomed to searching for things, this one is quite clear, I feel."
>
> "I would rather have than them than not. In fact, I would probably rather have more tabs than what you've given me."
>
> "It's not a big deal, but there are times when I'm just looking for research articles and would use the articles tab."
>
> "[The tabbed] makes it a little more clear that you have options."

Though one participant felt they might miss something by being provided choices through the tabs:

> "Usually people would just go in and type whatever they need and not even click on the tabs because they're just looking for everything… I don't think I would care for tabs really because I may forget to click a tab and not find anything whereas here without a tab I can just type it in and whatever I get is

> whatever I get…. I would rather have [the simple] one, just have it all, so I don't miss anything."

Positive responses to the simple search page focused on the lack of guesswork involved in using it especially related to the ease of use for students just beginning their research:

> "If I had to just send my undergrads or if I had to just start here this would be kind of nice to say 'hey look, blank slate, you don't know where you're starting, what are your key terms.' Since we talk to them about that a lot; sometimes you don't have the right terms, you're not going to find that book or that article that's going to help you."

> "I think in general without the tabs would be nice especially if you have undergrads where if we give them a project to just go look and see what's out there so they don't end up cutting themselves off from resources… they're used to a Google model."

Although other participants did not view the simple layout as being clear or convenient:

> "I feel like this one wasn't as intuitively [laid out]… like the other one I had identified this is a combined search whereas this one I feel seemed more like an articles search, so it was surprising to get the Books & More section."

> "If I know I am just looking for a book, I don't want to be disturbed by all the articles."

Rather than employ tabs, the simple interface uses links below the search bar to give users the choices and then some that the tabs provide. The tabbed interface also uses these links, but the links are broken out depending on which tab the user has selected. Many participants commented on the size and location of these links:

> "Links are like the fine print in an advertisement."

> "Tabs seem more important than things that are on the bottom."

> "When I see tiny blue links under search bars, it's usually help or contact, so I feel like I ignore them."

> One participant even referred to the links as "footnote sized type."
>
> "I'm used to ignoring things underneath. They tend to be things like 'forgot password.' I feel like I only look under the search bar if I'm panicking."

In general, all participants understood how to use both search pages without having to put in too much effort:

> "There's not a huge learning curve going from one to the other."
>
> "I like [the tabs] because I search articles only, but at the same time I know what to do with [the simple version] and it's getting me to what I need. It's getting me to something that's familiar."

Task 3: Searching for a Known Book

Task 3 entailed searching for a known item in print. Participants were provided with the full citation information of the book *Ecomyth: Challenging the dogmas and the ideology of the international 'green' movement* by Lance Kennedy. All participants found this task to be very easy (85%) or easy (15%) regardless of which search interface they chose when asked about the level of difficult involved in completing this task.

For the ten participants[4] who used the tabbed search page for this task, eight went straight for the Catalog tab with two of those eight using the Catalog's Advanced Search option, linked below the search box. The other two used the default combined Articles + Catalog search. Of the three participants who chose the simple interface for this task, two used the default search bar while one went for the Catalog link under the search bar, which links to the Advanced Search. This

[4] One participant used the tabbed search page for tasks 3 and 6, and used the simple search page for tasks 4 and 5.

participant then selected the basic Search tab from the Catalog's Advanced Search in the Endeca interface.

After an unsuccessful attempt to find the book due to a typo in the tabbed widget, one participant commented:

> "I think if I were sitting in my office and this had happened to me, I would probably think this isn't worth playing with, I'll just go back to the old catalog. And also any time software fails you, you begin to wonder can I really rely on this thing – what can I rely on it for and what can I not rely on it for."

This comment was telling based on other participants' approaches to using these search tools. Reliability of the tools being created is essential to having user acceptance as we continue to build more powerful search engines for library websites.

Task 4: Searching for an Individual Database

For this task, nine participants used the tabbed interface while four used the simple one. The task involved searching for the database PsycInfo via their chosen search page. Summon has a feature that allows specific individual databases to be searchable based. The library staff was able to manually program various terminologies such as PsycInfo and PsychInfo , which are not generated by the system. These terminologies were based on what testing participants might use to complete this task as well as the next one. After testing was completed, investigators were also able to recommend and add in more search terms based on what users had done during testing. The resulting search would provide a best bet recommendations box above the two columns of the combined search results. Investigators also had a second browser window open with UNC's live version of the

Articles + Catalog up display search results for PsycInfo to show participants a different location option for the best bets box (see Figures 6 and 7). If a participant's natural path to completing this task varied from them using the default Articles + Catalog search, they were asked to repeat the task using that search. The reason for this repetition was to see how participants responded to the two location options.

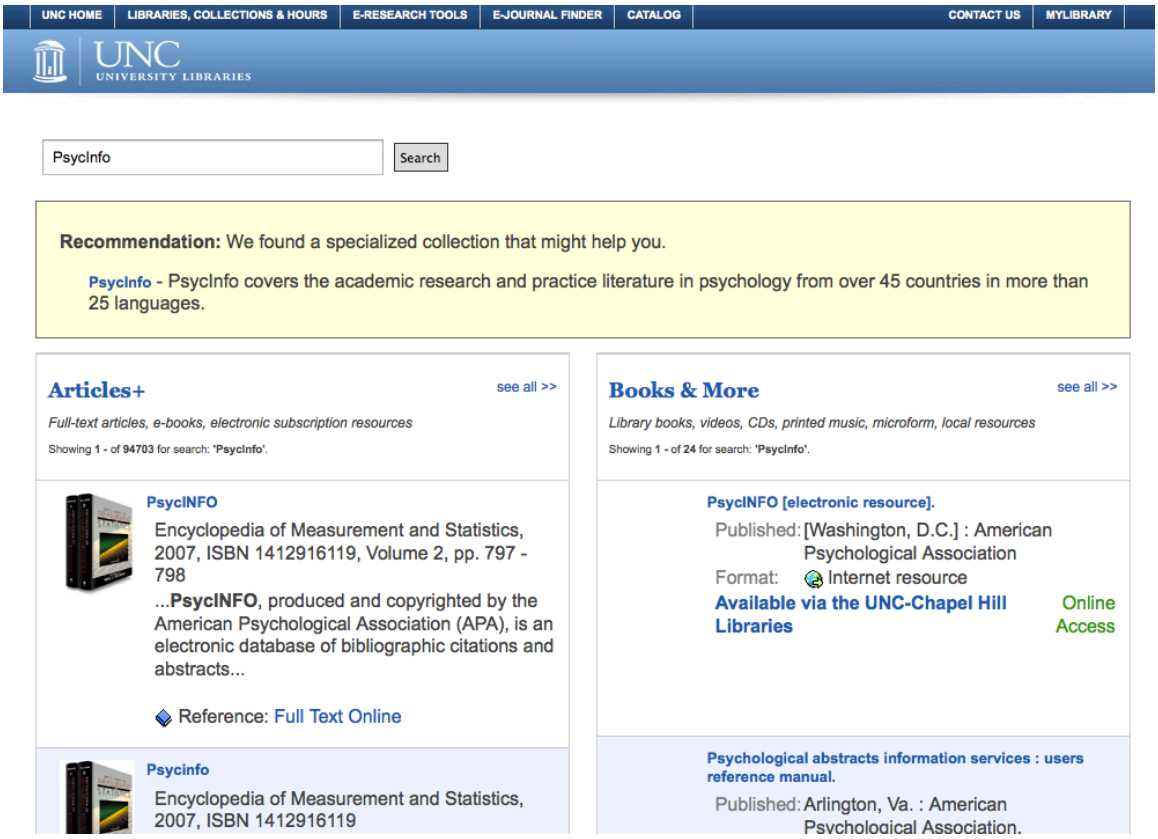

Figure 7. Screenshot showing the location of the "Recommendation" box in the combined search used during testing.

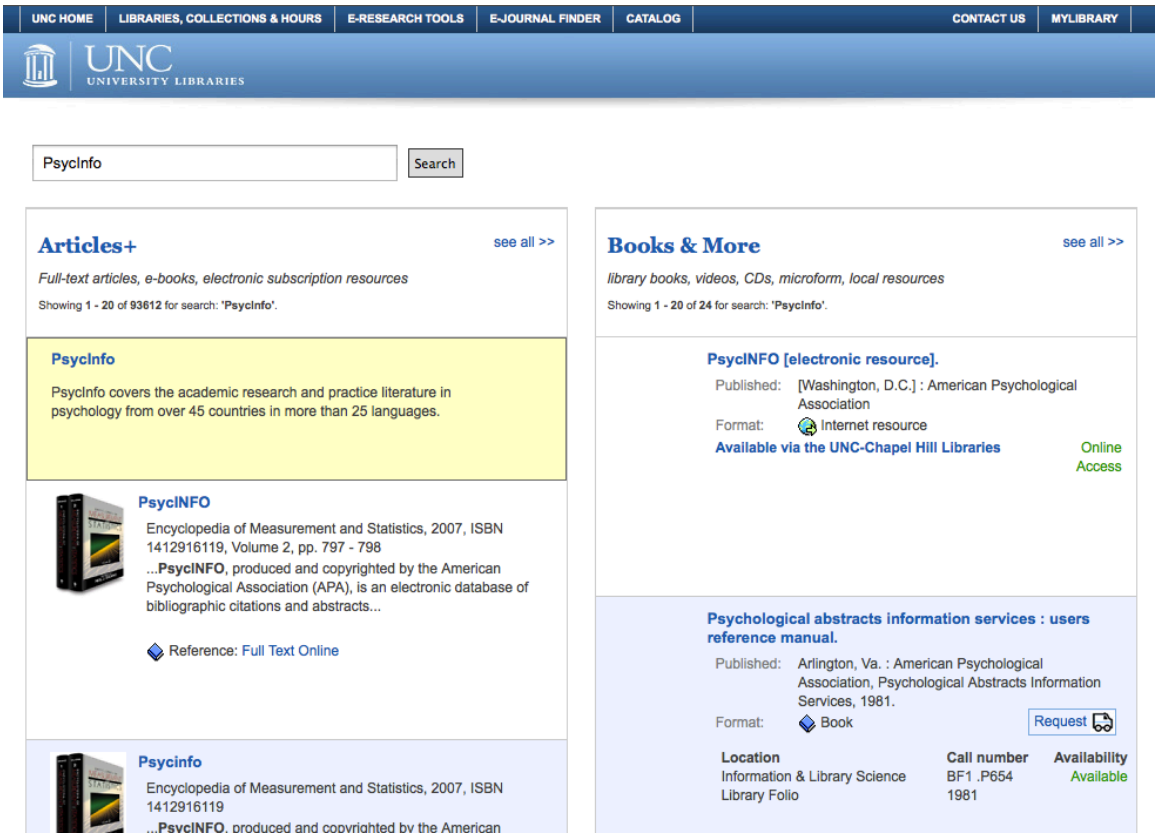

Figure 8. Screenshot of the "best bet" recommendation box from the live version of the combined Articles + Catalog search on UNC's website.

The participants' experienced difficulty on this task varied widely. Only 15% rated it as very easy, 54% as easy, 8% as neutral, and 23% as difficult. Of those who used the tabbed widget, five used the default Articles + Catalog option, three went for the E-Research by Discipline link underneath the default search, and one used the Articles+ tab. Of the four participants who chose to use the simple widget, two used the default search, one used the Articles+ link below the search bar, and one had to be prompted to try the default after expressing their uncertainty of how to go about this task. Six of the participants automatically searched for PsycInfo in the Articles + Catalog/default search. Regarding this feature of the search interface, one

participant made a comment that verifies the thoughts of the principal investigator on the importance of librarian guided instruction for all users of any library system:

> "If someone told me these things, like oriented me to the library, would I be able to use it? Absolutely, it's not hard. But if I came in here by myself, I'd probably be a bit confused."

The preference for location of the "Recommendations" box was split with six preferring the box to be located below the headings in the Articles+ column while the other seven preferred it across the top. Perhaps more telling is how the 13 participants noticed, or did not notice, the box as an option and their reasons why. The breakdown of what path they followed while searching is as follows: five noticed the banner across the top, four saw it in the Books & More column as the first result, and four thought it was the online reference entry on PsycInfo from the Encyclopedia of Measurement and Statistics.

For those who preferred the "Recommendation" box across the top of the page, it seemed to be due to the fact that it stood out from the two columns of results:

> "I feel like once I get used to this, I would prefer it."
>
> "It's a little more perceptible across the top."
>
> "It stands apart a little better than when it's hidden with the other articles."

While others felt the box across the top was similar to features found on Google searches:

> "Like in Google search, the highlighted stuff in the shaded area at the top is ads or saying something not relevant to me necessarily."
>
> "I thought at first it was correcting my typo."

Positive feedback from those who preferred the best bet box within the Articles+ column dealt with its location and appearance:

> "The first thing I'm going to look at is the Articles section rather than the Book section, and then I would immediately see PsycInfo."
>
> "I think I might notice this one better because I generally ignore everything that's around the margins and kind of zone in on what I'm looking for."
>
> "I think I still would have mashed on that… I think I would have still gone that way because of the yellow box, that's the attraction. It beat the picture."

On the other hand, one participant felt it was easier to ignore the box due to its different appearance from the regular results:

> "I'm automatically drawn to looking down the list. It looks like a warning box instead of part of the things that you can have, so I don't know that I would have realized that that was what I was looking for."

Overall, the participants shared some general thoughts on the location, which were telling because of its comparison to their use of non-library websites and what they have come to expect and to ignore based on this use:

> "When I'm researching online, you have to start not noticing things because if you notice everything it would just take forever… I think a reason I didn't notice it is because I feel like I'm programmed now to ignore title boxes… automatically ignore them because it didn't seem like part of the results."
>
> "When I know what I'm looking for, I just look for it and recommendation screens just aren't very relevant to me."

Task 5: Searching for a Group of Databases

Task 5 involved searching for all of the databases provided at UNC related to the field of Psychology. The original intent of this task was to find out if participants understood the new terminology being related to the library's databases. On the current library website, all databases are found via a button called "E-Research Tools" (see Figure 9). On the new search widgets, the terminology was changed to E-

Research by Discipline and linked below the search bar on each of the default views of the test interfaces (see Figures 3 and 4). After observing the second participant attempt to search for "all psychology databases" in the default search of the simple interface, it was decided to add this as an option, making this task similar to the previous one. The best bet was added with a link to the page that participants would find if they clicked through the E-Research by Discipline link and then into the Psychology page with search term options like psychology, psychology databases, psych database, and all psychology databases.

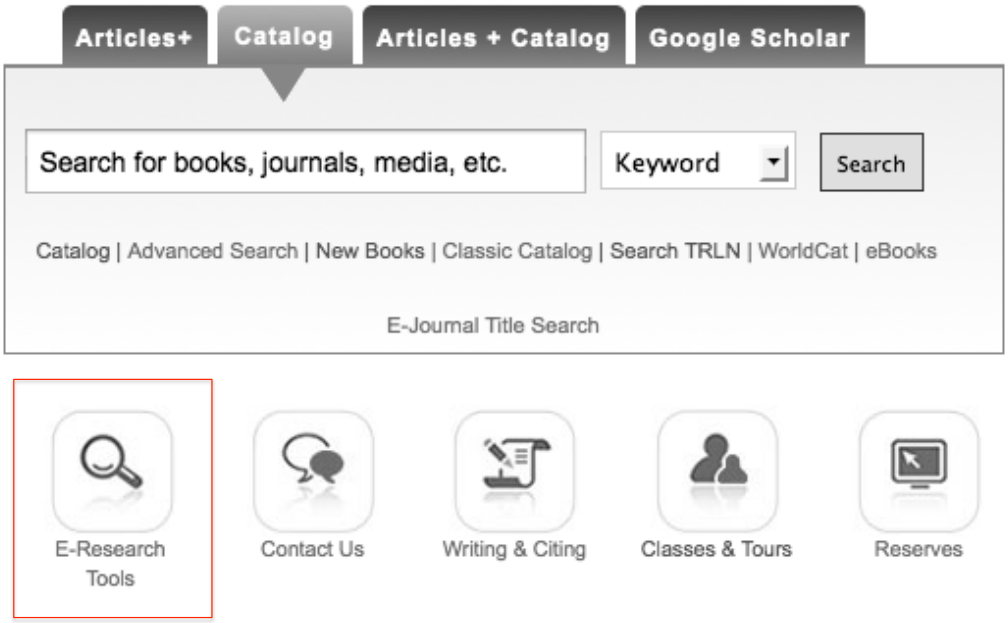

Figure 9. Screenshot of the live version of UNC's search widget with the E-Research Tools button highlighted.

Again the participants' rankings on the difficulty of this task were varied, but this time was more balanced. 31% thought the task was very easy, 38% easy, 23% neutral, and 8% difficult. The majority of the nine participants using the tabbed interface went straight for the E-Research by Discipline link under the search bar

while two used the Articles + Catalog search, and one used the Articles+ tab. Of the four using the simple interface, three used the default search and one used the E-Research by Discipline link under the search bar. Of those who did use the Articles + Catalog/default search, three did so automatically without any clicking or searching on the screen and three participants stated they learned what to do based on what had occurred in the previous task. Some participants stated how their search habits might change due to this fact:

> "My way of doing things is to remember how I did it before and to always do it that way."
>
> "Now that I know to look there, that makes more sense… It's cool that you can do that and once someone had told me I could do that, it would make me do more things in that search engine."
>
> "I keyed in on the way I already access it so I ignored [the links under the search bar]."

As for the first goal of this task, to determine if the wording "E-Research by Discipline" makes sense, the majority of participants stated that it did. Some suggested leaving it as E-Research Tools, others proposed changing "by discipline" to "by subject," and a few recommended simply labeling it as "Databases." For those that did struggle to find an access point on their first go, their reactions were interesting but insightful due to their persistence after not knowing exactly what to do:

> "I had no idea what I would get when I used the [search] box here."
>
> "I'd click around though and eventually figure out where it is."

Task 6: Searching with Incomplete Article Information

The sixth task provided participants with an article title and journal title, giving them incomplete information by excluding the date, volume, issue, and authors of the article. They were asked to use the search interface to find this article and the majority found it to be a very easy task to complete (77%). Of the ten who used the tabbed search page, three went with the Articles + Catalog search, six used the Articles+ tab with two of those six using the Advance Search option linked below the search bar, and one used the E-Research by Discipline link to access PsycInfo. For the three who used the simple search page, two used the default search and one tried the E-Journals link below the search bar before trying the Articles+ search also linked below after realizing they would need the date information to find the article via E-Journals.

With a combined search tool using two different interfaces like the Articles + Catalog search (Summon for articles, Endeca for books, media, etc.), turning on both autosuggest options would create a conflict between the two systems. To avoid this, only one side can be enabled. For the purposes of this test the autosuggest subject headings through Endeca were enabled while the Summon search suggestions were disabled. However, when users search for an article title, the autosuggestions will disappear after a certain point because of the specific search for the article by title. The intent of this task was to find out if disappearing autosuggestions would deter participants. Of the 13 participants, only six noticed the disappearance on their first search. Five stated they affected them and one said they did not affect the search. All participants were asked to go back in order to have them all view the disappearance

if they did not on their first path for the task. Overall not many of the participants would be deterred by the disappearance of the autosuggestions:

> "I suspect I would not be too bothered by it if I were confident that I had the text right."
>
> "If the drop down option wasn't still there, I would keep doing the search."

For those who were concerned by the disappearance, the theme seemed to be a lack of confidence in what they were searching for, but they all continued on their search:

> "Made me worried that the library doesn't have it, but I would keep going."
>
> "Nothing is really popping up, but I'll keep doing it anyway."
>
> "I'd panic a little… I feel like Google has made us really used to things just popping down immediately, but when I do searches currently for articles there's a lot of times when nothing comes down."
>
> "It threw me off a little bit, but I don't think it would throw me off in daily use."
>
> "If I didn't find anything I'd kind of be put off, but I'd still finish my search."

Some of the participants have even come to expect autosuggest options to disappear based on their searching in other interfaces or at other times:

> "One of the great things about Google, they've come up with these little suggestions, but they also come up with the answer even if you don't like their suggestions. I'm used to just plowing ahead."
>
> "I expect them to disappear if I keep going."

Library Homepage Wireframe

The final portion of the usability test showed participants a wireframe of the library's proposed new homepage. The proposed homepage moves the focus from a largely text based current page to a simplified page with only the necessities like

library hours, a search tool, and library events. The use of a large background image is meant to show off the libraries' great study spaces and the friendly people on campus. New students would learn where they could go to study via the images as well as the services available to them via the simplified links and search features in a much quicker manner.

The goal of this last portion was to provide the User Experience department, part of UNC Libraries, with user feedback on their idea of the direction that the library's homepage should be headed in. The current site is link and button heavy whereas the new site would tuck most of the links away in a top navigation bar and provide quick access to the library services users need the most like hours, search, booking a study room, and library events. To gather this information, participants were asked to rate the site based on how it looked in regards to being professional, welcoming, and reliable. These questions were followed by a request for three words or short phrases to describe the site in comparison to the current one and for three things the participant thinks should be found on the library's home page. The details from these questions can be found in Appendix E.

Out of the 13 participants, only two were averse in some way to the proposed redesign. One of the participants even considered that their dislike of the site could be due to their level of comfort using the current site:

> "Could be biased because I've been here so long, I'm used to it whereas a freshman coming in might like it better."

While the other disliked the lack of visual cues on the page in comparison to the use of buttons like those shown in Figure 8:

> "Not very fond of it… I like having all of the buttons and stuff as very visual cues."

Only one participant mentioned the use of the simple search widget despite the majority having previously stated their preference for the tabbed one. The positive feedback for the site redesign spawned from the stripped down nature of the site:

> "I like that better because it still has library hours… this gets right to the point."

> "I like the fact that there aren't quite as many links everywhere and I like the use of drop downs to cover those links as opposed to be all over the place on the page."

> "This looks like it's just the general search which I think would be helpful if students wanted to immediately go through and say here's a few key terms… or half a book title or an author that I wanted to search for."

While in general participants seemed receptive to the redesign, some had more mixed feelings about it:

> "For someone who has used the old site, the immediate reaction is how do I do the things on this page that I used to be able to do on the old page."

> "My needs are just the articles that I need to do my research and my assignments and that's my main my need for the website, so just being able to go straight into my journals that's all I want. And I do it really simple like I said. I know I've met with a librarian and saw all kinds of really complicated things you can put it and that doesn't work for me. It's overwhelming. I like to be able to pop in the key things that I'm interested in and getting back all the things that I want to see."

Discussion

Overall it can be stated that participants and users in general will follow the paths they know will work and are comfortable using without realizing a faster way may be available. After showing them some of the simpler access points into the library's resources, participants were impressed and would potentially change their search habits to save time in the future. The learning curve was low in this testing. The high number of regular library users among the participants exposed the strong search abilities of the participants. The similarities between the simple search widget and search engines like Google provided an easy transition for participants from what they know and what they could do to use it while the tabbed search widget provided them with familiar ground and plenty of options to choose from for their search needs.

The participants liked options when searching. They view being able to search for just articles or just books as a faster path to access library resources, but also want the option of a combined search in cases where they may want a broad overview of materials the library has on a particular topic. One issue to consider here is the potential participant bias generated toward the tabbed search widget by the fact that the current live UNC library site provides this option. As related in the previous paragraph, participants were comfortable sticking to what they know and thus this bias most likely carried over into their preferences for the tabbed widget.

It should be noted that despite this bias the participants did in fact utilize the tabs though many did not notice them right away.

Another telling piece at play here is the lack of disagreement on the use of the simple search widget on the library homepage wireframe. It can be assumed that the participants and UNC library users will be receptive to the simple widget should it go into use with the library's new homepage. Truly a single search box interface has been established as a valid option for library webpages. The same can be said of the library homepage redesign itself – users will take time to adapt, but once they do, they will be able to perform their necessary tasks with the library's tools. Findings of both the Pew Research Center and OCLC regarding middle and high school students' research habits coupled with the decreasing use of library websites were informative. In order to move these students to use our search tools, we must begin to conform to what they know and what they can use based on their online experiences. The simple search widget is flexible enough to conform to these notions and become future proof. Additionally the simple search tool was effective enough to handle current users' needs.

While many mentioned being overwhelmed by the large number of results they received on the combined search screen, few mentioned the lack of facets to refine their search on the page, and most seemed fine with using the combined search results page as a jumping off point into the library's more detailed search options populated by Summon and Endeca. None attempted to narrow their results in tasks 1 or 2. Those who discovered the path into the Summon or Endeca interface were pleased to see they could begin narrowing their results if needed. On the

whole, the participants stated they thought the combined search tool was effective and would increase their productivity. One potential reason for the tabbed search widget preference could spurn from this combination of the two interfaces into one results page; at times users will only need one or the other type to complete their research.

It was also interesting to see a common thread appear among the participants in teaching positions. They believed their students would prefer the simple search instead of the tabbed since it would be less intimidating. These perceptions about one another can be telling. In this case those perceptions were incorrect based on the findings of a majority preference for the tabbed search page. It also shows the desire to ensure our users, or students, are comfortable with the interfaces that they use on a regular basis. Based on the literature, it would seem that librarians and users alike make assumptions about one another and their capabilities. It should be noted that the tools librarians provide their users like the Articles + Catalog search are not as foreign as some would think especially as users take the opportunity to use the tools and learn how to work with them.

In regards to the location of a "recommendation" box, most suggested making the box bolder, a brighter color, larger, or adding an image/icon to make it stand out more. The principal investigator would recommend placing the best bet box with the results in the Articles+ column with the addition of an icon and bolder color and font. However, further testing would be needed to determine if these changes are noticeable based on this study's nearly even split among participants.

The changes made after participant 2 attempted to use the combined search to find all of the Psychology databases is an example of the ways in which this research has and will change the search tool itself. The ways in which participants searched for the databases on this task and the previous one will also inform what terminology to use for potential search terms for individual databases and all databases in a particular field.

As for the new library homepage wireframe, most participants were on board with the design that stripped away much of the clutter found on the current library's homepage. Their suggestions about changes to the page were minimal in comparison to their thoughts on the combined search page. Many suggested having a rotating picture, or a less distracting one, as well as enlarging the font used for the links underneath the single search bar. One thoughtful suggestion was to change the color of the top navigation to match that of the search, which would potentially help make the navigation more prominent to users.

Limitations of Study

While usability testing can provide a rich source of data straight from users, it does have some drawbacks. The participants representing UNC library users were self-selected based on their availability and any personal interests in the library's search tools and website. Most of the participants appeared to be regular library users as well as users that had been at UNC for a number of years, which certainly biased the data. Some of the ways these factors biased the data spawned from participants wanting to stick with what they knew and were comfortable with from years of experience and use of the library's resources. Essentially it comes down to a

struggle between what is familiar and what is unknown and untested. Additionally users were selected based on their areas of study rather than randomly. This was done to guarantee a wide range of input from various disciplines in order to ensure buy in from specific library stakeholders.

It should also be noted here that the mocked up search interfaces used for the study were imperfectly constructed with an occasional glitch throwing a participant off. On the whole the interfaces performed much as they were meant to. However with some error messages, slow loading pages, and disappearing search strings, the results could be affected due to the confusion caused by these issues.

Conclusion

The purposes of this study were to assess the usability of the library's new Articles + Catalog search tool and to gather user input on the library's proposed homepage design. This study discovered the preference of library users to be contingent upon the opportunity to choose their own search path. Participants in the study preferred a tabbed search page to a page that had one search bar with link options underneath it. Participants liked the combined search interface and felt it was convenient, but would still want the option to search each interface individually. Overall the participants in this study enjoyed the multiple ways in which the combined search tool could be used to find research materials from the library's resources.

Even with these positive aspects, some changes will need to be made to the search interface in order to construct a better search interface at UNC. Participants were generally unsure how to make the search results page even better, which leaves room for future changes based on their suggestions and further testing to evaluate changes made based on their suggestions.

The participants are decidedly on board with the proposed design for the library's homepage. The important library services and information like hours, contacts, locations, a search option, and access to more database and e-research tools were present thus pleasing the participants and aligning with the things they

would expect to find on a library homepage. Furthermore, keeping the simple search widget seems to be acceptable despite the participants' preference for the tabbed widget.

Considering a previous usability test from which the combined search results page in this study was developed, user preference can only go so far in regards to library website design and implementation. The previous test found that users preferred to have all search results in a one-column layout; however, due to budgetary considerations the two-column layout was pursued. The findings in this study have resulted in positive user feedback to the two-column layout. Truly we are designing not only for current users, but for the future ones as well. By utilizing the simple search widget, the UNC Libraries will move forward with the trend of other libraries to simplify their search tools becoming more accessible to novice users. One final conclusion to be drawn based on this study is the fact that these search tools will continue to develop as users continue using them. The users should shape the direction that these tools go in the future, not the other way around.

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Appendix A: Questionnaire Consent and Questions

Dear Participant,

My name is Sarah Arnold and I am a graduate student at the University of North Carolina at Chapel Hill. I am conducting a research study, in partial fulfillment of my degree requirements, on the use of library search tools. Library search tools are in a constant state of development due to the need to keep up with popular search engines like Google and online booksellers like Amazon. Across the nation, research is being conducted on a continual basis in order to keep up with this ever-changing market so that users like you will be able to access the resources that you need.

The University of North Carolina at Chapel Hill University Libraries has released a new search tool called "Articles + Catalog" that will allow you to access the resources from Articles+ and the resources from our catalog simultaneously. The aim is to create an easier entry point to the library's research materials for you, the user.

We are beginning to assess the usefulness of such a tool based on the feedback from users like you. We are asking that you take 10-15 minutes of your time to complete this questionnaire. We appreciate your time and feedback!

At the conclusion of the questionnaire, you may choose to provide your contact information for eligibility to participate in a follow-up usability test of the new Articles + Catalog search. Should you choose to do so, and are accepted to participate in this second phase of the study, you may be eligible for a monetary reward of $10 for your time and participation. There are no risks or direct benefits associated with participating in this research for either phase one or phase two since the focus in on the use of the library's search tools, not you.

I will report only summaries of the aggregated data. This means that your responses will be combined with all of the other responses received and will not be able to be identified as yours. Deductive disclosure which is the discerning of an individual respondent's identity and responses through the use of known characteristics of that individual is also possible but unlikely.

If you have any questions regarding this survey, you may contact me via email at sjarnold@live.unc.edu.

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns regarding your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at (919) 966-3113 or via email at IRB_subjects@unc.edu with study number 12-2592.

By completing the survey, you agree to be a participant in this study.

Thank you,

Sarah Arnold

Demographic Questions

1. Which of the following best describes you:
    A. Undergraduate
    B. Graduate
    C. Doctoral student
    D. Faculty
    E. Other (Please explain.) *text box*

2. What is your sex?
    A. Male
    B. Female

3. What is your area of study? *text box*

Library Use Questions

4. Have you attended a library instruction session during your time at UNC?
    A. Yes
    B. No

5. Have you used the library's website to search for books or other materials in print?
    A. Yes
    B. No

6. How many times per month do you use the library's website to search for these types of materials?
    A. 0-1
    B. 2-4
    C. 5-6
    D. 7-9
    E. 10 or more

7. Have you used Articles+ to search for journal articles from the library's electronic resources?

A. Yes
B. No

8. How many times per month do you use Articles+ to search for these types of materials?
   A. 0-1
   B. 2-4
   C. 5-6
   D. 7-9
   E. 10 or more

9. What percentage of the library's resources do you think Articles+ searches?
   A. Less than 5%
   B. 5-24%
   C. 25-49%
   D. 50-74%
   E. 75% or higher

10. What is the first place you go to begin researching?
    A. Google
    B. Wikipedia
    C. Library website
    D. Print materials
    E. Other (Please explain.) *text box*

11. What is your preferred search interface?
    A. Google-style with one search box
    B. Library-style search with multiple options like keyword, title, etc.
    C. Other (Please explain.) *text box*

Usability Test Participation Questions

12. Would you be willing to be contacted about participating in the second phase of this research study? If so, you will be randomly selected to participate in a usability test of the library's new Articles + Catalog search, which would make you eligible for $10 for your time. The one requirement is to be available for testing between February 18-March 1.
    A. Yes
    B. No

13. Please provide your name and contact information.

Appendix B: Usability Test Observation Guide

Setup for Testing

1. Pull up Firefox with 3 open tabs (make sure to randomize the second two for each test)
    a. Current library homepage
    b. Simple search page
    c. Tabbed search page
2. In a second Firefox browser window, open the following:
    a. Current Articles + Catalog search for PsycInfo (to show second "Recommendation" box option)
3. Papers for participant next to computer
    a. Consent Form
    b. Participant Handout
    c. Receipt to sign for $10 incentive
4. Note taker
    a. Search Usability Test Google doc

Introduction (reviewed while walking to testing room)
Today, you will be asked to complete a series of tasks that look at two different search interfaces and to repeat one task using the options on those pages. You are not being tested; instead, you will be testing the search systems. You are asked to be yourself and act as you would normally if searching the library's website, except that I will ask you to think out loud as you perform each task. Nothing you say will hurt my feelings.

Note: Let participant know about presence and purpose of note taker in room.

Demographic Questions

1. Which of the following best describes you?
    a. Undergraduate - what year?
    b. Graduate - how far along?
    c. Doctoral Student
    d. Faculty
2. What is your area of study?

Note: Ask participant to speak out loud as they complete each task for note taker.

Initial Questions about Library Site Use

Pull up http://www.lib.unc.edu/ to provide point of reference for first two questions:

1. In the last month, what tasks have you attempted to complete on the library's website (research a topic, locate a book or article)?
    a. Determine what they come to the library website to do

2. Where did you go to accomplish those tasks? How did you complete these tasks?
    a. Determine what tools they're familiar with

3. Do you have a preference between print or electronic versions of the item?
    a. If electronic, would you prefer to see that listed first in your search results?

Tasks 1 & 2

1. Show simple or tabbed search page. Note: randomize which page participants use first and have the perform the following task twice, once with simple search page and once with tabbed search page.
    a. Looking at this search page what do you expect to be searching?
    b. Using anything on this page, perform the following search: You are starting on research related to water conservation in North Carolina in relation to UNC's campus wide theme of "Water in Our World." Using the search page in front of you, find a book or journal article that you would use to research this topic.
        i. Note: do they select between tabs or use the default search box on tabbed search page?
    c. What is your first reaction when you see the results on this page? (Ask once if they use the default search on each page.)
    d. What are your thoughts on the effectiveness of this search tool?
    e. Did the drop down suggestions affect your search? If so how?
    f. How satisfied are you with the results?

g. What are your thoughts on this combined results screen? (Ask once if they use the default search on each page.)

2. Thinking about the searches you just completed, which display do you prefer?
    a. Simple
    b. Tabbed
        i. Note: if user wants to compare, they'll need to use the back button and refresh screen
    c. Why do you prefer that display?

Participant Handout Guide

Note: have participant continue speaking out loud about what they're doing, but also mark handout as they move through the tasks.

Using either search display you just used, please complete the following tasks:

3. How would you search for the book *Ecomyth: challenging the dogmas and the ideology of the international 'green' movement* by Lance Kennedy, published by Dunmore Press in 2003?
        i. Note: which search option they use - catalog or combined – if participant has chosen tabbed search page.
    b. What are your general thoughts about this task?
    c. On a scale of 1-5 (1 = very difficult, 5 = very easy), rank the task.

4. If you wanted to search in the database PsycInfo, where would you look?
        i. Note: what path do they take to complete task?
    d. What are your general thoughts about this task?
    e. If don't use default search, have participant go back to the default search page and ask: Did you think of using this search to look up the database?
    f. Compare to live Articles + Catalog search for location of "Recommendation" box option.
    g. On a scale of 1-5 (1 = very difficult, 5 = very easy), rank the task.

5. How would you go about finding all of the databases/search engines available through UNC in Psychology?
        i. Note: what path do they take?
    h. What are your general thoughts about this task?

i. On a scale of 1-5 (1 = very difficult, 5 = very easy), rank the task.

6. You've been given incomplete information for an article titled "Getting Started in Academia: A Guide for Educational Psychologists" from *Educational Psychology Review*. How would you go about finding this article?
   j. How would you approach this?
   k. On a scale of 1-5 (1 = very difficult, 5 = very easy), rank the task.
      i. Note: Ask them to use the combined search to test autosuggest if they don't on their first attempt.

Follow-up Questions (back)
Preface: We will now change gears. The library is proposing a new home page for the site that will strip out much of the content to the bare bones of what people use the most often. So in comparison to the library's current website, we'd like you to focus on the functionality of a website like this one and ignore any issues with the uniformity or the background image.

On a scale of 1-5 with 5 representing the best, how do you view the library's new site:

1. Professionalism
2. Being welcoming
3. Reliability (based on information you need)

4. What are three words you would use to describe this site?
   1:_____
   2:_____
   3:_____

5. What are three things that you think should be on the library's homepage?
   1:_____
   2:_____
   3:_____

6. Additional comments:

Appendix C: Usability Test Participant Handout

Usability Tasks 1 & 2

You are starting on research related to water conservation in North Carolina in relation to UNC's campus wide theme of "Water in Our World." Using the search page in front of you, find a book or journal article that you would use to research this topic.

Using either search display, please complete the following tasks and rate the each one's difficulty based on the search display you choose:

1. How would search for the book *Ecomyth: Challenging the dogmas and the ideology of the international 'green' movement* by Lance Kennedy, published by Dunmore Press in 2003?

   How difficult was this task?

Very Difficult				Very Easy
1	2	3	4	5

2. If you wanted to search in the database PsycInfo, where would you look?

   How difficult was this task?

Very Difficult				Very Easy
1	2	3	4	5

3. How would you go about finding all of the databases/search engines available through UNC in Psychology?

   How difficult was this task?

Very Difficult				Very Easy
1	2	3	4	5

   You've been given incomplete information for an article titled "Getting started in academia: A guide for educational psychologists" from *Educational Psychology Review.* How would you go about finding this article?

How difficult was this task?

Very Difficult				Very Easy
1	2	3	4	5

Follow-up Questions

1. On a scale of 1-5 with 5 representing the best, how do you view library's new site:

Unprofessional				Professional
1	2	3	4	5

Unwelcoming				Welcoming
1	2	3	4	5

Unreliable				Reliable
1	2	3	4	5

2. What are three words you would use to describe this site?

   1: _____

   2: _____

   3: _____

3. What are three things that you think should be on the library's homepage?

   1: _____

   2: _____

   3: _____

4. Additional comments

Appendix D: Results from Questionnaire and Usability Test

Questionnaire Responses

Demographic information:

	Undergrad	Grad	Doctoral	Faculty	Total
Male	10	3	3	29	45
Female	25	18	14	24	81
Total	35	21	17	53	126

Breakdown of respondents' areas of study:

School/Department	Total	%
Psychology	14	11.2
Public Health, School of	11	8.8
Medicine, School of	10	8
Journalism and Mass Communication, School of	7	5.6
Allied Health	5	4
English & Comparative Literature	5	4
Information and Library Science, School of	5	4
Social Work, School of	5	4
Biology	4	3.2
Communication Studies	4	3.2
Physics	4	3.2
Political Science	4	3.2
Other (staff, no response)	4	3.2

Chemistry	3	2.4
Economics	3	2.4
Education, School of	3	2.4
Genetics	3	2.4
Nursing, School of	3	2.4
Sociology	3	2.4
Biochemistry	2	1.6
Business School, Kenan-Flagler	2	1.6
Dentistry, School of	2	1.6
Dramatic Art	2	1.6
History	2	1.6
American Studies	1	.8
Anthropology	1	.8
Art	1	.8
Asian Studies	1	.8
Biostatistics	1	.8
Classics	1	.8
Geography	1	.8
Immunology	1	.8
Law, School of	1	.8
Neurology	1	.8
Nutrition	1	.8
Pathology	1	.8
Peace, War, and Defense	1	.8
Pharmacology	1	.8
Philosophy	1	.8

Library Use Responses:

		Undergrad	Grad	Doctoral	Faculty	Total
How many times per month do you use the library's website to search for print materials?	0-1	10	2	1	7	20
	2-4	16	3	0	7	26
	5-6	4	3	0	9	16
	7-9	1	2	2	3	8
	10 or more	4	9	14	21	48
	Total	35	19	17	47	118

		Undergrad	Grad	Doctoral	Faculty	Total
How many times per month do you use Articles+ to search for electronic materials?	0-1	2	4	0	4	10
	2-4	10	1	1	6	18
	5-6	2	5	1	3	11
	7-9	1	1	3	0	5
	10 or more	3	2	5	1	11
	Total	18	13	10	14	55

		Undergrad	Grad	Doctoral	Faculty	Total
What percentage of the library's resources do you think Articles+ searches?	Less than 5%	0	1	1	1	3
	5-24%	3	1	2	4	10
	25-49%	10	3	5	14	32
	50-74%	9	4	3	11	27
	75% or higher	12	11	4	10	37
	Total	34	20	15	40	109

		Undergrad	Grad	Doctoral	Faculty	Total
What is the first place you go to begin researching?	Google	23	9	3	15	50
	Wikipedia	1	0	0	0	1
	Library website	9	8	9	18	44
	Print materials	1	0	0	0	1
	Total	34	17	12	33	96

		Undergrad	Grad	Doctoral	Faculty	Total
What is your preferred search interface?	Google-style with one search box	16	6	7	19	48
	Library-style search with multiple options like keyword, title, etc.	18	12	8	27	65
	Total	34	18	15	46	113

Usability Testing Results

Demographic information:

	Undergrad	Grad	Doctoral	Faculty	Total
Male	1	0	0	3	4
Female	3	3	1	2	9
Total	4	3	1	5	13

Breakdown of the search terms used by each participant:

Participant	First search page	Simple Search Page Terms	Tabbed Search Page Term
P1	Simple	water conservation – north carolina (Subject heading)	"water conservation in nc" → "water conservation" "north carolina"
P2	Tabbed	water conservation	water in our world
P3	Simple	water conservation – north carolina (Subject heading)	water conservation in north Carolina → water conservation – north carolina (Subject heading)
P4	Simple	water conservation	water conservation
P5	Simple	international politics of water	water politics south Asia
P6	Tabbed	water conservation chapel hill	water conservation chapel hill
P7	Tabbed	methane cycling lakes	water conservation north carolina > methane cycling lakes

P8	Simple	water conservation	water conservation in nc
P9	Tabbed	Water in Our World	Water in our world
P10	Tabbed	water conservation – north carolina (Subject heading)	water conservation – north carolina (Subject heading)
P11	Simple	water conservation – north carolina (Subject heading)	water conservation – north carolina (Subject heading)
P12	Tabbed	water conservation	water conservation – north carolina (Subject heading)
P13	Tabbed	water in our world	water in our world

Level of difficulty experienced on Tasks 3-6:

		Undergrad	Grad	Doctoral	Faculty	Total
Task 3	Very Difficult	0	0	0	0	0
	Difficult	0	0	0	0	0
	Neutral	0	0	0	0	0
	Easy	0	0	0	2	2
	Very Easy	4	3	1	3	11
	Total	4	3	1	5	13
		Undergrad	Grad	Doctoral	Faculty	Total
Task 4	Very Difficult	0	0	0	0	0
	Difficult	1	1	0	1	3
	Neutral	0	0	0	1	1
	Easy	2	2	1	2	7
	Very Easy	1	0	0	1	2
	Total	4	3	1	5	13
		Undergrad	Grad	Doctoral	Faculty	Total
Task 5	Very Difficult	0	0	0	0	0
	Difficult	1	0	0	0	1
	Neutral	1	1	0	1	3
	Easy	1	1	1	2	5

	Very Easy	1	1	0	2	4
	Total	4	3	1	5	13
		Undergrad	Grad	Doctoral	Faculty	Total
Task 6	Very Difficult	0	0	0	0	0
	Difficult	0	0	0	0	0
	Neutral	0	0	0	0	0
	Easy	0	1	1	1	3
	Very Easy	4	2	0	4	10
	Total	4	3	1	5	13

Appendix E: Participant Response to Homepage Wireframe

Participant rankings based on look of proposed site:

	Professional	Welcoming	Reliable
1 (least)	0	0	0
2	1	1	1
3	2	4	2
4	3	4	1
5 (most)	7	4	9

Words/Phrases used to describe proposed site:

Number	Description
4	Organized
4	Easy to navigate
3	Useful
2	Visually appealing
2	Bare bones
2	Empty
2	Simple
2	Streamlined
2	Clean
1	Focused
1	Lacking links
1	Not exciting
1	Inadequate appearing
1	Not user friendly looking
1	Professional

1	Sleek
1	Sparse
1	Cryptic/abstract
1	Cluttered
1	Sunny
1	Picture distracting
1	Regroup headings

What things should be on the library home page:

Number	Library Resource/Service
13	Hours/contacts/locations
6	Search
5	E-Research tools
3	Tabs
2	Databases
2	Reserving a study room
2	Library Events
1	Link to ILL
1	Book Renewal
1	Buttons
1	Link to MRC
1	Links to catalog and other search options