

MEDIA SEARCH LITERACY: THE ROLE OF
ACCESS AS MEDIA TECHNOLOGIES
CONVERGE ONLINE

Griffin Hammond

93 Pages

August 2009

This study proposes media search literacy as a new research construct, and measures the level of college students' effectiveness when searching for media content online.

APPROVED:

Date Brent K. Simonds, Chair

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As media technologies converge onto the Internet, search engine technology is quickly becoming the only viable option for accessing media online. Previous research has suggested the search skills of the public have not kept pace with the rate of Internet innovation. This study argues the fields of information literacy and media literacy research have failed to recognize overlapping interests in this new media landscape, with data suggesting students use search engines more often to locate media online than for academic research. A new construct, media search literacy (MSL), is proposed, as the ability to use effective search engine strategies to locate media online. This study also measured college students' media-oriented search effectiveness, to uncover the value of search training students have been exposed to, and to recommend development of future training.

The key findings of this study suggest that while roughly half of the participants had been educated on search engine usage, they were no more effective at finding media content online than those without prior search training. Further, compared to participants who did not use advanced search techniques, those who correctly did were also twice as

likely to use them incorrectly, which likely inhibited their media search effectiveness. Avoidance of natural language queries was the strongest predictor of media search effectiveness.

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GRIFFIN HAMMOND

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CHAPTER I

INTRODUCTION

Modern media consumers face three paramount and seemingly paradoxical media challenges. First, they are increasingly and irreversibly facing the largest media glut in history (Potter, 2005). More than ever, their lives are dependent on television, radio, print, and Internet for information and entertainment. They accept this dependence on media because it has become central to their lives, and they require access to fulfill their personal and professional obligations. Second, this media audience is becoming increasingly diffused across a multitude of media options. The gap between the needs and interests of individual audience members is widening, and the various media are reacting. Media consumers have access to more television channels, radio stations, Web sites, and sources for news than ever, and each option is becoming increasingly specialized for target demographics. There is a growing mass of people accessing media, but less people choosing the same options. Finally, while the appetite for media grows, and choices stretch towards the infinite, technologies are converging. Television, radio, and print are now available online. Mobile phones have enveloped these technologies as well. Innovation is moving towards a media world in which choices are endless, but access is singular. From wherever they are, on whichever medium, media consumers will eventually be able to access everything.

This concept of *access* is the root of many challenges to cultural survival in this

new media world. Traditional methods for accessing media are becoming obsolete. In 2009, the United States adopted a digital standard for television broadcast, which indicates the divide between television and computer (and therefore Internet) will increasingly diminish. Assuming cable television providers continue to expand viewing options, channel surfing cannot continue as a viable option for viewers to seek the media they desire. Access to media becomes a problem as options increase and programming guides become complicatedly large and unmanageable.

This mode of access must change. The Internet, which already carries far more media options than traditional media sources, is the best model for the future of media access. With billions of media options, the preferred method for locating online media content is through search technology. Search engines have taken on the role of gatekeepers in mass media. The Internet grows by 60 terabytes of data each day (Roush, 2004), which means increasingly powerful tools and skills are needed to navigate its sprawling structure. Search engines, like Google, are the only reasonable method for locating online media content (Witten, Gori, & Numerico, 2007). Even offline, television technologies like cable boxes and digital video recorders (DVRs) have begun to use search engine technology to help users find the programs they want to watch or record. This burgeoning dependence on search technology means consumers of mass media need to understand how this technology works and gain the skills necessary to use it effectively.

These distinctive principles of the new media world challenge media consumers, practitioners, and researchers to understand and predict the rapidly changing environment

in which they operate. Researchers face several problems. The concepts and research needed to tackle the future of media are currently spread between disciplines that do not use the same terms or recognize the similar principles that link their studies.

Communication scholars refer to users' abilities to access and critically analyze media sources as *media literacy* (Potter, 2005; Livingstone, 2004). Many who identify the negative effects of media consumption recognize the importance of media literacy education. When students are prepared to digest media, they can better recognize and control the effects. Silverblatt (2007) noted that blindly exposing oneself to media without developing the critical faculties to analyze the messages presented could produce disastrous results. Media literacy has become part of the curriculum in many schools (Callison & Preddy, 2006), as educators wish to prepare students to critically consume society's bombardment of media. This has been demonstrated as school librarians evolve from book specialists to media literacy experts (Hudak, 2008), and many libraries have changed their titles to *media centers* (Grimble & Williams, 2004). Unfortunately, some point out the United States lags far behind many other countries in media literacy (Potter, 2005). Part of this may be due to the fact that many have not yet recognized that media convergence is blurring the lines between research disciplines. As media converges, so should the various interested disciplines.

While communication scholars study *media literacy*, educators and librarians focus on *information literacy*, the ability to access and analyze information (American Library Association, 1989). Although these concepts are similar, and overlap in many noteworthy ways, information literacy research has generally stayed in the realm of

library research skills, while media literacy has nearly avoided the question of access on the Internet altogether. Leu, Kinzer, Coiro, and Cammack (2007) have called for a multidisciplinary research agenda to prepare students with new literacies, although very little research has examined student Internet use (Wang & Artero, 2005). Information literacy training may very well produce crucial media literacy skills for students in a new media world, but research has yet to bridge the gap.

The purpose of this study is to identify how effectively students, products of this disconnected information literacy and media literacy curricula, navigate the new media landscape online. New, distinct digital literacies are proposed, and the study explores what gaps must be filled to enable students with these necessary literacies.

CHAPTER II
LITERATURE REVIEW

Literacy

In order to navigate any communication medium, be it the Internet or Egyptian hieroglyphs, users must first become literate in that particular medium's symbol system. Literacy is a simple concept. Venezky (1995) defined literacy as "a minimal ability to read and write in a designated language, as well as a mindset or way of thinking about the use of reading and writing in everyday life" (p. 142). Burniske (2008) called it "the functional literacy required to read and write letters of an alphabet, and sound the words they form" (p. 1). Literacy, therefore, is in the realm of schools. Educational institutions are charged with providing the basic language skills necessary to communicate. The ability to read and write correctly will take students far, but is not sufficient for the media demands of modern society. As Burniske continued, this basic literacy "serves as a stepping stone to more complex types of literacy" (p. 1). Eagleton and Dobler (2007) took their literacy definition a step further with "being somewhat fluent with art, dance, music, multimedia, and other areas of expressive language" (p. 6).

As these definitions illustrate, many literacies may be needed to fully prepare students for society's complex media demands. Basic literacy skills are necessary to read Web texts, but the Internet poses many additional complexities beyond reading and writing competencies, which require additional literacies (Eagleton & Dobler, 2007). The

No Child Left Behind Act of 2001 promised to “assist every student in crossing the digital divide by ensuring that every student is technologically literate.” To accomplish this task, schools must know what specific literacy standards to address. Prior research has proposed several amorphous Internet-related literacy terms. Livingstone (2004) identified some of these, including *computer literacy*, *Internet literacy*, and *cyberliteracy*. Computer literacy, as defined by Callison and Preddy (2006), is simply a “possession of skills and knowledge necessary for operating a computer” (p. 422). This definition is broad enough to include word processing, or shutting down a computer, but does not hone in on the unique skills necessary to navigate the Internet effectively. Plenty of users possess sufficient computer literacy skills, but do not understand the Internet. Leu, Kinzer, et al. (2007) had noted a “troublesome” lack of research in this area and posed the question: what are the specific literacies required for the Internet?

Information Literacy

Traditionally, research in Internet literacy has been limited to library studies scholars, who have used the umbrella term *information literacy*. According to the American Library Association (1989), “To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (para. 3). Nearly every definition of information literacy has included these four elements: (a) Realizing an information need, (b) accessing information, (c) evaluating the information, and (d) synthesizing the information into its necessary final form (Rockman, 2004; Wang & Artero, 2005; Callison & Preddy, 2006; Eagleton & Dobler, 2007). This process is broad enough to

include learning and problem solving in a variety of scenarios, and Callison and Preddy noted that true information literacy transcends “different sources regardless of format” (p. 422). Moreover, the most valuable form of information literacy is *information fluency*, when students become “fluid in their ability to adapt techniques to the technological environment” (Callison & Preddy, pp. 15–16). Therefore, information literacy training is truly about teaching students the skills to teach themselves (Rockman). In the *Information Age*, too much information exists for any one person to retain it all (Eagleton & Dobler). Educators cannot teach their students all the knowledge in the world, but can teach them a valuable tool – the ability to quickly and effectively access relevant information (Leu, Kinzer, et al., 2007). With the Internet, anyone has access to an education, assuming they first learn information access skills. Witten et al. (2007) identified the Internet as a natural learning environment, because “humans learn by connecting and linking information, the very activity that defines the web” (p. 7).

Most information literacy research explores students’ critical information access skills for academic purposes, and therefore focuses almost exclusively on school libraries. Stebbins (2006) stressed an understanding of library card catalogs and research databases as requirements for information literacy, but criticized the Internet as a less reliable tool. Rockman (2004) observed research as the fundamental information literacy skill students lacked, and called for universities and colleges to teach necessary research skills. While the vast majority of information literacy research has come from educators focused on classroom applications, Rockman also noted that information literacy is a large umbrella that contains many literacies, including *library literacy*, *computer literacy*,

media literacy, and *technological literacy*. In many ways, the skills required to find a book in a digital card catalog, or research a term paper, may also benefit students' critical approaches to media. Burniske (2008) shared a story about a college class, reading an online article titled "America Online To Build Three Million Home Pages For The Homeless." To most modern Internet users, the title alone evokes the article's satirical nature, but in 1998, the standard journalistic conventions of the article convinced a group of undergraduates it was a real news event. Because the Internet document looked like every other "legitimate" Internet news source, they failed to critically analyze the source – *The Onion*, a satirical newspaper. In this example, the information literacy process, specifically the evaluation step, could have benefitted students in a casual media encounter, unrelated to academic research. It is within this realm that research rarely probes: where information literacy overlaps with media literacy.

Media Literacy

As long as communication scholars have perceived the effects of media on audiences, they have understood the necessity to critically engage media, to either curb or control the effects. As the current media world shifts dramatically away from its humble origins, so does the concept of media literacy. This rapid change in media has led to increased attention to media literacy research. Frenchette (2002) has defined media literacy as "the ability to 'read' media texts by analyzing, accessing, and evaluating communication in a variety of forms" (p. 25). To replace *media* with *information* would produce a working definition of information literacy. With a broad overlap in concepts, some scholars consider media literacy a subset of information literacy (Rockman, 2004)

and vice versa (Livingstone, 2004). Beyond this basic definition of media literacy, many definitions expound on the unique features of media. Burniske (2008) called media literacy the ability to “understand a communications medium by looking *through* the processes it enables, interpreting its signs and symbols, while also looking *at* the medium’s effect on an author, audience, and message” (p. 11). Callison and Preddy (2006) noted several additional qualities of the media literate: They understand media are not reality, but constructs, but also construct reality. They negotiate meaning in media, and understand it often serves commercial purposes. Media contain ideological messages and unique aesthetic characteristics, which have social and political implications. (Callison and Preddy’s critical approach is one many educators adopt for the classroom.)

Potter (2005) has recognized there are more media messages than ever, so audiences must develop skills to avoid the media glut that so aggressively seeks their attention. He defined media literacy as “a set of perspectives that we actively use to expose ourselves to the media to interpret the meaning of the messages we encounter” (p. 22). The benefit of this type of definition is that it not only focuses on interpretation of messages, but also exposure to messages. Therefore media literacy is not only the ability to critically analyze messages, but also the ability to access them. In this case, media literacy includes knowing how to turn on a television, or understanding the proper keywords to use when searching a library catalog. Potter noted that media literacy in U.S. public schools had fallen far behind those in many other countries, including Australia, Canada, Great Britain, South Africa, Scandinavia, Russia, and Israel. If U.S. schools have failed to develop media literacy, educators clearly do not recognize its increasing

importance. Not only is comprehensive media literacy integral to a complete education, but according to Silverblatt (2007), it is essential for students' survival in a mass-mediated environment.

Training is necessary to allow students to control the effects of the media they consume, but before one can begin to consume media efficiently and critically, one must have a clear understanding of the media landscape (Potter, 2005). As traditional and new media technologies converge, what becomes of the distinction between computer literacy and media literacy? Because this vague concept of computer literacy lies somewhere outside the traditional scope of media literacy, media scholars have failed to study it thoroughly. Livingstone (2004) had called for future research to clearly establish how literacy is different when dealing with television versus new media online. The most obvious difference is size. One cannot navigate television channels the same way one navigates online content. The Internet is a sprawling, ever-expanding, complicated web. According to Witten et al. (2007), the Internet is "the largest collection of information ever known. One might speculate that it contains the answer to every conceivable question – if not today, perhaps tomorrow" (p. 21). No one knows exactly how large the Internet has become, but between 1993 and 2005, data online consistently doubled every two or three years (Witten et al.). A 2005 study by Gulli and Signorini estimated the size of the Web accessible by search engines at 11.5 billion pages, but the Web inaccessible to search engines is estimated at 400 to 550 times larger (Witten et al.). Therefore the Internet in 2005 could have consisted of approximately five trillion pages.

A phenomenon known as Moore's Law predicts the number of transistors

squeezed onto a microchip will double every two years. This has proved a steady truth of technological advancement since 1965 (Witten et al., 2007). Similarly, the cost of hard drives (data storage) cuts in half every year, while capacity doubles. As of this writing, a 500-gigabyte (GB) hard drive costs about \$100. A year from now, a one-terabyte (TB) drive (1,024 GBs) will likely cost about \$50. As the cost of data transfer and storage continues to slide, more content will move online, which puts a greater burden on navigation.

A study by He (1996) of students' research habits in the library uncovered that more than any other online research tool, students used search engines to find information. Forty-five percent of students agreed they could use the Internet to find information for class projects, and one-third considered the Internet the most important research tool. He's findings illustrate the importance of search engines for locating information, which again highlights the concept of access in media literacy. Much of media literacy, as well as information literacy, depend on access. Users must be able to find particular media or information before critically engaging it. Livingstone (2004) defined media literacy as "the ability to access, analyze, evaluate, and create messages in a variety of forms" (p. 5). Her definition included *a variety of forms*, which bridged the gap between traditional and new media, and she explained that access must occur before any other step in the media literacy process. Likewise, the American Library Association's (1989) definition of information literacy placed the act of locating information before every other aspect of information literacy.

As new technology rapidly upends the media landscape, access is becoming the

most critical aspect of media and information literacies. Livingstone (2004) noted that historically, there were many barriers to media access. Lack of education or social mobility precluded many people from reading a newspaper, for instance. Those without a functional literacy could not access messages in print, which remained reserved for those at a higher social stratum. Likewise, early radio and television messages exclusively reached those who could afford the new technologies. While financial barriers to media still exist, they increasingly fade over time. Access today is limited to those with the skills necessary to traverse the increasingly complex new media environment. And more than ever, accessing online information, as illustrated in He's 1996 study, is best achieved through search engine technology. It is for this reason that many studies in information literacy have focused on users' search engine behavior.

Search Engines

As Witten et al. (2007) have noted, drawing a map of the Internet would be impossible, leaving search engines as the only reasonable method for navigating online content. Google, the most popular search engine in the United States (comScore, 2009), is also the most frequented Web site in the United States, with over 130 million unique visitors each month (Compete, 2009). About equal to the rate of Internet expansion, Google's 2009 search query volume is triple that of 2007 (Witten et al.). As of this writing, Google fields 9.6 billion search queries a month (comScore), which amounts to over 3,500 per second. Other popular search engines include YouTube (3.6 billion

queries per month), Yahoo! (2.9 billion), Bing¹ (1.0 billion), AOL (0.4 billion), and Ask.com (0.4 billion) (comScore). Some search engines, like the one at YouTube, is site-specific, or an *internal search engine*, meaning it only searches YouTube's video library (Notess, 2006). Another example is eBay's search engine, which only searches auctions on the site. Most of the other popular search engines, like Google and Yahoo!, are full Internet-*crawlers*, meaning they seek the most possible information on the *indexable* Web, the portion of the Web that can be found by search engines. Although these two types operate differently, layman users consider anything with a search function a search engine, according to Notess, who also provided a detailed definition:

A search engine is an Internet-based search box that provides text-match searching of its own crawler-built database of text-indexed Web pages.

Search results are ranked according to internal relevance-ranking algorithms. It is a tool providing searchable access to the text of millions of freely accessible Web pages. (p. 98)

Search engine technology is elaborate, finely tuned, and secretive, which is why Witten et al. (2007) have called search engines *Web dragons*, and said they are *powerful*, *mysterious*, and *mythical*. No one quite knows what happens behind the scenes. While trade secrets remain under wraps, at their most basic, search engines perform two main tasks. Software called *crawlers* or *bots* surf the Internet, creating an index of the words contained on every crawler-accessible page. According to Witten et al., "today's crawlers can fetch thousands of pages every second, which allows them to visit a good percentage

¹ Windows Live Search, also called *MSN Search* by Microsoft, became *Bing* in June 2009.

of the web in a few weeks” (p. 70). This index is updated continuously, with an emphasis on visiting more popular and frequently updated Web sites more often. It is important to note that only the indexable, or *surface* Web can be visited. Web sites that are password-protected, not linked to by other sites, or pages that are dynamically created cannot be found by crawlers, and make up what is called the *deep Web*. Search engines can respond to a query with a full list of results in a fraction of a second. This is possible because a search engine does not actually search the Web, but rather searches the computer process-friendly, crawler-built index. Therefore, until a crawler finds and documents a Web page for the index, it will not appear in any search results.

Most often, search results pages are organized by relevance. According to Witten et al. (2007), a document is generally considered more relevant “if it contains more query terms, if the query terms occur more often, [and] if it contains fewer non-query terms” (p. 106). Search engines use unique, often proprietary relevance algorithms to interpret user queries. For instance, if query terms appear in a Web page’s title or Web address (URL), that page may be deemed more relevant than a page where query terms only appear in the body text. Because search engines and their crawlers are not human, they cannot interpret meaning from a search query, only lexical and statistical properties (Witten et al.). In general, if a Web page does not contain all of the query terms, it will not appear in a results list, even if the page is actually very relevant to a user’s search intention. Search engine designers are working to improve this, though. Many search engines employ some sort of *natural language processing*, (i.e., converting flawed human intention into computer-friendly query language). For instance, a user may input <abraham lincoln

biography², but some of the best biographical articles related to Abraham Lincoln may not contain the word *biography* at all. A natural language processing system might search for other words related to *biography* or other textual clues that indicate biographical material. Google, for instance, automatically searches synonyms of query keywords, unless the user opts out. In interviews with search engine producers, Van Couvering (2007) discovered a desire for customer satisfaction through increasingly relevant, user-intuitive results. Wolfram|Alpha and Bing, both released in 2009, have attempted to better interpret users' natural language queries. Wolfram|Alpha is not a search engine, but rather an *answer engine*, in that it does not index the Web, but relies on a database of information to provide responses to queries it interprets. Bing, by Microsoft, is a traditional search engine, but is marketed as a *decision engine*, because it promises to better understand users' query meanings and purposes. While search engines are becoming more intuitive, there may always be a disconnect between intention and outcome in search engine usage. This is why search training is necessary.

Search technology has long been used to navigate library catalogs and research databases, so search training has often been implemented to teach users how to best locate library resources. Even with the rapid growth of the Internet in the last two decades, libraries remain the central source of search training (Notess, 2006). This means that many users extend search training designed for library use onto the Internet. Especially today, the amount of data online far surpasses the data collection of any library. In fact, Witten et al. (2007) calculated that the textual data held in a local library

² For clarity, all search query text will be denoted inside angle brackets.

could fit in a modern MP3 player. Nims and Rich (1998) observed that poor search strategies cause small problems in a library setting, but these problems are magnified on the Internet. This is due to the large amount of search results online. If a user makes a search error in a library, the user may garner no results and try again, possibly correcting the mistake. If the same search error is conducted on the vastness of the World Wide Web, results will likely be returned, and the user, unaware of the error, may consume faulty information.

This dilemma is further exemplified in a study by Bao (2002), which compared results over a 3-year period. This study of college students' Internet usage found that daily Web use doubled from 1998 to 2001. Not only did users report they had difficulty finding information online, but in 2001, 50% of users complained their searches returned too many confounding results, compared to only 38% in 1998. This study demonstrated that users were not gaining search skills fast enough to keep up with the growing complexity of the Web. Wang and Artero (2005) confirmed these suspicions. They found 89% of students used search engines to find information online, but the majority of students also complained of search difficulty. Their three most cited reasons were the gross multitude of information online, inability to choose correct search keywords, and lack of search strategies. Only half had received prior search training. Each of these studies reiterated the importance of effective search training to find information online. The findings suggest a lack of training or subpar training is responsible for users' inability to manage the complexity of online data.

Literacy Disparity

These studies are significant for their results, but also for their authors' inability to have recognized the potentially broad application of these concepts. Search engine proficiency could be applied to every type of online purpose, be it research, media, leisure, shopping, etc. But as most search-related research has originated from the information literacy realm, it has remained squarely in that arena. While the parallels to non-library applications are many, especially to research in media literacy, not many in media studies have embarked on this kind of empirical research, and these studies only appear in library-oriented publications. Even Wang and Artero's (2005) study, which appeared in *Educational Media International*, never mentioned the word *media*. This lopsidedness is clearly detrimental to both media literacy and information literacy research, so this study proposes a blending of concepts.

In many cases, the definitions of information literacy and media literacy are nearly indistinguishable. Rockman (2004) considered information literacy a fusion of multiple literacies, including computer literacy and media literacy. Callison and Preddy (2006) recognized the two literacies overlap in "skills of evaluating, comprehending, interpreting, and communicating information," and diverge where information literacy "emphasizes problem identification and information search strategy skills," but media literacy does not (p. 72). This distinction is less an actual difference, and more an indication of media literacy scholars' avoidance of new media literacy concepts. Identifying search problems and appropriate skills are not absent steps from media literacy in a new media landscape. These are the aspects of media literacy that currently

require the most attention. It is the question of access that applies to both information literacy and media literacy. Like convergence in technology, these literacies will increasingly coincide, and future research must better study their points of intersection, and develop the many smaller, specific literacies that fall under each broad concept.

Multiple Literacies

Callison and Preddy (2006), in their book on literacy in the Information Age, listed 20 distinct literacies, including concepts such as *community literacy*, *network literacy*, and *vernacular literacy*. Each literacy represents a valid, necessary skill set for various endeavors, but even this list is not exhaustive. Leu, Kinzer, et al. (2007) have suggested the speedy evolution of technology turns literacy into a moving target, pointing out that students experience entirely different literacies at the end of their education unimagined at the onset. Eagleton and Dobler (2007) put the responsibility on educators to integrate new technology into the literacy curriculum, and Leu, Kinzer, et al. have called on educators to expand their definitions of literacy and develop new literacies. Their *New Literacy Perspective* posed five functions new literacies should address: “(1) generating important questions or problems to be solved; (2) locating relevant information; (3) critically evaluating the usefulness of that information; (4) synthesizing information to address those questions or problems; and (5) communicating possible solutions to authors” (pp. 44–45). While these functions echo traditional information literacy standards, Leu, Kinzer, et al. emphasized the Internet’s power to reshape the definition of literacy. Gunn and Hepburn (2003) and Leu, Leu, and Coiro (2004) have agreed new Internet search tools will constantly emerge, mandating researchers define

new literacies to teach the skills necessary for students' personal success.

Search Literacy

Frenchette (2002) wrote, "One of the basic tenets of a cyber-based media literacy resulting from information overload is learning how to carefully and intelligently navigate your way through the Internet" (p. 82). Successful Internet navigation has become a prerequisite to media and information literacy. Understanding the search tools available to navigate the Internet and how to use them effectively poses a challenge to students large enough to warrant a specific literacy. One of the *new literacies*, according to Leu, Kinzer, et al. (2007), is "using a search engine effectively to locate information" (p. 1590).

The term *search literacy* has not appeared in traditional literacy research. Rather, it is a term that has gained ground colloquially among technophiles, not in scholarly circles. It often appears in its adjective form, as in *to be search literate*. A recent Google search of these two forms resulted in only 7,580 combined entries, a relatively small level of adoption. John Battelle, author and Google historian, called for the implementation of search literacy on his blog (2005, November 10): "Developing a framework in our schools for 'search literacy' – how to use and think about using a search engine – might be just the kind of thing you could do with a modest investment" (para. 11). In a later blog post (2008, October 21), he shared a story about his fifth-grade daughter, who struggled to find definitions of political terms for school. He suggested Google, which she had tried, without luck, because she had queried, <what is the meaning of polls>, not aware of Google's <define:> command. Battelle's daughter exhibited a classic natural

language search, forming a query only a human could interpret correctly. This experience again prompted Battelle to call for search literacy education in schools, which would in turn better teach students to teach themselves.

Few scholars have published any information on search literacy. Among them, van der Meij (1998) and Papantoniou (2007) offered definitions. According to van der Meij, search literacy is “the motivation, knowledge, and skills people need for gaining access to information and for processing the information” (p. 208). His definition is similar to information literacy, because his *search* referred not to the Internet, but to finding information in a print text. Papantoniou referred specifically to search engines with his definition: Search literacy “enables users to use search engines effectively not only in the sense of employing simple Boolean operators (e.g. AND, OR etc.), but also of using various tricks” (p. 10). His definition illustrates that search literacy requires skills beyond those emphasized in information literacy. Capturing too much in one broad literacy definition is a mistake, according to Leu, Kinzer, et al. (2007), who recommended many literacies to capture the complexity of new technologies. Operating a search engine is more than identifying and solving an information need; search literacy is perhaps a subset of information literacy, but with a range of very specific skills that require attention. At its most basic, search literacy is the effective use of search engine technology. A total understanding of search literacy, though, requires an explanation of the specific skills it entails and an argument for its importance.

Search Literacy Skills

The first step to becoming search literate is learning how search engines operate.

Understanding crawlers, the keyword index, and the folly of natural language will help students overcome many of the hurdles to effective searching. Battelle (2005) has observed the average Web searcher as “extraordinarily good at incoherence, making the task of procuring useful search results a Herculean task” (p. 23). This statement reiterates the fact that search engines cannot infer a searcher’s intent. Search queries must be written in a language that best exploits the computer process of a search engine. This means complete sentences, questions, punctuation, unnecessary words, etc. – all signs of natural language – are the demise of an effective search query. Eagleton and Dobler (2006) noted that successful searching requires a fluency with *computerspeak* – an understanding of how search engines match keywords against the index, and what specific keywords will likely appear on a relevant target page. Understanding appropriate keyword choice is integral to search literacy. Overly specific keywords may yield no results, but overly broad keywords may yield too many (Eagleton & Dobler). Some words, like *the*, *a*, *is*, and *of* are so broad, that most Web pages contain them, rendering them useless as search terms. When users include words of this kind (called *stop words*), many search engines automatically remove them from the query. For instance, if a user searched <yes and you and I> (to find the song “And You And I” by the band *Yes*), Windows Live Search would have omitted all the stop words, only searching <yes>, meaning no entries on the results page would pertain to the band or their song.³ Google though, simultaneously checks queries with and without stop words to compare relevancy. As of this writing, the same query on Google returns mostly relevant results.

³ With Bing, Microsoft has corrected this Windows Live Search problem.

Battelle (2005) has noted that very few users use more than two or three keywords, while many only use one, which does not generally return very relevant results. Choosing keywords that effectively limit or broaden search results is an important search literacy skill. Leu, Leu, and Coiro (2004) have recommended a *topic plus focus* search query strategy, employing a word or phrase to define the field of interest and a second search term to narrow the field to the most relevant results. Witten et al. (2007) also highlighted the benefit of anticipating *where* keywords will appear. Many search engines appear to favor the relevance of search results when search query terms appear in prominent locations, like the title of a page, or within the page's URL. Like most keyword strategies, the better a user can anticipate what keywords will appear where, the more relevant the search results will be.

Many search engines also offer search query suggestions, either appearing real-time as the user types in a query, or on the results page after the query has been submitted. These suggestions are either based on other users' popular queries or a set of algorithms that anticipate a user's likely search purpose. While potentially helpful, they can confuse users or send them in the wrong direction. An online anecdote reads, "My mom thinks Google's 'Suggestions' are the only options available. If she's trying to find something and it doesn't come up in the suggestions, she'll say, 'Sorry, it's not on the internet'" (Wolff, 2009, para. 8). Query suggestions are not necessarily indicative of actual content available and cannot carry any insight about what a user is actually looking for.

Misspellings also plague searchers. Witten et al. (2007) reported that within one

month, Google documented 87 different incorrect spellings of *Britney Spears*, each variation queried at least 44 times. Many search engines, including Google, offer spelling recommendations, or automatically replace misspellings. Even so, many spelling errors go unchecked, certainly reducing search result relevancy. Spelling need not necessarily match dictionary spelling, but only the spelling utilized on relevant target pages. Billions of different words appear in Google's text index, according to Witten et al., only a fraction of which would appear in a dictionary.

Search literacy also requires some understanding of Boolean operators. While many modern search engines no longer require these "mathematical punctuation marks" (Eagleton & Dobler, 2007, p. 61), Boolean operators are still integral to other databases, and remnants persist in many popular search engines (Notess, 2006). Boolean operators, named after mathematician George Boole, are a natural-language extension of algebraic logic. Using the word *AND* between query words in early search engines connected them, refining search results to only those pages containing both words. The Boolean operator *OR* would seek results containing either word, broadening results, or as Stebbins (2006) has recommended, allowing users to try several synonyms at once. The *NOT* operator can be used to remove search results with an undesired search term. <AND>, <OR>, and <NOT> have also been simplified to <+>, <|>, and <->, respectively. Both forms are still accepted by many search engines, although generally Boolean words must be capitalized to avoid removal as stop words. The *AND* (+) operator is usually unnecessary, as most search engines automatically include this between search query terms, assuming the searcher intends to narrow results with additional terms. In the past, only 2 to 8% of

search engine users have employed Boolean techniques (Jansen & Pooch, 2001). Boolean is no longer required for most search engines, but in a search environment many liken to finding a needle in a haystack (Roush, 2004; Calishain & Dornfest, 2005), the principles of *OR* and *NOT* can help savvy users uncover the most relevant, buried results.

Similar to Boolean logic, Leu, Leu, and Coiro (2004) have called quotation marks one of the most powerful search strategies, and Notess (2006) has noted it is accepted almost everywhere. Putting quotation marks around any string of search terms allows *phrase searching*, wherein the search engine only checks the index for instances when the words appear together, exactly in the form dictated within the quotation marks. Quotation marks can also force the inclusion of stop words or opt out of automatic synonym search. While Google and other search engines have become “smart” enough to make phrase inferences without quotation marks (Leu, Leu, & Coiro), this simple trick can easily distinguish perfectly relevant results from the completely irrelevant. It is also one of the simplest, most overlooked search tricks, employed frequently by only 38% of users (Gunn & Hepburn, 2003). To illustrate Boolean and phrase searching, <“search literacy” OR “search literate”> would effectively retrieve any page that mentions either phrase in its entirety (on most search engines).

The especially search literate use advanced search functions, whether by clicking the *Advanced Search* link on many search engines, or by including special, often search engine-specific terms and punctuation. Many advanced search functions are complex, unintuitive, or relatively hidden from average users, which is why 95% of searchers do not use them (Battelle, 2005). Some of these functions, though, are the most powerful

search tools available. Most advanced search pages allow users to specify Boolean-type logic and phrase searching, without requiring an understanding of Boolean operators or quotation marks. Search engines may also allow users to place limits on types/domains of sites, where keywords appear on a page, site language or country of origin, file types, or date ranges, to name a few options.

Without visiting an Advanced Search page on a search engine, several of these limits can be called upon via special search syntax. In Google, for instance, <site:> can be prepended to a search term to define a specific Web site or domain type. For academic research, Stebbins (2006) has recommended the Google search query <site:edu>, which will only result in domain names ending with the .*edu* suffix (educational institutions). A Google search for <site:ilstu.edu> would only return results on Illinois State University's Web site. Other Google-specific search syntax include <intitle:> and <inurl:> which seek search terms only in the title of a page or its URL, respectively. Within Google, users can also prepend <+> to a stop word to ensure it is not removed from a search, or <~> to any term to force a synonym search of that term (Calishain & Dornfest, 2005). While some modern search engines automatically search synonyms, traditionally a search for <education> would leave out results that fail to mention *education*, but mention *educate*, or *educators*. In a few remaining search engines and some library databases, by appending an asterisk to a partial search term, like <educat*>, the searcher can ensure that any word beginning with *educat* will be found. Google and Yahoo! do not offer this method of *truncation*, also known as *stemming* or *partial wildcard*, but instead use the asterisk for *full wildcard* search, in place of an entire word. A phrase search for <<san *

california"> will return results related to *San Diego*, *San Francisco*, or any of the *San* cities in California. This technique can be particularly useful when users know most of a phrase, but not all of it.

Finally, search literacy requires critical evaluation of search results. Because the vast majority of users do not employ the aforementioned advanced search techniques (Jansen & Pooch, 2001), the likelihood of perfect relevance in the first available results is low. Search engines attempt to order results by relevance, and a study by Pan et al. (2007) suggested students were blindly trusting of results page ordering. The study found students more likely clicked on results in order from top to bottom, even when context clues indicated a different order of relevance, which Eagleton and Dobler (2007) have pointed to as an indicator of novice or weak searchers. Further, broad searches can return tens of thousands of results, but most users never navigate beyond the top-10 list of results (Jansen & Pooch, 2001; Notess, 2006). This is because, as Witten et al. (2007) have observed, 90% of searchers say they are confident in search results, although “users should recognize Plato’s dilemma of knowledge: you cannot tell when you have arrived at the truth when you don’t know what truth is” (p. 23). The search literate, according to Eagleton and Dobler, use “their knowledge of domain names and URLs to determine the likelihood of a good match” (p. 165), and try new keywords or search engines when necessary.

The Need for Search Literacy

The most common search engine query, according to Witten et al. (2007), is nothing. More than any other common search engine behavior, confused searchers click

the *Search* button or hit the *Enter* key with an empty search box. This illustrates the alarming lack of search literacy most Web users have. Studies by Nims and Rich (1998), Bao (2002), Roush (2004), and Wang and Artero (2005) found search engine users constantly made mistakes, did not employ effective techniques, became confused and frustrated, and were not satisfied with their search results. This is why Eagleton and Dobler (2007) have observed many search illiterate students employ the *dot-com formula*, simply appending *.com* to their topic of interest, and navigating to the consequent Web site, which often fails them. For example, *electoralcollege.com*, currently an advertising page, provides much less information than an <“electoral college”> search query would. Students lacking search literacy also use the *shopping mall method*, visiting known, preferred sites, hoping to eventually navigate to a solution (Eagleton & Dobler).

As the Internet grows, by 60 terabytes a day (Roush, 2004), these non-search engine strategies by the search illiterate will increasingly result in frustration. Fortunately, the Pew Internet & American Life Project (2009) reported 89% of Internet users use search engines to find information online. Nearly half access search engines daily. Users search 25% more each year, according to Battelle (2005), who also notes since the U.S. attacks on September 11, 2001, Americans have turned foremostly to the Internet for answers to their most important questions. With Internet access in 100% of public schools (Eagleton & Dobler, 2007), 94% of students have said they use search engines for school research (Callison & Preddy, 2006). For many users, their favorite search engine has become synonymous with the Web (Witten et al., 2007). Even with this increasing level of adoption, Eagleton and Dobler wrote, “people of all ages are

surprisingly inefficient in finding information using this unique resource” (p. 2).

Although search engine producers have been trying to bridge the gap between technology and human intention (Van Couvering, 2007), search literacy is now a necessary skill for almost everyone (Notess, 2006), whether for online or offline use. Technologies like Google’s *GOOG-411*, a voice-activated phone service extension of the search engine, and new cable boxes and digital video recorders (DVRs), which utilize search to find desired programming, illustrate the necessity for search literacy outside an Internet environment. Calishain and Dornfest (2005) quoted Craig Silverstein, Google’s Director of Technology:

Search has only grown in importance. Not only is there more information than ever to be found – via e-mail, computer hard drives, and newly digitized repositories of previously offline content – there is also a greater need to automate tasks and to locate that needle of information in a haystack that just will not stop growing. (p. xi)

Those with search literacy skills are empowered as information seekers (Gunn & Hepburn, 2003), which positions them with significant advantages over their peers (Eagleton & Dobler, 2007).

What began as a research project, Google has become a billion-dollar company, and as Battelle (2005) has argued, it has redefined culture and the very way businesses operate. The Pew Internet & American Life Project (2009) reported 51% of Internet users had sought information online to fulfill job duties. Increasingly, those who can efficiently seek information are in demand in a competitive marketplace (Leu, Kinzer, et al., 2007).

Beyond using search engines within traditional job positions, search technology has spawned an entire industry, full of unique job opportunities. Corporations now employ the search literate to monitor company mentions and brand reputation online, or outsource this duty to companies like TNS Cymfony or J.D. Power's Umbria, who formulate exhaustive search algorithms to catch all Web activity related to a client's business. *Search engine optimization* (SEO) companies market their tools to those organizations that wish to appear higher in users' search engine results. A company called ChaCha, launched in 2008, fields text message questions from curious mobile phone users. They only hire search literate *guides* who can quickly seek online information to answer customers' questions. Ultimately, Callison and Preddy (2006) have noted that people fluent in multiple literacies will find the most success.

Beyond professional success, search literacy leads to more satisfying, productive personal lives (Leu, Kinzer, et al., 2007), by making easier tasks like "re-financing a home, selecting a university, advocating for social justice, purchasing books, or any one of hundreds of other tasks important to daily life" (p. 1577). Rockman (2004) explained the benefits of search literacy:

Individuals who are knowledgeable about finding, evaluating, analyzing, integrating, managing, and conveying information to others efficiently and effectively are held in high esteem. These are the students, workers, and citizens who are most successful at solving problems, providing solutions, and producing new ideas and directions for the future. They are lifelong learners. (p. 2)

Battelle (2005, September 14) stressed the importance of evolving educational institutions away from rote testing, towards enabling within students the critical faculties to learn for themselves: “We as users of search need to get better at searching . . . [through] critical thinking, at reviewing and critiquing a set of results, learning from what is and is not there, and refining our searches as a result” (para. 1).

Search Literacy Definition

The Association of College & Research Libraries (2001) published several competency standards of information literacy for college students, including “The information literate student accesses needed information effectively and efficiently” (Competency Standard 2). To specify the search skills necessary within information literacy, they defined several performance indicators for students searching within online content: A search literate student “constructs and implements effectively-designed search strategies” (Performance Indicator 2), including choosing an appropriate search engine and utilizing advanced search commands, and then evaluates the relevance of search results and “refines the search strategy if necessary” (Performance Indicator 4).

Based on search literacy skills outlined herein, search literacy is defined as the ability to identify a searchable information need, access and feed an appropriate search engine an effective, strategic query, utilizing proper keywords and advanced commands (when necessary), evaluate relevance of results, and revise search when necessary.

Search Training

Leu, Kinzer, et al. (2007) have argued it is essential to integrate new literacies into the classroom, “to prepare all students for the literacy futures they deserve” (p.

1600). High schools generally integrate information and media literacies into curricula, as mandated by the No Child Left Behind Act (2001). Callison and Preddy (2006) have recognized the information, media, and technology literacy standards placed on high schools, which briefly mention *search engines*, but Rockman (2004) has observed students are entering colleges and universities without adequate search literacy skills. In most high schools, search training is the responsibility of librarians (Callison & Preddy), who already have a broad information literacy responsibility. While 100% of public schools now have Internet access (Callison & Preddy), 32% of teens do not use the Internet at school (Rainie & Hitlin, 2005). This suggests high school students are not gaining the Internet exposure necessary to develop search literacy. According to Wang and Artero (2005), 52% of college students said they had received search training, presumably as part of their education. For the rest, they find search literacy training on their own. Gunn and Hepburn (2003) report 73% of students say they taught themselves to find information on the Internet. Students are more likely to learn search literacy skills from friends and classmates than teachers. This would explain why nearly half of students with Internet access at home use quotation marks to utilize phrase searching online, whereas only 11% of students without at-home Internet employ the same strategy (Gunn & Hepburn). They may have the capacity for some self-learning, but students who teach themselves to use search engines are generally not aware strategies and techniques exist that can help locate information online more effectively.

Perhaps this lack of search literacy training stems from the belief that students already know more about technology than teachers. Eagleton and Dobler (2007) noted

that middle and high school students were surprisingly unsuccessful using the Web as a search tool, and “a danger of having students teach one another about using the Internet is that they can proliferate misinformation about this critical literacy” (p. 2). Search literacy represents an overlooked, but increasingly necessary skill set for students. The void left by a lack of search training extends across multiple literacies.

Media Search Literacy

As Leu, Kinzer, et al. (2007) have noted, new digital literacies (e.g. search literacy), do not replace old literacies (e.g. information and media literacies), but build off of them. While search training has traditionally been housed in information literacy, for research purposes, Notess (2006) and Dhillon (2007) have noted the audience for search is much broader than academia. Search literacy can and should be applied to subjects beyond research, including media. Therefore, search literacy is neither exclusive to information literacy or media literacy, but deeply entrenched in their overlap.

As the media environment approaches a true convergence of technology, all of the media sought will become available online. Certainly this is partially true right now. Newspapers have developed strong online presences, radio stations can be streamed over the Internet, and many television networks provide their programming online. The Internet has also promoted the growth of new media, including blogs, photo-sharing, and non-television video broadcasting. The incredible number of media options already available is intimidating, and this number will only grow, with increasing velocity. It is reasonable to assume that in the future, every media option will be available online, including perhaps every available historical piece of media ever produced.

Media poses the same daunting issue of access as information online. Search engines will increasingly become the method by which audiences find media, which requires that users will need the same search literacy to consume media as they would to solve information needs. Whether it is information or entertainment that users seek, Witten et al. (2007) have predicted search engines “will change the very way we work and play” (p. 240). Bernier (2007) noted that literacies need not only serve serious, academic purposes, but can also help seek joy. While not explicitly taught in many search training classes, Notess (2006) observed, “searching for multimedia on the Internet is a very popular search activity” (p. 161). In 1998, only 2.5% of search engine queries related to video (Jansen & Pooch, 2001), but today, the second most popular search engine in the United States, YouTube, contains exclusively video content (comScore, 2009). The most recent Pew Internet & American Life Project (2009) statistics have shown 52% of Internet users watch video online, including 72% of 18 to 29-year-old users. Blog readership is up to 32% of users, with 58% of 18 to 29-year-olds.

Leu, Kinzer, et al. (2007) have argued it would be a mistake to try to capture too much within any single literacy definition. Many literacies are required to organize the complexity of technology and user motivation. As demonstrated by Nims and Rich (1998), search literacy can change dramatically between different environments (i.e., a library or online), and it is reasonable to assume the same could be true for different search purposes (i.e., research or media fulfillment). Therefore, *media search literacy* requires distinction as a concept necessarily unique from the literacies mentioned thus far. Media search literacy (MSL) is the ability to use effective search engine strategies to

locate media online. It is important to distinguish MSL as an independent concept, as many of the literacies currently defined are too broad to lend themselves to empirical research. It is possible skills that indicate great information literacy or research effectiveness may prove less directly related to MSL.

Figure 1 illustrates the overlapping relationship between information literacy, media literacy, search literacy, and MSL. The broad terrains of information literacy and media literacy have significant overlap, due in part to convergence of technology. Their overlap has been relatively ignored by empirical research (Livingstone, 2004), but will continue to expand in crossover and significance.

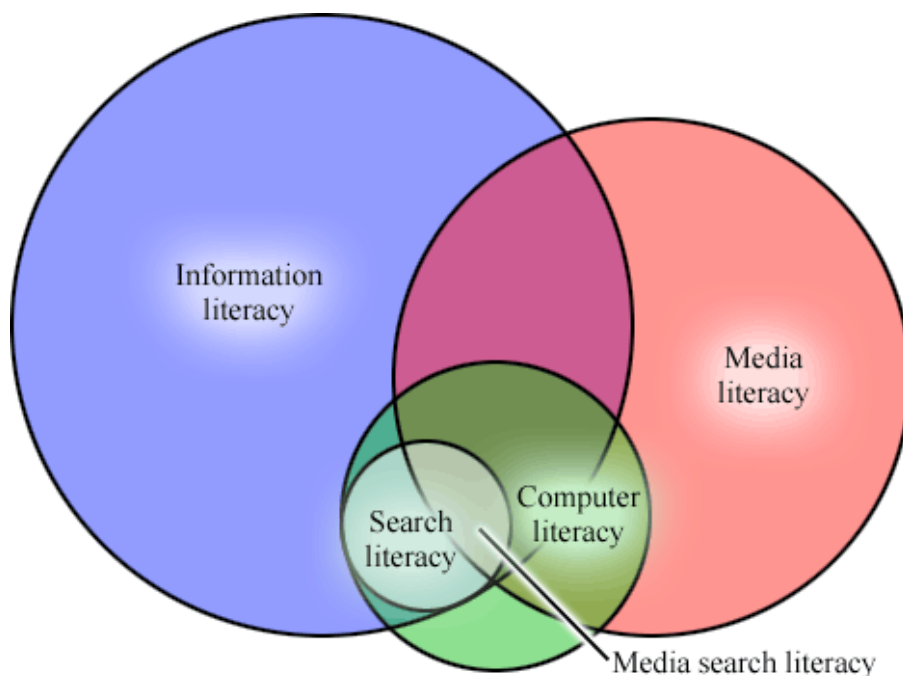


Figure 1. The overlapping literacies required for effective search engine usage.

Search literacy falls within information literacy, and the portion of search literacy that contributes directly to media consumption lies within the media/information literacy overlap. MSL is that region of search literacy within the intersection of media literacy and information literacy. This illustration reiterates the makeup of the MSL construct – it is not the sum of media literacy and search literacy, but only their points of intersection. (To phrase it as a search query, with Boolean logic, MSL is <“media literacy” AND “search literacy”>.)

Like other literacies, MSL represents a range of skills and various levels of ability. Students do not fall into *literate* or *illiterate* categories, but may have mastered some skills and remain unaware of others. To gauge the cumulative effect of their level of ability, as related to MSL, students can be tested for their *media search effectiveness*, a quantitative measure of speed and efficiency when locating media online. Media search effectiveness is simply a question of whether one reaches a desired media destination online, without spending too much time or navigating to too many Web pages along the way. While a deeper understanding of students’ search knowledge and ability is needed to identify their level of MSL, measuring students’ media search effectiveness is a simple way to focus on what MSL skills lead students to quick, direct, and successful searches.

Media Gratifications

The first step in the search process is to identify a searchable information need. For the media search process, this requires identifying a media need. The underlying implication of the MSL definition (the ability to use effective search engine strategies to locate media online) is that once the correct media is located, a desired gratification will

be obtained. McQuail, Blumler, and Brown (1972) designed the theory of *uses and gratifications* to explain the relationship between users' exposure to media and the effects those media cause. Unlike most media effects theories, uses and gratifications dismisses the top-down ideology where media sources cause effects in passive recipients. Instead, this theory suggests that people seek out media to satisfy needs and therefore achieve various gratifications. Many uses and gratifications scholars have developed constructs to explain the different types of needs gratified by media. These include Lasswell's fourfold typology of *surveillance, correlation, socialization, and entertainment*, and McQuail's categories of *diversion, personal relationships, personal identity, and surveillance* (Palmgreen, Wenner, & Rosengren, 1985).

Contemporary studies have identified uses and gratifications as the best approach to new media online, because it focuses on the idea that users seek out or search for media online, to obtain various gratifications. This approach easily connects with the concept of MSL, because media consumers use search technology to reach media, and a successful search would likely be gratifying. Many recent uses and gratifications studies have tested the traditional typologies to learn which uses are most often employed, and which gratifications are most often sought on the Internet. These studies have converged on the following gratification types: *social, information, surveillance, convenience, and entertainment* (Vincent & Basil, 1997; Kaye & Johnson, 2002). In 2000, Papacharissi and Rubin surveyed college students about what motivated them to use the Internet. By far, the top two needs gratified by Internet use were information and entertainment. Four years later, Stafford and Gonier (2004) published a similar survey of AOL users. The top

gratification was no longer information or entertainment, but searching itself. This suggests that while information and entertainment are likely the end needs that gratify, a successful search, in an of itself, can be the most gratifying. This then suggests that increased MSL would relate to improved gratifications obtained through successful searches and through the media outcomes of those searches.

CHAPTER III

METHOD

Purpose

While several studies have examined high school and college student use of search engines (e.g. He, 1996; Nims & Rich, 1998; Bao, 2001; Jansen & Pooch, 2001; Gunn & Hepburn, 2003; Rouet, 2003; Rainie & Hitlin, 2005; Wang & Artero, 2005; Pan et al., 2007), none have explored search engine-aided media-seeking behavior. This oversight by communication scholars has kept search literacy out of media literacy research, and left a hole in the study of access in online media consumption. Further, as search engine technology changes rapidly, findings become less useful with age. Research must keep pace with technological innovation. The purpose of this study is to update search engine usage research, gauge students' MSL, media search effectiveness, and prior search training, test the predicted indicators of MSL, and produce recommendations for future MSL and search literacy training, so that students may be better enabled as media consumers.

Hypotheses and Research Questions

As proposed by Gunn and Hepburn (2003), students who go without search engine education are less likely to be aware of advanced search functions or strategies for effective search. Therefore, this study proposes the following hypothesis:

H1: Students with prior search training will exhibit greater media search effectiveness than students without prior search training.

Based on the definition of search literacy, and MSL's frame within search literacy, advanced search techniques, like phrase searching, Boolean logic, and advanced commands will likely benefit media seeking. Therefore, this study proposes the following hypothesis:

H2: Students who utilize advanced search techniques will exhibit greater media search effectiveness than students who do not utilize advanced search techniques.

Google is the most trafficked search engine (Compete, 2009; comScore, 2009), blindly-rated as yielding the most relevant results (Witten et al., 2007), and used by two-thirds of college students (Gunn & Hepburn, 2003). If students prefer Google as their gatekeeper to information, it is likely Google will also be their starting point for accessing media online. Therefore, this study proposes the following hypothesis:

H3: Google will be the most popular search engine option for students seeking media online.

The lack of media-oriented search literacy research is alarming considering the heavy emphasis on academic research applications of search literacy. It is likely that this unbalanced representation in prior research is not indicative of students' actual search engine usage. According to the Pew Internet & American Life Project (2009), among 18 to 29-year-old Internet users, 70% do research for school or training, while 72% view video content online. Considering the number of media options beyond video (e.g. music,

blogs, etc.), students' actual Web priorities would likely validate the need to study MSL to fill a research gap. Therefore, this study proposes the following hypothesis:

H4: Students spend more time searching for media content online than searching online for academic research purposes.

Because successful media searches likely lead to media gratifications obtained, as related to the uses and gratifications model, this study proposes the following hypothesis:

H5: Students' media search effectiveness will be positively related to their level of media gratifications obtained online.

Students tend to lack search literacy and hold a simplistic view of search engine operation and effective search skills (Gunn & Hepburn, 2003). This study poses the following three research questions to better understand students' perception of and need for MSL:

RQ1: How do students perceive their level of media search effectiveness? Can they accurately rank their personal media search effectiveness against their peers?

RQ2: Do students report that they need or want additional MSL training?

RQ3: In general, which MSL skills do students have, and which do they lack?
(Therefore, where should future search training focus attention?)

Participants

One hundred two undergraduate students, enrolled in a writing for mass media course at Illinois State University, participated in this study for extra credit. College students were chosen because most have recently finished high school, where search

training would have most likely occurred, they have high exposure to online media, and are required to have access to the Internet. One hundred percent of the sample reported owning a computer, having Internet access, and regularly accessing media content online. The majority (64%) reported using the Internet between 2 and 4 hours each day. The sample consisted of 72 female (71%) and 30 male (29%) students (a ratio representative of the university), aged 18 through 37 ($M = 20.6$, $SD = 2.29$). Eight participants (8%) reported graduating from a rural high school, 23 (23%) from a small town high school, 58 (57%) from a suburban high school, and 13 (13%) from an urban high school.

Design

Participants entered a computer lab environment, and were asked to complete a 15-question pre-task survey (see Appendix A) which collected data on Internet use, media gratifications, prior search training, media-seeking and research-seeking behavior, MSL perception, and desire for training. Participants then completed three specific media-oriented search tasks on a computer, using the Internet. The tasks tested their ability to find a Web video, a song, and a full TV show online. Participants used Windows Vista operating systems with Internet Explorer 7 Web browsers. Participants were allowed no more than 5 minutes to complete each task. Screen-capturing software recorded videos of their on-screen performance, including their navigation to search engines and other Web pages and formulation of search queries. Data collected and coded (see Appendix B for coding sheet used) from videos included time elapsed, number of Web pages accessed, search engines used, number of search query keywords used, advanced search techniques used correctly or incorrectly, human errors, and whether

destination pages satisfied each assigned task. Participants then responded to an 18-question post-task survey (see Appendix C), which collected data about the previous three tasks, search engine usage, MSL perception, desire for training, high school education, and demographic details. The entire process, from entering the lab to exiting, lasted about 20 minutes for most participants.

Search Tasks

Using the Web browser, participants were directed to an HTML page stored on their computer's hard drive with search task instructions, and were asked to navigate away from that page to complete the first search task within 5 minutes. The second and third search tasks were delivered in the same fashion. Participants did not need to fully consume each piece of destination media content, but were instructed to initiate the media and verify completion of each task. The instructions for each of the three search tasks were as follows:

TASK A

A popular online video features a local newswoman at a winery, crushing grapes with her feet, who falls off a raised platform on live television. You would like to watch this short Internet video clip.

Starting from this page, (or by opening a new window or tab) navigate to a Web page where you could watch the video of this woman's misfortune.

TASK B

You would like to listen to the classic rock song "And You And I"

from an album called “Close to the Edge.”

Starting from this page, (or by opening a new window or tab) navigate to a Web page where you could listen to audio of the song “And You And I.”

TASK C

In 1999, the television drama “Angel” premiered. You would like to watch the first full episode.

Starting from this page, (or by opening a new window or tab) navigate to a page where you could watch the entire premiere episode (1st season, 1st episode) of “Angel.”

Each set of task instructions also contained an image for reference. Tasks A and C’s instructions contained *screenshots*, images directly from the video content, so participants could better identify them. Task B’s instructions featured an image of the album cover (with the band’s name removed). Task A was designed to simulate searching for an Internet video when neither the title or location are known, but several descriptive details are available. Task B simulated searching for a song, when the song title and album title are known, but the song artist is unknown. Task C simulated searching for a television show when the show title, but not the episode title is known. Each of these tasks were chosen because they represented a diverse set of media types and search strategies required, with destinations unlikely to differ much over the course of the study.

Scales

Media Search Effectiveness

Search effectiveness on media-oriented tasks was measured with an equal consideration of time elapsed (as in Rouet, 2003) and number of page loads required (i.e., the number of independent Internet pages or files loaded or downloaded) per task. By observing video files of participants' performance, it was assessed whether each participant successfully accomplished each search task, and the number of seconds required to accomplish each task was measured, as well as the number of page loads required. Time began once a participant began typing into the address bar of the Web browser or initiated navigation to a new Web page. Time ended once the participant clicked the *Play* button on the correct media content, or once the Web page began loading an automatic playback of the correct media content. One page load was counted every time a mouse click initiated a new page or file download, not counting the final correct media content or unintended pages like pop-up advertisements. Using the *Back* browser button or reloading a page previously loaded during an individual task session were also excepted from the page load count. Participants ended each task by successfully completing the task, incorrectly believing the task had been completed, giving up on the task, or exceeding 5 minutes (300 seconds) without completing the task. Any Web destination that fulfilled the task instructions constituted a successful task completion.

After all participants passed through the study, it was calculated that on average, for every one page load required per successful task completion, participants spent 13.63 seconds per task. This ratio was built into the formula for scoring search effectiveness, so

that time and page loads contributed equally to participants' search effectiveness scores. A Pearson correlation found time elapsed and page loads required were highly related in the study ($r = .97, p = .01$), but this scoring method appropriately awarded especially fast or data-efficient outliers. The search effectiveness scores for each successful individual task completion were calculated with the following original formula: *search effectiveness* = $\{600 - [\textit{seconds elapsed} + 13.63(\textit{page loads})]\}/600$. The significance of 600 is that a maximum 300 seconds were allowed per task, and page loads were weighed equally, so an additional 300 "points" were assigned to the maximum 22 page loads allowed. (300/13.63 = 22 pageloads.) These 600 points were inverted in the formula because time elapsed and page loads required are negatively related to search effectiveness. An unsuccessful task completion resulted in a substitution of zero for the individual task score, instead of application of the formula. Therefore, all scores fell between zero and one. The three individual task scores were averaged to arrive at each participant's total search effectiveness score. A total score of zero meant no tasks were completed within the required time. A score of one was impossible, but would theoretically have meant all three tasks were completed without any time passing and zero page loads required. A higher score translated to greater search effectiveness.

Advanced Search Techniques

Phrase-searching (i.e., using quotation marks in a query), use of Boolean search logic (e.g. <OR>, <->, etc.), or advanced commands (i.e., accessing *Advanced Search* or utilizing special non-keyword search syntax) were considered *advanced search techniques*. Participants' three search tasks were each coded for advanced search

techniques as positive (if at least one correct advanced search technique was submitted in a search query) or negative (if no advanced search techniques were correctly exhibited). Participants' performances were also coded for incorrect use of any of the above techniques, which also included unnecessary usage, like unnecessary use of the plus sign (+) as a connector.

Human Error

Separate from incorrect use of advanced techniques, human search errors were also coded. These included relying on a search engine's suggested search query (rather than submitting a self-crafted query), submitting natural language queries, misspellings, and unnecessary use of capitalization in search engines that ignore capitalization. Participants' three search tasks were each coded for *human error* as positive (if at least one human error was submitted in a search query) or negative (if no human errors were exhibited).

Prior Search Training

A single pre-task survey item asked participants, "Where did you learn how to use search engines?" Participants who self-reported search education through high school, college, or extra-curricular formal training were coded as positive for *prior search training*. Participants who did not report search education, or reported learning search skills solely through self-teaching or peer observation were coded as negative.

Seeking Media Content vs. Academic Research

Two pre-task survey items asked participants to self-report the number of instances in a week they used a search engine "to find media content (video, music/audio,

news, blogs, photos),” and the number of instances in a week they used a search engine “to find information online for school work or research.”

Media Gratifications

A 15-item scale adapted from those used by Vincent and Basil (1997), Papacharissi and Rubin (2000), and Kaye and Johnson (2002) measured media gratifications in the pre-task survey. Respondents indicated level of agreement using a 5-point Likert scale. The internal consistency of this scale was $\alpha = .79$. Within this scale, five 3-item scales measured the following types of online media gratifications: *social*, *information*, *surveillance*, *convenience*, and *entertainment*, with internal consistencies of $\alpha = .39$, $\alpha = .66$, $\alpha = .56$, $\alpha = .50$, and $\alpha = .72$, respectively.

MSL Perception and Training

Four survey items, posed both in the pre-task and post-task surveys, gauged participants’ perception of their personal level of MSL, and desire to improve search literacy through training. Participants self-reported their confidence levels in finding media content online and ranked their media seeking into a percentile against their peers to arrive at MSL perception. To measure desire for training, participants were asked if they believed they could benefit from search training, and if they would pay for search training, sign up only for free training, or avoid training altogether.

CHAPTER IV

RESULTS

Data Analysis

Overall Performance

Participants' total search effectiveness scores ranged from zero (did not complete any of the three tasks in the time allowed) to .85 (completed each of the three tasks in an average 36.33 seconds and with an average 4 page loads). Participants averaged .56 ($SD = .20$) across all three tasks. Participants scored highest on Task A (video) ($M = .76$, $SD = .23$), followed by Task C (TV show) ($M = .47$, $SD = .35$), and lowest on Task B (song) ($M = .44$, $SD = .32$). Table 1 illustrates minimums (Min.), maximums (Max.), and means (M) for scores earned, time elapsed, and page loads required for participants for each task, including the percentage of participants who successfully completed each task.

Table 1

Search Effectiveness Scores

Task	Score			Time (seconds)*			Page loads*			Success
	Min.	<i>M</i>	Max.	Min.	<i>M</i>	Max.	Min.	<i>M</i>	Max.	Rate
Video (A)	0	.76	.91	13	55	244	3	4.6	17	95%
Song (B)	0	.44	.89	24	121	280	3	7.7	17	71%
TV show (C)	0	.47	.87	22	91	284	3	7.0	18	68%
Total**	0	.56	.85	109	256	550	12	18.9	40	49%***

*Only includes participants who successfully completed the task (or all tasks in the *Total* row).

**Not a sum of above rows, but data on cumulative, total task performance.

***Percentage represents participants who successfully completed all three tasks.

On a scale from zero to four points (zero being *much easier* and four being *much harder* than participants' usual search experiences), participants rated Task A an average 1.21 ($SD = .99$), Task B an average 2.24 ($SD = .87$), and Task C an average 2.06 ($SD = 1.22$). Five participants (5%) failed to complete Task A within 5 minutes. Thirty participants (29%) failed to complete Task B within 5 minutes. Thirty-three participants (32%) failed to complete Task C within 5 minutes. Two participants (2%) were unable to complete any task within 5 minutes. Table 2 illustrates the top three most common Web site destinations participants reached to successfully complete each task.

Table 2

Most Common Successful Task Destinations

Task	#1	#2	#3	Total Found
Video (A)				
Destination	YouTube	Google Video	3 other sites	5
Participants ($n = 97$)	91 (94%)	3 (3%)	1 each (1%)	
Song (B)				
Destination	YouTube	Last.fm	Rhapsody	13
Participants ($n = 72$)	34 (47%)	13 (18%)	8 (11%)	
TV show (C)				
Destination	Hulu	IMDB	Fancast	10
Participants ($n = 69$)	45 (65%)	10 (15%)	6 (9%)	

Note. The URLs for the above sites are youtube.com, video.google.com, last.fm, rhapsody.com, hulu.com, imdb.com, and fancast.com.

While not related to any of the hypotheses or research questions, the data revealed several interesting differences in search effectiveness scores. t test analysis revealed no significant difference between female ($M = .54$, $SD = .20$) and male ($M = .60$, $SD = .18$) total search effectiveness scores, $t(100) = 1.53$, $p = .13$. Only in Task C did men ($M = .60$, $SD = .31$) score significantly higher than women ($M = .41$, $SD = .36$), $t(63.67) = 2.69$, $p = .01$. Total search effectiveness scores were also significantly higher for participants who reported graduating from a rural high school ($M = .64$, $SD = .13$) than participants who

reported graduating from an urban high school ($M = .44$, $SD = .23$), $t(18.9) = 2.49$, $p = .02$. (This difference is compared in Table 5.)

Prior Training

Fifty-four participants (53%) reported having received prior search training, mostly through high school (49%), but also college (19%) and other sources (9%). Hypothesis 1 was rejected by t test analysis, which revealed no significant difference in search effectiveness scores between participants who reported prior training ($M = .53$, $SD = .20$) and those who reported no prior training ($M = .59$, $SD = .19$), $t(100) = 1.44$, $p = .15$.

Advanced Search Techniques

Phrase searching was the only correctly used advanced search technique, used by 30 participants (29%) in at least one task. Various t test analyses partially supported Hypothesis 2. Total search effectiveness scores for participants who correctly utilized phrase searching ($M = .60$, $SD = .16$) did not significantly differ from those for participants who did not correctly utilize phrase searching ($M = .54$, $SD = .21$), $t(100) = 1.42$, $p = .15$. No participants correctly utilized phrase searching on Task A, and only two participants did on Task C. The 29 participants who correctly utilized phrase searching on Task B ($M = .57$, $SD = .25$) scored significantly higher on isolated Task B search effectiveness scores than participants who did not ($M = .39$, $SD = .33$), $t(67.7) = 2.91$, $p = .01$. (This difference is compared in Table 5.)

Of participants who correctly used phrase searching, 8 (27%) also used phrase searching incorrectly. Only 6 (8%) participants who never used phrase searching

correctly used phrase searching incorrectly. The majority (57%) of participants who correctly utilized at least one advanced search technique also exhibited at least one incorrect technique ($n = 17$), whereas only 32% of participants who did not correctly utilize advanced techniques exhibited at least one incorrect technique ($n = 23$). Forty participants (39%) exhibited at least one incorrect technique, including incorrect usage of the minus (-) Boolean operator (22%, $n = 22$), incorrect phrase searching (14%, $n = 14$), and unnecessary use of the plus (+) Boolean operator (7%, $n = 7$). A t test analysis supported a significant difference in total search effectiveness scores between participants who used advanced techniques incorrectly ($M = .50$, $SD = .20$) and those who did not ($M = .60$, $SD = .19$), $t(100) = 2.51$, $p = .01$. (This difference is compared in Table 5.)

Search Engine Preference

Hypothesis 3 was rejected by observation data. When asked where they usually perform the majority of their non-media-specific Web searches, 87 participants (85%) reported Google, and 7 each reported YouTube (7%) and Yahoo! (7%). In the media-oriented tasks, participants submitted queries to YouTube's site-specific search engine first more often than Google, and successfully completed tasks through YouTube-driven results more often than through Google's results. Table 3 illustrates the search engines most commonly used first and used previous to successful completion of each task. YouTube was most preferred and most successful in finding the video in Task A and song in Task B. Participants preferred Google to begin Task C, but found the TV show most often after using Hulu's site-specific search engine. Beyond the goals of this study, the data suggested an interesting, but unsuspected gender disparity in Task C. Although

men comprised only 29% of the sample, an equal number of men ($n = 11$) and women ($n = 11$) used Hulu first in Task C; 37% of men used Hulu first, compared to 15% of women. t test analysis demonstrated those who submitted queries to Hulu first in Task C ($M = .80, SD = .08$) scored significantly higher on Task C search effectiveness than those who did not ($M = .37, SD = .35$), $t(97.37) = 9.98, p = .00$. (This difference is compared in Table 5.)

Table 3

Most Common Search Engines Used

Task	#1	#2	#3	Total used
Video (A)				
First	YouTube	Google	Live Search	3
Participants ($n = 102$)	77 (75%)	17 (17%)	8 (8%)	
Successful				
Participants ($n = 97$)*	83 (86%)	10 (10%)	3 (3%)	
Song (B)				
First	YouTube	Google	Live Search	12
Participants ($n = 102$)	49 (48%)	31 (30%)	9 (9%)	
Successful				
Participants ($n = 72$)*	31 (43%)	25 (35%)	4 (6%)	
TV show (C)				
First	Google	Hulu	YouTube	9
Participants ($n = 101$)**	44 (44%)	22 (22%)	16 (16%)	
Successful				
Participants ($n = 68$)*	31 (46%)	24 (35%)	7 (10%)	

*Not all participants completed every task. Percentages reflect share of successful completions.

**One participant completed Task 3 without using any search engines.

Media Content vs. Academic Research

t test analysis supported Hypothesis 4. Participants reported significantly less weekly visits to a search engine for research or academic purposes ($M = 11.44$, $SD = 16.44$) than for seeking media content online ($M = 17.77$, $SD = 21.22$), $t(101) = 3.72$, $p = .00$.

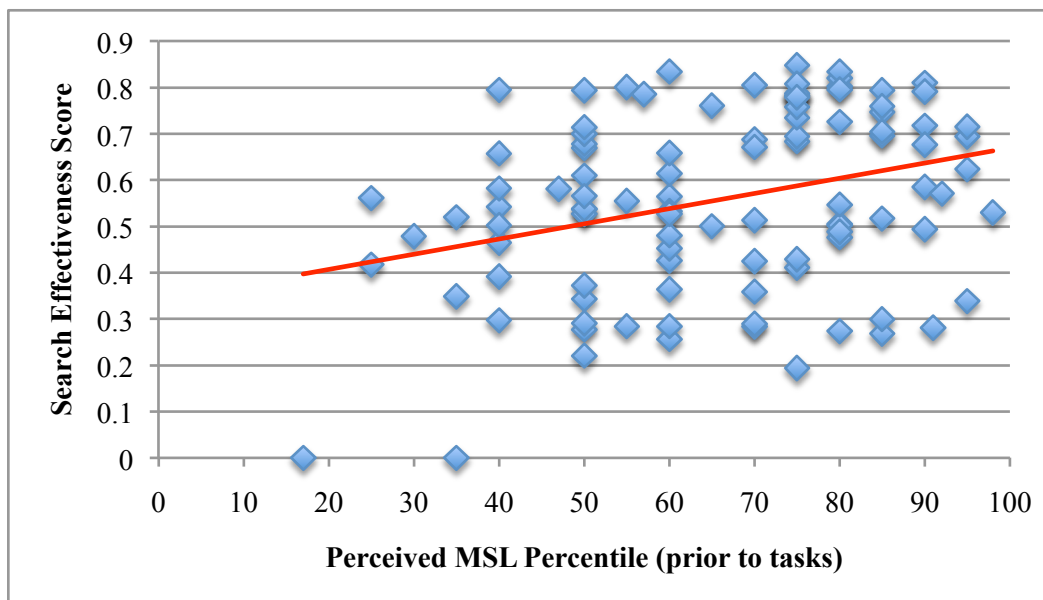
Media Gratifications

On a scale from zero to four, participants averaged 3.18 ($SD = 0.34$) on reported levels of media gratifications obtained online. Hypothesis 5 was rejected by a Pearson correlation, which suggested no significant relationship between search effectiveness scores and media gratification scores ($r = -.07$, $p = .50$).

MSL Perception

When asked about media content online in the pre-task survey, the majority of participants ($n = 56$, 55%) agreed to the statement, "If it's on the Internet, I can probably find it," compared to 49 (48%) in the post-task survey. Also prior to the tasks, 40 (39%) agreed to the statement, "I'm pretty good at finding things online, but sometimes I need a lot of time to do it." Four (4%) agreed to the statement, "I'm neither good nor bad at finding things online." Two (2%) agreed to the statement, "Sometimes I need help, because I run into trouble finding some things." On average, participants ranked themselves in the 66th percentile of MSL compared to their college peers before performing the search tasks, and in the 64th percentile after. A Pearson correlation suggested a significant, positive relationship between total search effectiveness scores and perceived MSL percentiles, prior to tasks ($r = .32$, $p = .00$) and after tasks ($r = .39$, p

= .00). Figure 2 illustrates the moderate relationship between perceived MSL (prior to tasks) and search effectiveness scores.



Note. The line illustrates the direction of the correlation.

Figure 2. Scatter plot of perceived MSL and search effectiveness scores.

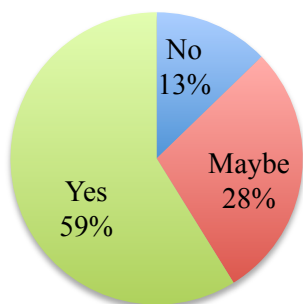
Want and Need for Training

Eighty-four participants (82%) reported self-teaching search skills, and 37 of those participants (36%) reported also learning search skills through formal education. An additional 17 participants (17%) reported learning search skills only through formal education. Only 13 participants (13%) reported knowledge of Boolean search logic.

Figure 3 illustrates participants' perception of search literacy and their willingness

to attend search literacy training. After performing the search tasks, 60 participants (59%) said they thought they could benefit from search training; 29 (28%) were unsure; 13 (13%) said they did not think they could benefit from search training. When asked if they would attend search training, 34 (33%) said they would not, 57 (56%) said they would, and 11 (11%) said they would, but only if the training were free. *t* test analysis demonstrated participants willing to attend search literacy training ($M = .50, SD = .20$) scored significantly lower in search effectiveness than participants unwilling to attend search literacy training ($M = .66, SD = .14$), $t(100) = 4.19, p = .00$. (This difference is compared in Table 5.)

“Do you think you would benefit from training designed to teach better online search techniques?”



“If offered, would you sign up for search training?”

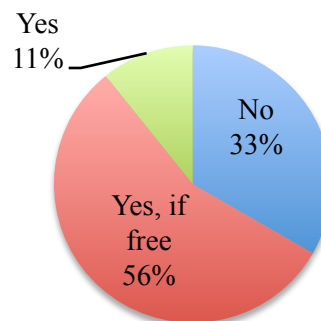


Figure 3. Participants' desire for search training.

Other Media Search Skills Exhibited

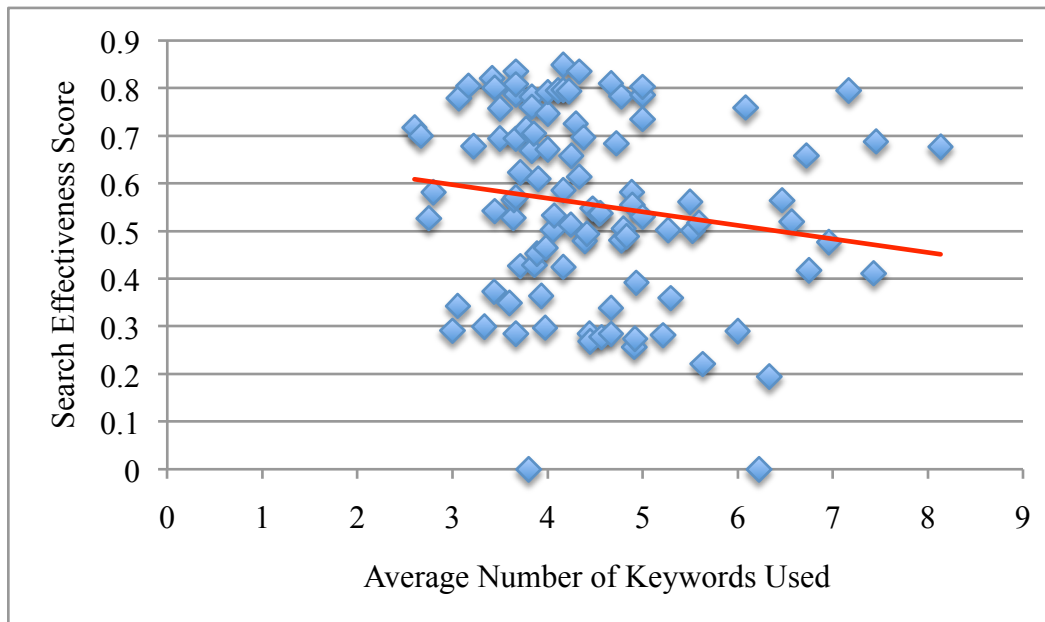
Table 4 identifies the average (M) number of keywords and queries submitted for each task, as well as minimums (Min.) and maximums (Max.). Participants averaged three search queries per task ($SD = 1.27$) and 4.48 keywords per search ($SD = 1.13$) (when tasks are weighed evenly, regardless of number of queries per task). As illustrated in Figure 4, a Pearson correlation suggested no significant relationship between the average number of search query keywords used and total search effectiveness scores.

Table 4

Number of Search Queries and Keywords Used

Task	Queries			Keyword Average		
	Min.	M	Max.	Min.	M	Max.
Video (A)	1	2.21	10	2.00	4.03	10.50
Song (B)	1	4.01	11	3.00	6.16	12.00
TV show (C)	0	2.78	11	1.00	3.25	9.00
Total*	3	9.00	22	2.60	4.48	8.13

*Not a sum of above rows, but data on cumulative, total task performance.



Note. The line illustrates the direction of the correlation (not significant).

Figure 4. Scatter plot of number of keywords used and search effectiveness scores.

Only nine participants (9%) performed all three tasks without committing one of the following human errors: 67 participants (66%) relied at least once on a search engine query suggestion; 55 (54%) submitted at least one natural language query; 29 (29%) misspelled at least one query, and six of them (21%) took advantage of the search engine spelling correction; 37 (36%) unnecessarily capitalized a query keyword, on a search engine that ignores capitalization (e.g. YouTube, Yahoo!).

t test analysis suggested that many of these human errors indicated hindered search effectiveness. In Task A, participants who relied at least once on a search engine's query suggestion ($M = .68$, $SD = .28$) scored significantly lower than participants who did not ($M = .81$, $SD = .18$), $t(49.28) = 2.37$, $p = .02$, and participants who unnecessarily

capitalized query keywords, when the search engine ignored capitalization ($M = .61$, $SD = .32$), scored significantly lower than those who did not ($M = .78$, $SD = .21$), $t(100) = 1.95$, $p = .05$. (This difference is compared in Table 5.) In Task C, participants who submitted natural language search queries ($M = .25$, $SD = .34$) scored significantly lower than participants who did not ($M = .52$, $SD = .34$), $t(100) = 3.16$, $p = .00$, and participants who submitted misspelled queries ($M = .11$, $SD = .23$) scored significantly lower than those who did not ($M = .50$, $SD = .35$), $t(13.73) = 4.77$, $p = .00$. (This difference is compared in Table 5.) In total search effectiveness scores, participants who submitted natural language search queries ($M = .52$, $SD = .20$) scored significantly lower than participants who did not ($M = .60$, $SD = .18$), $t(100) = 2.02$, $p = .05$. (This difference is compared in Table 5.) Compared to participants who relied on a search engine's query suggestion at least once in each task ($M = .46$, $SD = .08$), participants who never relied on a query suggestion scored significantly higher ($M = .60$, $SD = .21$), $t(19.17) = 2.84$, $p = .01$. (This difference is compared in Table 5.)

Table 5

Best Predictors of Media Search Effectiveness

Predictor (% of participants)	Task	Pageloads Saved	Time Saved
Avoid natural language (46%)	All tasks	4.75	74 seconds
Rural over urban education (8%)	All tasks	4.32	59 seconds
Unwilling to attend training (33%)	All tasks	3.26	51 seconds
Avoid query suggestions* (34%)	All tasks	2.48	48 seconds
Avoid incorrect techniques (61%)	All tasks	2.20	38 seconds
Visit Hulu first (22%)	TV show (C)	8.96	133 seconds
Avoid spelling mistakes (90%)	TV show (C)	8.23	122 seconds
Avoid unnecessary CAPS (93%)	Video (A)	3.02	61 seconds
Phrase searching (29%)	Song (B)	3.64	57 seconds

*Difference between consistent use of query suggestions and no use of query suggestions.

CHAPTER V

DISCUSSION

Conclusions

Prior Training and Advanced Search Techniques

Nearly equal to Wang and Artero's finding in 2005, 53% of college student participants in this study reported prior training of search engine skills. Compared to Gunn and Hepburn's 2003 finding that 73% of high school seniors had self-taught search skills, 82% in this study reported self-teaching. Interestingly, the data rejected Hypothesis 1; there was no relationship between prior training and search effectiveness. This finding suggests several possibilities, including: either students do not gain or retain any skills from search training beyond those they can self-learn (training is entirely ineffective), or the training is equally harmful as it is beneficial (training is simultaneously positively and negatively effective). The data on advanced search technique usage support the latter possibility. Participants who used advanced techniques *correctly* were nearly twice as likely as the others to use advanced techniques *incorrectly*. In fact, a *majority* of these participants used advanced techniques incorrectly, a hindrance which related to an average 38 additional seconds needed per search task (see Table 5).

No participants correctly used a minus (-) sign as a Boolean <NOT> operator; instead, 22% used it incorrectly, often like a dash, as a form of punctuation, like in these queries from Task A: <Video- local newswoman crushing grapes> and <news woman

winery fall-youtube>. Seven percent of participants used a plus (+) sign unnecessarily or incorrectly. This example from a Task B Google search illustrates an unnecessary, and likely unintended use of the plus sign: <“and you and I” +“close to the edge” +“listen” +“online”>. When a plus sign in Google is preceded by a space, it no longer serves a Boolean purpose; it signals Google not to search synonyms for the attached word, which was redundant in this case, because quotation marks around single words signal the same request. Fourteen percent of participants used phrase searching incorrectly, sometimes forgetting to close a quotation or using single apostrophes, which is ineffective. Participants who used phrase searching correctly were more than three times as likely to also use it incorrectly compared to others.

This data suggest the search training students have primarily received has not been comprehensive. Students have been exposed to advanced search techniques, but have not fully understood how and when to use them. Without mastering these techniques, students’ knowledge of them has done more harm than good to their media search effectiveness.

Jansen and Pooch’s (2001) survey of general search engine usage statistics found 2 to 8% of searchers used Boolean operators correctly. Gunn and Hepburn’s (2003) study of high school seniors’ search skills found 38% correctly used phrase searching. Participants in the current study did not correctly use Boolean, and only 29% used phrase searching correctly. Perhaps this suggests a decline in the use of advanced techniques over time, which could be attributed to the relative advancement of search engine technology. It is also possible that the media-oriented searches in this study were less

benefitted by advanced technique usage than the non-media searches performed in previous research.

No advanced techniques beyond phrase searching were successfully executed by participants during the study, and only Task B teased phrase searching out of more than a couple of participants. This uneven use of advanced techniques across tasks led to an insignificant difference between groups in total search effectiveness scores, and little support for Hypothesis 2. Isolating Task B scores gave a truer picture: using phrase searching indicated an average 57 seconds and 3.64 page loads saved over other participants (see Table 5), lending support for Hypothesis 2.

Many variables affect media search effectiveness, so it is impossible to say that phrase searching alone (or any other search skill exhibited) could have directly saved time and page loads required. The items listed in Table 5 (including phrase searching) have not been proven to have a causal impact on media search effectiveness; rather, they are behavioral indicators that best predict improved media search effectiveness. The data suggest that phrase searching, the simplest and most popular advanced technique, likely improves search effectiveness dramatically, but it is possible this advanced technique simply correlates with other search skills that individually or collectively benefit media search effectiveness. For instance, those who use phrase searching correctly may also choose better search query keywords. The data in this study do not isolate the specific impact of each variable on media search effectiveness. Nevertheless, the variables listed in Table 5 are significant indicators of performance, and can be used to identify students who would best benefit from MSL and search literacy education.

Search Engine Preference

While their self-reported data suggest most students do not consider YouTube their primary search engine, participants overwhelmingly preferred the site-specific engine over Google for some media applications, rejecting Hypothesis 3. Participants' preference for YouTube in Task A is unsurprising, considering YouTube's unrivaled popularity as a video-sharing site, but participants' reliance on the site for Task B suggests YouTube dominates music seeking as well. Unlike previous research (Gunn & Hepburn, 2003), in which students heavily favored Google, participants preferred media-specific search engines like YouTube and Hulu for media applications. Perhaps Google is the first stop for most users when the Web destination is unknown, but as long as YouTube monopolizes Internet video, the destination is clear for many users.

Site-specific search engines have their drawbacks, though. While YouTube is owned and operated by Google, the search technology of each search engine differs greatly. In Task A, a participant searched <newswoman crush grapes> on YouTube, a seemingly satisfactory query, which returned zero first-page results related to the task. By replacing *crush* with *crushing*, the participant's search returned the target video five times in the top seven results. This discrepancy was much less dramatic when both of the differing queries were submitted to Google. In fact, the *No results found* message was observed many times on YouTube over the course of the study. In some cases, YouTube was less responsive to natural language and other imperfect queries than Google, but occasionally showed its flexibility. Flawed queries submitted to YouTube like <rgape lady falling> and <new grapes fal,l> each resulted in the target video at the top of the

search results page. This unpredictability in results appeared to lead several participants to abandon YouTube after many unsuccessful search attempts.

While no research objectives targeted gender, the data uncovered that men outperformed women in Task C search effectiveness, seemingly because they were more than twice as likely to try Hulu first. Using Hulu, the NBC-owned service that streams free television programs, proved to be the greatest predictor of media search effectiveness in a single task (see Table 5). Participants who submitted their first query to Hulu in Task C saved 2 minutes 13 seconds, on average, over those who did not use Hulu first. Months before this study, Hulu began a television advertising campaign that premiered during the Super Bowl. Perhaps this indicates a marketing effort targeted at men, which could explain the task-specific gender disparity.

Media Search vs. Academic Research

On average, participants reported searching for media content nearly three times for every two times they searched for academic research content online, supporting Hypothesis 4. This finding suggests prior research has been inappropriately lopsided in its focus on search literacy primarily as a means of research. Students search for many types of content online, and numerous applications of search literacy have been ignored to the detriment of the body of research. For the benefit of the media literacy field, communication scholars, media producers, media consumers, educators, and students, research must appropriately represent the actual and current applications of search engine technology.

Media Gratifications

Rejecting Hypothesis 5, the data supported no relationship between levels of media gratifications reportedly obtained online and media search effectiveness scores. This finding suggests one of two possibilities: either search literacy skills do not lead to greater social, information, surveillance, convenience, or entertainment gratifications, or participants had not the frame of reference to accurately report their gratifications obtained. One of the assumptions of the uses and gratifications model of media effects is that media consumers are sufficiently self-aware to report their own motivations for media use (McQuail et al., 1972), but Witten et al. (2007) have explained how Plato's dilemma of knowledge plays in this space: if users cannot find content online, how can they know what they are missing? For those with lower levels of MSL, who are less able to find what they are looking for, they may also be unaware there are additional media gratifications to be obtained online. Further, not a single participant scored in the lower half of the media gratifications scale, and the average was at the 80th percentile of the scale range. The Internet has already revolutionized media consumption; it is not surprising users are extremely gratified by their online media experiences, and perhaps unable to foresee much possibility of improvement.

MSL Perception and Want and Need for Training

As supported by the data, students have a moderate sense of their level of media search effectiveness compared to their peers. This diverges from Gunn and Hepburn's (2003) finding that (high school) students were inaccurate in their self-perception. On average, participants in this study ranked themselves in the 66th percentile of search

effectiveness (above average), which is consistent with previous research on self-perception. Kruger and Dunning (1999) have explained the *above-average effect* witnessed in many studies as “the tendency of the average person to believe he or she is above average, a result that defies the logic of descriptive statistics” (p. 1122). A majority of participants agreed they thought they would benefit from search training, and an even greater number said they would attend such training, especially if it were offered for free. Participants’ awareness of their own search literacy was also apparent in their willingness to attend search training. On average, those who expressed an interest in training spent 51 seconds longer and 3.26 more page loads on each task than participants who did not want training (see Table 5). This suggests that students with low media search effectiveness realize room for improvement. While participants generally rated themselves highly, most also recognized an additional search literacy need.

Other Media Search Skills Exhibited

As illustrated in Table 5, across all media-oriented search tasks, avoidance of natural language in search queries was the strongest predictor of search effectiveness. The 46% of participants who did not submit natural language queries during the study scored significantly higher than those who did, by spending, on average, 1 minute 14 seconds less on every task. Instances of natural language included prevalent use of stop words (*a, the, of, etc.*), punctuation like commas (which many search engines remove), and full sentences or phrases inappropriate for a search engine to decipher. Natural language is likely a strong predictor of poor media search effectiveness because (1) the extra, ineffective keywords may eliminate appropriate search results or lead to many

more confounding results, (2) more time is spent typing extra words and punctuation, and (3) submitting natural language queries indicates a greater misunderstanding of search engine operation. Admittedly, there is the occasional effective use of natural language. While a search engine may not know the answer to a natural language question, if the natural language question appears in its entirety on another site (e.g. Yahoo! Answers), the natural language query may effectively lead to an answer. But as this data suggest, natural language was more often an indicator of poor understanding of search engine functionality, and still a hindrance, even as much as search engines have progressed in recent years.

While not as detrimental as natural language, relying on a search query suggestions represented another moment of human weakness in the searching process. While taking advantage of the occasional search suggestion did not indicate a significant impact on search effectiveness, participants who consistently relied on search suggestions spent, on average, 48 seconds longer per task than those who never used search suggestions (see Table 5). There is no reason a query suggestion would have any greater insight into a user's search intent than the user. In many instances, participants in this study appeared to form adequate queries on their own, only to abruptly replace them with an unrelated suggestion from the drop-down list. On Task B, one such participant replaced the seemingly effective query <yes "and you and I"> with <yes and you and I studio>. Due to an unwarranted trust in the search engine's ability, this user abandoned what would have been a successful use of an advanced search technique – phrase searching – and added a confounding keyword – *studio*.

Beyond the occasional overreliance on query suggestions, participants generally chose effective keyword combinations. Although the average number of keywords used per search query ranged from 1 to 12, no significant correlation existed between number of keywords used and search effectiveness (see Figure 4). This suggests that students are strategic with their keyword choices, and choose to use more or less keywords when appropriate. One participant in Task A searched <local newswoman at winery crushing grapes with her feet> on YouTube, which returned no results, but then appropriately shortened the query to <newswoman falls grapes>, and found immediate success. Perhaps due to the nature of these tasks (especially Task B, which drove up the keyword average), participants averaged 4.48 keywords per query, higher than the 2-keyword preference previously observed by Jansen and Pooch (2001) and Battelle (2001).

While participants appeared competent in keyword selection and query formation, anecdotal evidence suggests participants would benefit from better critical analysis of search results pages. In many instances, participants formed effective queries that retrieved many top results directly related to the media search task at hand, but never clicked any of the most appropriate results. Often in these cases, any of the top three results would have led to a successful task completion, but the participant may have clicked on the unrelated fourth, many times after hovering the mouse for a period of time over the more appropriate results. Some participants even landed on appropriate destination pages but left before noticing the target media content available or how to initiate it. Perhaps students unfamiliar with the conventions of online media content need to be taught what to look for in page titles and descriptions on search results pages, or

what context clues commonly lead to media content. Pan et al. (2007) identified this lack of critical results analysis in their study, but observed participants' blind reliance on search result order. Many participants in the present study, after effective queries, would actually have benefitted from a blind reliance on result order, rather than foregoing the top, most appropriate results. While this study did not focus on effective results page analysis, observation in this study suggests this is the aspect of media search literacy participants could improve upon most. Certainly it is a topic deserving of focus in search literacy education.

Related to this notion of critical analysis and understanding Web resources, a small, but surprising number of participants in Task A visited the national FOX News Web site, which does not contain the "Grape Lady" video. The screenshot from the task's instructions included a *FOX5* graphic, because the video originated from a local FOX affiliate's newscast. These participants could have benefitted from a better understanding of the loose relationship between FOX affiliates and the FOX News cable channel, but also a better understanding of what types of media content to expect from what types of Web sites. The Internet is diverse, but there are many commonalities and conventions that, when recognized, could aid students in their navigation.

Other predictors of weakened media search effectiveness on specific tasks were use of misspelled search queries and unnecessary capitalization on specific tasks (see Table 5). Misspellings have an obvious detrimental effect on search effectiveness, but unnecessary capitalization does not alter search results, and would likely have little direct impact on search effectiveness. While unnecessarily capitalized words alone would be

unlikely to contribute much to the extra time participants used in Task A, they indicate a greater misunderstanding of search engine technology, which likely affected media search effectiveness in various, additional ways.

While not a target of this research, the data suggests a rural high school education was also a strong predictor of media search effectiveness, as demonstrated in Table 5. While significant differences did not exist between all high school areas, rural-educated participants scored significantly higher than urban-educated participants. This finding is consistent with Gunn and Hepburn's (2003) observation that high school students with computers at home learn greater search skills, because students in urban environments are less likely to have computers at home (U.S. Department of Education, 2006, p. 15).

Limitations and Future Research

This study provides interesting insight into the navigation behavior of media-seeking students online, but is limited in its scope by practicality. Three isolated search tasks cannot fully capture the level of MSL and specific skills college students possess. Future research should contribute to a broader sample of media-oriented search tasks measured, and focus on the areas that preliminarily appear to weigh greatest on media search effectiveness: natural language and critical analysis of search results pages. Future studies could also isolate and control for the testing of individual MSL skills, or ask students to identify their personal strengths, weaknesses, and goals related to reaching media content online.

Participants' motivations during task performance were impossible to gather from screen-captured videos. Use of the minus (-) sign, for instance, was always coded as an

incorrect use of Boolean, although it could be argued that many participants used it as an extension of their natural language grammar, without knowing the Boolean implications. Therefore, some search mistakes could have been coded differently had participants' true motivations been known.

While mostly indicative of the gender disparity in a university environment, women outnumbered men in this sample, by more than 2 to 1. Fortunately, overall search effectiveness scores did not differ between genders, but as Task C results suggested, gender differences in search behavior do exist.

This study was designed to limit confounding influences, but it is likely the order of the search tasks played some role in altering natural performance. Naturally, successes or failures on early tasks likely affected behavior in the later tasks to a degree. Especially in providing the easiest task at the start, with a goal that led many participants to YouTube, participants may have been encouraged or primed to repeat their use of YouTube, which may have skewed participants' actual allegiance to the search engine.

Any study of the live Internet also faces the research challenges of a dynamic environment. For instance, The WB's Web site, which carried the "Angel" premiere episode during the design of this study, removed it during *most* of the study period. While several participants looked without success for the episode on The WB's Web site, it became temporarily available for one participant, who used the destination to successfully complete Task C.

Recommendations

It is apparent from this study and previous research that about half of college

students have received prior search training, mostly in high school. An even greater number recognize a personal opportunity for growth and are ready and willing to learn more. At present, formal education has failed to provide a search literacy edge over self-teaching, but it is clear that students only have a cursory understanding of existing search technology and techniques. Educators must remain true to their dedication to encourage media literacy in the classroom by embracing new media literacies, including media search literacy. Further research must identify whether current training needs to be augmented or replaced, or if additional training must be implemented either at the high school or college level. Literacy scholars must devote more focus into this field of study to keep pace with changing technology and media trends. Together, the most effective search literacy skills must be identified and shared with students. This includes helping students become aware of the current tools and resources available to discover media content online, enabling them with the critical reasoning to see a search query through to the best results, and teaching beyond how to operate a search engine, but also how search engines operate. This level of comprehension is required before students can understand why natural language and reliance on query suggestions appear to hinder search effectiveness, and why phrase searching or even the archaic Boolean operators can be beneficial. Students have the desire, and possibly personal and professional obligations, to become masters of search literacy. Educators and scholars now have a mandate to help proliferate these skills to media consumers as they traverse an evolving media landscape.

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APPENDIX A
PRE-TASK SURVEY

1) Do you own a computer?

- Yes
- No
- I don't know

2) Do you have access to the Internet?

- Yes
- No
- I don't know

3) Whether at home or elsewhere, how many hours do you use the Internet on an average day?

- Zero hours (If you answered “Zero,” skip to the end of this page.)
- More than zero, up to 1 hour a day
- More than 1, up to 2 hours a day
- More than 2, up to 4 hours a day
- More than 4, up to 8 hours a day
- More than 8 hours a day

4) Do you ever access media on the Internet, including video, television, audio, music, photos, news, or blogs?

- Yes
- No
- I don't know

Why do you access media online?

Please choose your level of agreement with the following statements.

5) I consume media (video, television, audio, music, photos, news, blogs, etc.) on the Internet... [on a 5-point scale from *Strongly Disagree* to *Strongly Agree*]

- ...to hear more points of view.
- ...so I can share what I find and talk about it with others.
- ...so I can visit the sites my friends tell me about.
- ...to look for information.
- ...because it's a good way to research.
- ...to learn.
- ...to better understand news of the world and current events.
- ...to satisfy my curiosity.
- ...because it helps me better understand myself and others.
- ...because it's convenient.
- ...because I can find what I want, with little effort.
- ...because I can use it anytime, anywhere.
- ...because it's entertaining.
- ...because it's enjoyable.
- ...because I like to do it.

Your Usual Internet Use

6) In your usual Internet use, do you use search engines? (“Search engine” refers to any website in which you type in a string of words to produce a list of relevant results or Internet destinations. Popular search engines include Google, Yahoo! Search, Microsoft Live Search, AOL Search, and Ask.com.)

- Yes, I use a search engine nearly every time I go online.
- Yes, I use a search engine occasionally.
- No, I never use search engines.
- I don't know whether or not I ever use any search engines.

7) In your usual Internet use, which operating system (OS) do you use most often to access the Internet?

- Windows Vista
- Windows XP
- Mac/Apple
- Linux
- I don't know.
- Other, please specify

8) In your usual Internet use, which Web browser do you use most often to access the Internet?

- Mozilla Firefox
- Internet Explorer
- Google Chrome
- Apple Safari
- I don't know.
- Other, please specify

Your Usual Search Engine Use

“Search engine” refers to any website in which you type in a string of words to produce a list of relevant results or Internet destinations. Popular search engines include Google, Yahoo! Search, Microsoft Live Search, AOL Search, and Ask.com.

9) How many times per week do you use a search engine to find information online for school work or academic research?

10) How many times per week do you use a search engine to find media content (video, television, audio, music, photos, news, or blogs) online, for non-academic purposes?

Search Ability & Training

11) Where did you learn how to use search engines? (Check all answers that apply.)

- I taught myself or figured it out from friends.
- In high school, I learned some search engine skills in a class or training session.
- In college, I learned some search engine skills in a class or training session.
- Outside of school, I learned some search engine skills in a class or training session.
- I do not know how to use any search engines.

12) How confident are you in your ability to find media content online?

- If it's on the Internet, I can probably find it.
- I'm pretty good at finding things online, but sometimes I need a lot of time to do it.
- I'm neither good nor bad at finding things online.
- Sometimes I need help, because I run into trouble finding some things.
- I can never find anything I'm looking for online.

13) What percentage of all college students do you think are better than you at finding media content online?

(Choose a number between zero and 100.) (A lower number means you're better at finding content.)

14) Do you think you would benefit from training designed to teach better online search techniques?

- Yes, I think I have something to learn about searching online.
- I don't know. Maybe.
- No, I doubt training would improve my online search ability.

15) If offered, would you sign up for search training?

- Yes, even if it had a minimal cost associated with it.
- Yes, but only if it were free.
- No, I would not sign up for training, even if it were free.

APPENDIX B

TASK CODING SHEET

<p>SEs used (○1st, ☆success)</p> <p>Google _____</p> <p>YouTube _____</p> <p>Live Search _____</p> <p>Yahoo! _____</p> <p>() _____</p> <p>() _____</p> <p>() _____</p> <p>() _____</p>	<p>Advanced</p> <p><input type="checkbox"/> correct phrase _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct Boolean _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct advncd. _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct other _____</p> <p><input type="checkbox"/> incorrect _____</p>	<p># Keywords used:</p> <table border="1" style="width: 100%; height: 20px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <p>AVG: _____</p> <p>Human error</p> <p><input type="checkbox"/> query suggest _____</p> <p><input type="checkbox"/> natural language _____</p> <p><input type="checkbox"/> misspelling _____</p> <p><input type="checkbox"/> SE correct? _____</p> <p><input type="checkbox"/> unnecessary CAPS _____</p>											<p>Task A</p> <p>1 = 60</p> <p>2 = 120</p> <p>3 = 180</p> <p>4 = 240</p> <p>success destination/FAIL _____</p> <p>error? <input type="checkbox"/></p> <p>incorrect? <input type="checkbox"/></p> <p>advanced? <input type="checkbox"/></p> <p>time _____ pageloads _____</p> <p>first SE _____ star SE _____ most SE _____</p>
<p>SEs used (○1st, ☆success)</p> <p>Google _____</p> <p>YouTube _____</p> <p>Live Search _____</p> <p>Yahoo! _____</p> <p>() _____</p> <p>() _____</p> <p>() _____</p> <p>() _____</p>	<p>Advanced</p> <p><input type="checkbox"/> correct phrase _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct Boolean _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct advncd. _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct other _____</p> <p><input type="checkbox"/> incorrect _____</p>	<p># Keywords used:</p> <table border="1" style="width: 100%; height: 20px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <p>AVG: _____</p> <p>Human error</p> <p><input type="checkbox"/> query suggest _____</p> <p><input type="checkbox"/> natural language _____</p> <p><input type="checkbox"/> misspelling _____</p> <p><input type="checkbox"/> SE correct? _____</p> <p><input type="checkbox"/> unnecessary CAPS _____</p>											<p>Task B</p> <p>1 = 60</p> <p>2 = 120</p> <p>3 = 180</p> <p>4 = 240</p> <p>success destination/FAIL _____</p> <p>error? <input type="checkbox"/></p> <p>incorrect? <input type="checkbox"/></p> <p>advanced? <input type="checkbox"/></p> <p>time _____ pageloads _____</p> <p>first SE _____ star SE _____ most SE _____</p>
<p>SEs used (○1st, ☆success)</p> <p>Google _____</p> <p>YouTube _____</p> <p>Live Search _____</p> <p>Hulu _____</p> <p>() _____</p> <p>() _____</p> <p>() _____</p>	<p>Advanced</p> <p><input type="checkbox"/> correct phrase _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct Boolean _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct advncd. _____</p> <p><input type="checkbox"/> incorrect _____</p> <p><input type="checkbox"/> correct other _____</p> <p><input type="checkbox"/> incorrect _____</p>	<p># Keywords used:</p> <table border="1" style="width: 100%; height: 20px;"> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> <p>AVG: _____</p> <p>Human error</p> <p><input type="checkbox"/> query suggest _____</p> <p><input type="checkbox"/> natural language _____</p> <p><input type="checkbox"/> misspelling _____</p> <p><input type="checkbox"/> SE correct? _____</p> <p><input type="checkbox"/> unnecessary CAPS _____</p>											<p>Task C</p> <p>1 = 60</p> <p>2 = 120</p> <p>3 = 180</p> <p>4 = 240</p> <p>success destination/FAIL _____</p> <p>error? <input type="checkbox"/></p> <p>incorrect? <input type="checkbox"/></p> <p>advanced? <input type="checkbox"/></p> <p>time _____ pageloads _____</p> <p>first SE _____ star SE _____ most SE _____</p>
<p>Results Clicked</p> <p>1st _____</p> <p>2-4 _____</p> <p>5-10 _____</p> <p>>10 _____</p>	<p>Notes</p> <div style="border: 1px solid black; height: 50px; width: 100%;"></div>		<p>video ID _____</p> <p>FAIL: ___/3</p> <p>error: ___/3</p> <p>incorrect: ___/3</p> <p>advanced: ___/3</p> <p>first SE _____ star SE _____ most SE _____</p>										

APPENDIX C

POST-TASK SURVEY

1) How did the three web-surfing tasks you completed for our research compare to your usual Internet use? Were our tasks easier or harder than you're used to? [on a 5-point scale from *Much harder* to *Much easier*]

- Task A ("Grape Lady" blooper video)
- Task B ("And You And I" song)
- Task C ("Angel" TV show)

2) In the three web-surfing tasks you completed for our research, did you use any search engines? ("Search engine" refers to any website in which you type in a string of words to produce a list of relevant results or Internet destinations. Popular search engines include Google, Yahoo! Search, Microsoft Live Search, AOL Search, and Ask.com.)

- Yes, I used at least one search engine (like Google, Yahoo!, or another type) to find what I was looking for.
- No, I did not use any search engines.
- I don't know whether or not I used any search engines.

3) In your usual Internet use, do you use search engines?

- Yes, I use a search engine nearly every time I go online.
- Yes, I use a search engine occasionally.
- No, I never use search engines.
- I don't know whether or not I ever use any search engine

Your Usual Search Engine Use

“Search engine” refers to any website in which you type in a string of words to produce a list of relevant results or Internet destinations. Popular search engines include Google, Yahoo! Search, Microsoft Live Search, AOL Search, and Ask.com.

4) In your usual Internet use, where do you perform the majority of your Web searches?

- Google
- YouTube Search
- Yahoo! Search
- Microsoft Live Search
- AOL (America Online) Search
- Ask.com
- Other, please specify

5) Is your primary search engine usually the only search engine you use?

- Yes, I almost always use that search engine.
- No, I use different search engines for different tasks.

6) When you use your primary search engine, do you usually...

- Navigate to the search engine website?
- Navigate to another website that has your search engine?
- Use a search bar built in to your Web browser?
- Use a desktop application?
- Other, please specify

Search Ability & Training

7) Do you know what Boolean search logic is? If yes, where did you learn about Boolean? (Check all answers that apply.)

- No, I do not know what Boolean is.
- Yes, I taught myself or figured it out from friends.
- Yes, I learned Boolean in high school, at a class or attended a training session.
- Yes, I learned Boolean in college, at a class or attended a training session.
- Yes, I learned Boolean outside of school, at a class or attended a training session.

You've already answered the next four questions, but your answers may have changed. Please answer them one more time.

8) How confident are you in your ability to find media content online?

- If it's on the Internet, I can probably find it.
- I'm pretty good at finding things online, but sometimes I need a lot of time to do it.
- I'm neither good nor bad at finding things online.
- Sometimes I need help, because I run into trouble finding some things.
- I can never find anything I'm looking for online.

9) What percentage of all college students do you think are better than you at finding media content online? (Choose a number between zero and 100.) (A lower number means you're better at finding content.)

10) Do you think you would benefit from training designed to teach better online search techniques?

- Yes, I think I have something to learn about searching online.
- I don't know. Maybe.
- No, I doubt training would improve my online search ability.

11) If offered, would you sign up for search training?

- Yes, even if it had a minimal cost associated with it.
- Yes, but only if it were free.
- No, I would not sign up for training, even if it were free.

Your High School

If you attended multiple high schools, answer the following questions for the school you attended longest.

12) Where did you go to high school?

- In a big city.
- In a suburb.
- In a small town.
- In a rural area.
- I did not go to a high school. (If you did not go to high school, skip to the end of this page.)

13) What type of high school did you attend?

- Public
- Private
- Home schooling

14) How many seniors graduated in your high school class?

- Over 1,000
- 600–1,000
- 400–599
- 200–399
- 100–199
- 50–99
- Less than 50

Questions About You

This is the final page of the survey. We'd like to know a few simple details about you, which, like the rest of this study, will remain anonymous.

15) What year are you in college?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate student

16) What is your age?

17) What is your gender?

- Female
- Male

18) Which one ethnicity best describes you?

- American Indian or Alaska Native
- Hawaiian or Other Pacific Islander
- Asian or Asian American
- Black or African American
- Hispanic or Latino
- Non-Hispanic, White
- Prefer not to answer
- Other, please specify