

Use of Technology in Research

Two Steps Forward, Three Steps Back

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Abstract: Given that universities have embraced new information technologies, we must inquire as to the extent these technologies have promoted and/or hindered the higher educational mission. Technology has increased access overall including simultaneous access to a variety of materials from a multitude of sources. One consequence of this eclectic electronic environment is that while access is increasing, comprehension of what is being accessed seems to be decreasing. Previously, the particular disciplinary focus determined the finding tools that would be used for research. These finding tools, in turn, clearly articulated for the user the materials covered (e.g. books, articles, scholarly journals, newspapers, government documents). This shift from an environment where information access was discipline- and/or publication-specific, to one that is amorphous and constantly changing, has put the responsibility for distinguishing among types, formats, quality, and relevancy directly onto the user. This paper will examine the implications for user education both at the university level and beyond.

Keywords: Research, Technology, Academic Libraries, Library Instruction, Electronic Resources, Metasearching, Federated Searching, Lifelong Learning

Introduction

GIVEN THAT UNIVERSITIES have embraced new information technologies, we must inquire as to the extent these technologies have promoted and/or hindered the higher educational mission of educating students to be lifelong learners as well as responsible, informed contributors to a rapidly changing world. The ability to utilize information and related technologies to the best advantage is vital to academic success as students are required to be creators and evaluators of knowledge. These same skills and abilities become increasingly more vital as students leave the academic environment and pursue their chosen careers. According to the Organisation for Economic Co-operation and Development (1996), the demand for capabilities in selecting relevant information, recognizing information patterns, and interpreting information is increasing. Students possessing these skills will be more marketable in the workplace as virtually the full spectrum of employment opportunity requires increased literacy (Mikulecky & Kirkley, 1998) and higher-level occupations specifically require increased information literacy (Cleveland, 1985). Technology has increased access overall, including simultaneous access to a variety of materials from a multitude of sources. Both faculty and students are more tech-savvy. Yet, despite improved access to materials and experienced technology users, comprehension of what is being accessed and whether it

meets informational needs does not seem to be increasing in a population which requires these skills (e.g. O'Sullivan, 2002). The questions we examine are: Why? and What is the remedy?

In order to effectively access, select, evaluate, and utilize information, one must have a schema or mental model of what types of information are available and the source and function of that information vis-à-vis the problem at hand. Such schemata consist of categorical knowledge, where categories are defined by attributes (e.g., encyclopedias typically have indexes, are arranged alphabetically, and are easily browsable; websites have links that are typically easier to search than browse). They also have a spatial (map-like) and /or temporal (time-specific) quality (Farnham-Diggory, 1994). They are knowledge structures used for organizing associated concepts based on prior experience (Alba & Hasher, 1983.) As will be seen, the development of such informational schema has historically been facilitated by the source of the information itself.

From Print to Electronic Access: An Almost Forgotten History?

In the print era, the research process started with use of the card catalog for identifying books and use of indexes for identifying periodical and other literature. The initial migration to electronic access involved translation of the existing print finding tools to an electronic DOS-based format. Thus, the catalog be-



came electronic, as did selected indexes and abstracts. The content of these tools remained the same (as did the publisher). The electronic catalog still enabled the user to examine the institution's holdings by author, title, and subject. The controlled vocabulary of title, author, and subject served the purpose of focusing the search, and consequently the results. The eventual ability to search 'notes' fields (containing information such as chapter headings and miscellanea) and the ability to keyword search the title and subject fields reduced the probability of false-negatives (not identifying useful items because the user doesn't know the title, author, or appropriate subject heading) by broadening the search. This, in turn, increased the probability of false-positives (identifying non-useful items because a particular word or words appeared in any context in the record). As will be seen, minimizing both types of errors becomes more problematic with advances in technology. At this point, the catalog is identifiable as the finding tool for the physical holdings of books, journals, government documents, and audio-visual materials of the institution.

The pattern of print indexes evolving into electronic format parallels that of the catalog (we use the term 'indexes' to refer collectively to the many varieties of indexes and abstracts of periodical literature). Individual indexes were directly translated into electronic format, but clearly maintained their original identity. Examples include discipline-specific indexes such as Psychological Abstracts (later PsycLit and then PsycInfo) or Historical Abstracts and indexes of broader branches of learning such as Wilson's Humanities Index and Social Sciences Index.

These indexes typically had long histories of publication and well-established controlled-vocabulary terms and classification schemes with which faculty were familiar and which was part of the informal education of undergraduate majors in a discipline. Such classification schemes included terminology and structural information such as content and material types (e.g., literature review, empirical study, secondary study, population, location, time period, book review, editorial, and dissertation).

During the print period, knowledge of the terminology and schemes enabled users to create a useful package of materials through their own examination of search results (i.e., the actual citation, abstract, and other data provided). This process was labor-intensive, involving examination of the index volume by volume, one user per volume at a time. The translation into electronic format enabled one to keyword search and simultaneously search/limit the classification fields, reducing the burden of needing to examine the individual records to view the secondary- and tertiary-level classifications. During the

1970's and 1980's, access to databases was limited, and most of these searches were performed by librarians. In 1977, the demand for ERIC and PsycAbstracts online searches had increased to the point that they were being scheduled two weeks in advance (UTLLOL, 2005). By the mid-1980's, the catalog had gone electronic, and larger universities were providing dedicated terminals for users to search databases; remote access was limited and cumbersome. By the mid-1990's, more user-friendly web versions of some databases were available, some full-text was available, and remote access had increased and become less cumbersome (for examples of timelines of these developments in academia, see Electronic Resources in Transition, 1998 and UTLLOL, 2005).

Those using indexes, both in the print and early electronic years, either knew or quickly found out that index citations, unlike catalog records, were not restricted to the holdings of the institution. Once one identified desired materials, one searched the catalog to determine if the institution carried the periodical. If the institution did carry the book or periodical, the physical item was removed from a physical place by the user or library staff. If the institution did not carry the item, one requested that the item be retrieved from another physical place and brought to one's own library for use. Thus, the delineation between a) finding tools for books and articles (catalogs vs. indexes), b) finding tools restricted to institutional holdings and those independent of institutional holdings (catalogs vs. indexes), and c) the delineation of who owned the materials (direct material access vs. interloan) remained clear. The continuing clarity of content type and spatial location maintained the schemata, in which changes of format were assimilated and schematic categories were altered to accommodate new formats.

This evolution, from print finding tools to electronic finding tools where both source and physical location of items were identifiable, was unequivocally positive, and once one became facile with the technology, generally increased the efficiency of conducting research. It is important to note that these events occurred during the text-based computing era. The development of the graphic user interface (GUI) in the 1990's, the subsequent explosion of information available via the web, and the infiltration of the web into virtually all aspects of life, changed expectations not only about *what* information should be available, but *how* it should be available. And this is particularly true among NetGens.

NetGens and Technology

Today's students are often referred to as the Net Generation (NetGens) or Millenials. They are almost

always connected to technology—whether it is cell phone, wireless PC, PDA, or iPod. In *The Internet goes to college: How students are living in the future with today's technology* (a Pew Internet & American Life Project), Jones and Madden (2002) reported that college students tend to be early adopters of technology and heavy internet users. Internet penetration is much higher among them than in the general population; they lead in file-sharing of all kinds, are twice as likely to download music files, and are heavy users of instant messaging and online chat. In academia, the web is used for participation in online study groups, emailing of assignments, and communicating with professors and fellow students. A number of studies identify the strengths of NetGens as including the ability to multi-task, being goal-oriented, having a positive attitude and a collaborative working style (Oblinger, 2004; for a review of studies, see Lippincott, 2005). Their learning preferences lean toward teamwork, experiential activities, structure, and the use of various technologies (Raines, 2002); and most have a favorable attitude toward the net, are comfortable with interactive communication, and enjoy both for academic and social reasons. A large percentage of students surveyed indicated that internet use has had a positive impact on their academic experience, enabling them to communicate with professors and classmates, conduct research, and access library materials (Jones & Madden, 2002).

Despite all of the above, the anecdotal consensus is that many students, undergraduate and graduate, have difficulty with the research process, and this consensus is supported by the empirical literature. Some of these difficulties include a lack of rudimentary understanding of types of publications as well as where to search for them (Allen, 1990; Nash & Wilson, 1991; Novotny, 2004; Wallace, 1993;); disciplinary perspective, currency of materials, distinctions among citations for books, articles, chapters, dissertations, and webpages; and distinction between scholarly v. popular publications (Borgman, 1996; Nash & Wilson, 1991); the use of Boolean operators and synonyms to modify searches (Novotny, 2004; Tallent, 2004), and how to identify and/or retrieve articles and books. That a specific publication may be available through several vendors, and coverage may vary by vendor (in terms of all or selected articles, indexing, abstracting, or full-text, and time period included) adds to the confusion (Electronic Resources in Transition, 1998).

Despite this confusion in the geometrically-expanding universe of available information, there is a continuous clamor for one-stop-shopping – one common place where one can access all information, all the time, from anywhere. Advances in technology and their collective life experience has led NetGens

to become increasingly impatient with the multiple agencies involved in the process of information access and the lack of distinction between hardware, software, content, and the assistance they need to utilize it all (Ferguson, 2000; Tallent, 2004).

From There to Here – and Perhaps Back Again?

As mentioned earlier, the earliest print-to-electronic conversions occurred in the pre-web era. The explosion of the web created an environment where traditional publishers of indexes need to make their products usable and marketable in a new and ever-changing environment. ‘Vendors’ stepped into this competitive void – the business of how the index contents would be accessed. A single product (e.g., Humanities Index, Philosopher’s Index) could be licensed to several different vendors, who would then license their rendition (interface) of the original product content to the end-user (universities, libraries). Vendors could also license several different indexes, etc. and make them available through a unified interface. The advantage of this was that users needed to learn fewer interfaces; it met the demands of NetGens who wanted instant gratification. It also blurred the lines of what exactly they were accessing. The original indexes, with their long histories and known classification schemes, lost their disciplinary identities even for experienced users. However, the delineation between the catalog for books, electronic indexes for periodical citations, and the independence of indexes from holdings, was still relatively clear to experienced users and easy to explain to novice users.

Another advance occurred as some, but not all, periodical publishers agreed to make some, but not all, of the full-text of selected publications or articles available electronically. While easier and increased access to the text of articles was welcomed by the research community, this created confusion regarding the contents of a database (i.e., citations, abstracts, full-text and disciplinary perspective). This confusion is further compounded by the variety of available databases, both discipline-specific and multi-disciplinary, containing popular and scholarly literature, with multiple interfaces. Previously, the particular disciplinary focus determined the finding tools that would be used for research. These finding tools (e.g. indexes, abstracts, bibliographies), in turn, clearly articulated the materials covered (e.g. books, articles, scholarly journals, newspapers, government documents). This shift from an environment where information access was discipline- and/or publication-specific, to one that is amorphous and constantly changing, has put the responsibility for distinguishing

among types, formats, quality, and relevancy directly onto the user.

At the same time, universities find themselves in a highly competitive recruiting, funding, and research dollar environment. They are highly sensitive to meeting the information requirements of students and faculty. These factors have led institutions to invest tremendous monies in acquiring print and electronic resources. This money is not well-spent, however, if users are unable to utilize these resources effectively; often users are not aware of available resources, and/or are overwhelmed by the scope of those resources (e.g., Tallent, 2004). Thus, the university library invests much of its personnel resources in organizing its own holdings, subscription products, and publicly available information in order to increase accessibility and utility to its users.

Such is the reality at a growing number of universities: a cornucopia of resources is more readily available -- content, remote access, 24-hour access, subject guides, and links to information that was previously difficult to identify and access, such as grey literature, government information, research reports from non-governmental and independent organizations, professional and advocacy organizations, international sources of information, etc.

But despite all of the above, students still find navigating this wealth of resources to be a difficult if not insurmountable task, and resort to their tried-and-true tool -- Google (see Lippincott, 2005).

From Google to Metasearching

Why are students so attracted and loyal to Google? Perhaps because Google offers a simple, uncluttered interface that will virtually always return some results to a search query no matter how badly it is formulated or spelled. The understanding that getting search results to the most primitive search is a primary motivating factor for users has led to the development of similar technologies for subscription products such as catalogs and electronic indexes. The current rendition of this is embodied in what is referred to as federated- or meta-searching.

Federated searching refers to a new technology that allows a variety of information resources (subscription databases, library catalogs, and public websites) to be searched simultaneously from a common user interface. The technology allows a particular institution to customize which databases are to be included in the federated search. Is this a possible solution to the information-seeking habits of the Net Gen students who are searching Google for every information need and ignoring the costly library resources that offer the quality information required by their professors?

From the NetGen point of view, and to the extent that it is similar to Google, federated searching offers several advantages. By searching pre-selected resources simultaneously, the need to know which database to select among the many offerings is reduced. Information retrieved from sources that may not have otherwise been searched but is relevant may be retrieved. And, most attractive to students, as the number of databases to search individually is reduced, the number of different interfaces to become familiar with is also reduced. The entire process becomes much less intimidating.

Although this technology offers many benefits, there are potential problems that must be seriously considered. These issues fall into two categories, technological and pedagogical.

As with Google, technological issues such as merging, reliably de-duplicating results, and relevance ranking have not been perfected. Users will retrieve more results, but the probability of false-positives will also increase. Federated search results are also reduced to the level of the 'lowest common denominator,' i.e. a federated search system can only utilize features that are common to all the databases included in the system. The ability to exploit features such as Boolean logic, full-text searching, and limiters (e.g. date range, type of material, language) is sometimes reduced. In addition, the retrieval of a greater number of results requires the user to do more sifting of those results.

Most of these issues may not be considered problems by students. In a study of a federated search tool at Boston College, Tallent (2004) found that both undergraduate and graduate students perform rudimentary keyword searches; if the text does not meet their need, they prefer to conduct an entirely new keyword search rather than refining the existing search using subject searching or limiters (also observed in catalog searching by Novotny, 2004 and Turner & Beck, 2002). They also do not sift through the large number of results (Tallent, 2004). Why should they? As Tallent points out, in a Google world, the most relevant results are listed first!

A number of existing pedagogical issues are exacerbated by federated searching technology. As mentioned earlier, before federated searching, the user needed to identify the type of material required before starting to search. Federated searching does not require this as a *preliminary* step. This is, however, a *necessary* step as different types of literature provide different perspectives and fulfil different needs. As indicated earlier, students typically have difficulty distinguishing between scholarly and popular literature and the appropriate use of each. When many materials went from the physical form and physical location to an electronic format, users lost contextual clues as to the origin, type, and pub-

lication cycle of the material. For example, books are generally in one area of the library and periodicals are in another. When a user accesses periodicals, the physical form of a newspaper is quite different from the physical form of a journal. It is also clear that publication cycles differ, which, in turn, determines the accuracy and depth (news vs. analysis) of the content. Electronic access to periodicals blurred the lines between different types of periodicals but they were still distinguishable from books. Interestingly, in a study of faculty attitudes toward the transition from print to electronic journals, some faculty expressed concern with losing the connection to the original manifestation of a work, indicating an awareness of the importance of the physical form (Sandler & Palmer, 2003). Federated searching, which can identify and/or retrieve books, government documents, websites, and various types of periodicals even further reduces the ability to distinguish between different types of materials, for the novice and sometimes even for the experienced user. Even presupposing the ability to distinguish among types (and thus appropriateness) of materials, there is another user pattern which impacts retrieving appropriate materials—lack of persistence in result scanning. A number of studies have shown that users only look at the first one or two screen pages generally (e.g. Tallent, 2004) or when the number of results exceeds thirty (Wiberley, Daugherty, & Danowski, 1990). Another study (Barbuto & Cevallos, 1991) found that while users wanted a ‘comprehensive’ search, when queried about the meaning of such a search, over half indicated that it meant one to twenty items.

Can this technology “out-Google Google?” Fryer (2004) questions. She points out that “federated searching is *not* for power searching needs....it is a good starting point, but never the ending point, for sophisticated search needs.” (p. 19). Federated searching is one more tool that can be added to a library’s suite of resources that may be appropriate for some needs and not for others. Students, however, may consider this to be a panacea for all their needs. What is the role of library research instruction for both students and faculty in this environment?

Role of Library Instruction

In 1975, before digital libraries existed, Elizabeth Frick clearly articulated the role of library instruction:

Ultimately, we should aim at developing intelligent persons who, independently, can locate and assess the sources of information needed for a wide variety of intellectual, social, and personal concerns.....We need to educate students who are able to discriminate among the various sources of information in order to

locate pertinent data and to discover countervailing opinions to those which are first presented to them. We want to help students develop a sense that they receive data from a variety of sources: libraries, mass media, community agencies, politicians, experts, and friends. Some of these sources will prove to be reliable, some will need always to be carefully checked..... the student is taught the appropriate skills in information location and selection, as well as helped to acquire an appreciation of the interconnections between information structure, reference source structure, and retrieval methods. (p. 12).

These goals of library instruction are still relevant today. Students need to become familiar with information structure within their discipline and also how knowledge is generated and disseminated in society. Students need to be aware that although these information products may be delivered through a common interface, they vary as to their source, their timeliness, depth of analysis, point of view, accuracy, authority, credibility and that these issues are critical in determining whether the information is appropriate to their need.

Librarians and faculty are concerned that students have more difficulty with evaluating sources of credible information in the electronic environment. Some faculty have responded by not accepting URLs as a credible source. Although this is an option, many valuable sources of information may be overlooked. The web provides access to official government information that may only be available electronically, many research organizations and associations disseminate their findings through the web, and many universities and other organizations are digitizing valuable primary source collections.

Rather than restricting students from using certain types of resources because they are *not* critical users, we need to work with faculty to educate students in order to *become* critical users; to understand what types of resources currently exist and in what formats, how to critique information and resources, and which are best suited to various informational needs. Faculty need to design assignments which can be carried out successfully within the time and material constraints that exist, and students need to learn why some resources are appropriate to the assignment and why others are not, and how to access and use them. The librarian needs to work with both the faculty and the students toward meeting these goals. As the electronic environment becomes both more complex and more amorphous, library instruction becomes more important in fulfilling the broad educational mission of the university.

Birdsall (1994) argues that “librarians should be identified with a broad concern for the collection,

organization, and dissemination of knowledge, rather than a narrower focus on information... Librarianship is among the few professions with the experience in organizing books, journals, and other media into coherent bodies of knowledge” (p. 152). The focus of academic librarianship is not only to demonstrate how to access information. It should also foster an understanding of how fragmented pieces of information are different yet coalesce to form a coherent body of knowledge in a discipline. “Information is only part of the lesson and the focus of our attention needs to be on educating about knowledge—why the documents in our collections [electronic or otherwise] figure in that inquiry ...” (Hubbard, 1995).

Advances in information technology have increased access to a wide variety of puzzle pieces. Instruction teaches them how the pieces fit together into a meaningful whole.

Library Instruction Models

Library instruction programs operate on a number of different models. Library instruction presently takes many forms including assignment-based workshops, credit-bearing information literacy courses, online tutorials and workbooks, and freshmen year programs, each of which have limitations, including task-orientation rather than literacy-orientation, low motivation due to lack of academic credit or grading, lack of relevancy, and non-transferability of learning (for an overview of models and their limitations, see Dolan & Martorella, 2003). These limitations have led many librarians to advocate for discipline-based information literacy programs with a true collaboration between course faculty and library faculty (Amstutz & Whitson, 1997; Bruce, 2001; Dennis, 2001; Dupuis, 1997; Grafstein, 2002; Leckie & Fullerton, 1999; Nerz & Weiner, 2001).

As mentioned earlier, advances in technology have resulted in the loss of many of the physical and locational contextual clues that lend meaning to information. This loss of external context must be replaced. Based on schema theory, Dolan and Martorella (2003) suggest that students need a mental model of information that will enable them to access and use a variety of materials to answer a variety of information needs. First and foremost, students need to be able to clearly articulate an information need in order to determine both the types and depth of the sources required. In a model still applicable today, Voight (1961) proposed that an information need may be approached in one of three ways. The ‘everyday’ approach addresses a straightforward need for factual information. Students who are familiar with a variety of reference sources will learn to recognize those that can be used to answer a particular factual question. The ‘current’ approach to information gathering

addresses a need for up-to-date information. Students who can recognize the need for this type of information need to become familiar with those tools that provide access to current information such as newspapers and magazines. The ‘exhaustive’ approach addresses a requirement for an in-depth examination of a topic. This need requires an exhaustive search of reference tools and both general and discipline-specific resources to gather the necessary information to fulfil this type of need.

Some web resources found through search engines like Google are very suitable for meeting *some* of these information needs in *some* fields. When it became apparent to faculty and librarians that students were relying on web resources for *all* of their information, the need for evaluation became apparent and this has been increasingly incorporated into library research instruction. As library tools move towards becoming more ‘Google-like’, including results of many types of resources coming from a variety of places, evaluation as to source, currency, accuracy, and relevancy will continue to increase in importance.

Federated searching creates a shift from an environment where information access was discipline-and/or publication-specific, to one that is amorphous and constantly changing. It has put the responsibility for distinguishing among types, formats, quality, and relevancy directly onto the user. *Technically*, users can conduct a search without knowing what it is they need, but *effectively*, they still need to know what they need before they can analyze the results in terms of that need.

Previously, this decision was partially satisfied by the selection of the finding tool itself which provided some contextual clues as to the type and quality of information that would be retrieved. Typically, at this point in time, federated searching requires that these distinctions be made at the item level for every item retrieved. This is particularly problematic because, as mentioned earlier, users tend to only look at the first page or two of results (or a limited number of items (e.g. Wiberley, et al, 1990)). Tallent (2004) found that student reaction was mixed regarding having metasearch results sorted according to the database from which they were extracted; duplication of results increases from such sorting; he also found that they only scan the first few pages. If students are only willing to look at the beginning of the result list, it becomes critical that they understand concepts such as Boolean logic, using limiters, field searching, keyword vs. subject searching and the significance of these variables on the result set so that their search set is shorter and more focused. Library instruction is essential in providing these skills as well as equipping students with that mental model (schema)

of the research process that will enable them to successfully conduct research to solve a problem.

In a chapter on restructuring academic libraries, Schwartz (1997) points out that while rapid technological changes created *the need* for new structural patterns and interdependent relationships among university departments, it did not in fact *create* those changes. In a similar vein, technological changes in library materials and access have created a *need* for changes in the work of academic librarians and their relationship to the rest of the academic enterprise, but have not actually *created* those changes. As Harley, Dreger, and Knobloch (2001) have asserted, librarians can “provide students with more context, more general principles, and less information. The context in which information is presented can convey more than information alone, providing meaning and value. Make student learning a relevant, coherent progression toward increasing self-reliance” (p. 31). Arguing that the instructional model should be the main focus of librarians, Birdsall (1994) also asserts that we should be promoting user self-sufficiency. As argued elsewhere (e.g., Grafstein, 2002), this type of paradigmatic change requires the collaboration of library faculty, other course faculty, and administrators at the library and the university level.

Library instruction, as well as the reference encounter, can work together to help students be self-sufficient. Many academic librarians share an instructional philosophy of reference service wherein the reference encounter is considered a ‘teachable moment’ occurring at the point of information need rather than merely providing information from a source. In today’s digital environment, academic libraries can also reach out to those students who do not enroll in a library instruction course, are not exposed to single-session library research classes, or do not seek assistance at the reference desk. Libraries can promote services such as online ‘chat’ reference, email reference, online tutorials and subject guides, and individual research appointments to connect with students in order to promote information literacy concepts.

Summary

When students leave the academic environment, their levels of access to different types of information will

change as well as the tools they will have at their disposal. In preparing students for lifelong learning in a rapidly changing digital environment, learning to use specific tools is not enough, particularly as those tools lose their specificity. So what is it that students need to learn and how will they learn it? As mentioned earlier, development of informational schema has in the past incorporated the physical cues of the various indexes, catalogs, physical item location and visual cues of the item itself (e.g., newspaper v. book). As these cues are rapidly evaporating, it becomes even more critical that users internalize an informational schema incorporating a match between need assessment (Voight, 1961) and source categories (Farnham-Diggory, 1994). With the reduction in physical clues, the user must engage in higher-order conceptual learning (outlined in Dolan & Martorella, 2003), typically through information literacy instruction. Virtually the full spectrum of employment opportunity requires increased literacy (Mikulecky & Kirkley, 1998) and higher-level occupations specifically require increased information literacy (Cleveland, 1985). Those who lag behind will pay a steep price socially and economically. Federated searching is not the problem. Federated searching highlights the myriad problems that users have accessing, evaluating, and appropriately using information. Not all users are in an information environment where they have access to information literacy instruction. For those who are, however, it would be a lapse of institutional responsibility to not incorporate information literacy into the higher educational enterprise. This is reflected in the standards set by accrediting agencies such as the Middle States Commission on Higher Education’s requirement for an information literacy component in the undergraduate curriculum (2002, Standard 12, p. 37-38). Academic librarians, course faculty, and university administrations need to work together to embed information literacy concepts and standards within the curriculum in order to equip students with a model of information seeking that will enable them to continue the process of lifelong learning, a requirement for a comfortable life in our society. This is particularly true in the current and evolving environment which is more convenient in terms of access, but more demanding in terms of evaluation.

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