

Information Fluency: A Literary Review

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Abstract

Research continues to confuse computer literacy with Internet literacy, and Internet literacy with Information Fluency. Research strategies are not computer operations and there is a need for a more specific vernacular in regards to Internet research. Researchers may need to acknowledge the New Literacy and conform to ISTE's NETS standard of Internet information fluency in order for this impediment to be resolved

1.0 Introduction

The world population is approximately 6.5 billion, and, of that total, some 1.3 billion people use the Internet—an increase of 244% since 2000. In North America, Internet usage ranks among the highest in the world, at about 70% of the population. This is an increase of 117% since 2000, according to the World Internet Statistics (2007). ComScore reported Google handled over 37 billion searches in August of 2007, which is approximately 1.4 million Internet searches every minute (Jesdanun, 2007).

Regarding the pace of technological change and the coming explosion of information-technology, Kurzweil (2006) suggested that technology would irreversibly alter existence on this planet. He said, "We stand on the threshold of the most profound and transformative event in the history of humanity, the 'Singularity'" (p. 39).

Postman (1993) wrote about a similar impact that technology would have on society:

New technologies alter the structure of our interests: the things we think about. They alter the character of our symbols: the things we think with. And they alter the nature of community: the arena in which thoughts develop...For something has happened in America that is strange and dangerous, and there is only a dull and even stupid awareness of what it is—in part because it has no name. I call it Technopoly. (p. 20)

In *Technopoly*, Postman (1993), attempted to warn America that technological changes are not cute little inventions that make our lives more convenient and fun, but, in fact, these little changes are "all out war that would transform the very fabric of society as we know it" (p. 18). He felt technological changes would threaten our institutions and put them in crisis. Postman predicted that education would not be the exception to this cataclysmic paradigm shift: "This is serious business which is why we learn nothing

when educators ask, 'Will students learn mathematics better by computers than by textbooks?'" (p. 18).

Tapscott (1996) also addressed the coming Singularity when he wrote, "The result is the new world disorder, unfolding at warp velocity. Previously unimagined changes taking place in the world and their implications for our professional and personal lives are relentless" (p. 5). Tapscott pointed out that the new world order will revolve around a new industrial sector "from the convergence among computing (computers, software, services), communications (telephone, cable, satellite, wireless), and content (entertainment, publishing, information providers)" (p. 5).

November (2001) suggested that the "Internet is the Wild, Wild West of information and there is no sheriff in town" (p. xxv). November states that:

It is essential that students learn information literacy: how to access and validate information and understand the organization of information. Communication literacy will also become a basic skill—if students do not understand the basic grammar of the Internet they will be manipulated by people who do." (p. xxv)

November (2001) wrote that "Rather than talk about making students computer literate or technically literate, there are now two essential literacy's: information literacy and communication literacy" (p. xxv). November admonishes educators to "provide students with meaningful learning experiences that empower students with how to use computers, fax machines, digital cameras, and other technology as productive and innovative learning tools that lead to information fluency" (p. 21). November stresses that computer literacy is not about the technology, but about the ability to use technology to solve real problems.

November (2001) addressed constructivism when he said "Rather than relying on textbooks to make meaning for students, teachers can now challenge students to construct their own knowledge" (p. xxvi). November admonished teachers to "stay focused on what is flowing through the technology--information" (p. xxi). According to November, the real dynamic change that is coming is the shift of control "At the core of the change is a shift of control of who manages learning" (p. xxi).

When November (2001) talked about information literacy he identified it as the new skill. November warns that the

Internet is the global classroom and that it is seductive and distracting:

There are people and organizations that hope our schools do not teach students how to validate or evaluate the information they encounter on the Web. Understanding the grammar of the Internet, just as we do with print media, is the first step in helping students to be more astute and careful about how they interpret information on the Web. If you do not know the rules, it is impossible to win the game. (p. 2)

November (2001) suggested that educators need to reveal the structure of information on the Internet to students; “There is an Internet grammar that necessitates that students know what is the Internet’s equivalent to, among other things, footnotes, indexes, and bibliographies” (p. 5).

When addressing critical thinking, November (2001) pointed out that students are often equipped to handle the technical side of the Internet, but fail to have the tools to make sense of the information “The Internet is a place where you can find proof of essentially any belief system that you can imagine” (p. 16). November warned parents that “Students too often mistake technical mastery with critical thinking” (p. 16). Finally, November warned us that filtering is not the answer and in fact only works some of the time in the classroom. November wrote “blocking students to the Internet in school is a short-term victory—a classic case of winning the battle and losing the war—filtering without teaching students critical thinking skills is too often the swiftest and politically expedient thing to do” (p. 19).

This topic, Information Fluency, is important for several reasons and while the information so far has been challenging and informative, it has been primarily personal or anecdotal. According to Kurzweil (2006), there is an explosion of information-technology about to happen. If this is true, then serious minded Instructional Technology and Distance Education students would want to consider the academic point of view and review some primary research.

2.0 Methodology

The information used in this literature review came from books, journals, and dissertations. There was an attempt to gather research that was not more than five years old, except in the case where it was necessary to establish landmark or classical studies and theories (e.g., Bruner and Constructivism). The primary problem was that there seems to be a collective confusion regarding “computer literacy” and “information fluency” vernacular. It seems that the terms have a variety of different interpretations and misunderstandings.

Primary to the consideration in this literature review, of information fluency, is a constructivist view of pedagogy.

Constructivism (Bruner, 1966) is a cognitive psychology theory of learning that says students construct or build their own skills and knowledge from their current or past experience. Since online research is an attempt to construct knowledge from information provided on the Internet, some researchers might connect that process of researching and constructing knowledge with constructivism.

One definition of Information Fluency is provided by the International Society for Technology in Education (ISTE) and their Student National Educational Technology Standards for Students (NETS-S). The basic NETS tree identifies Creativity and Innovation, Communication and Collaboration, Research and Information Fluency, Critical Thinking, Problem Solving and Decision making, Digital Citizenship, and Technology Operations and Concepts. This literature review will focus on Research and Information Fluency. In ISTE’s NETS-S (ISTE, 2007) Information Fluency is defined as the following:

Students apply digital tools to gather, to evaluate and use information. Students

- a. plan strategies to guide inquiry
- b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
- c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks, and
- d. process data and report results.

For purposes of this paper the following keywords were very helpful in locating the primary research: Information-literacy, information-fluency, techno-literacy, digital-literacy, computer-literacy, search engine literacy, functional-literacy, literacy theory, Internet literacy strategies, scaffolding keywords, media-literacy, constructivism and literacy, search engine optimization, and Internet.

3.0 Classical Research

Middle School: Heeren (2007) treated computer literacy not as a static concept, but explored computer-literacy as new literacies stating that “technology has fundamentally transformed the nature of literacy practices in education” (p. vi). Heeren conducted research on 26 middle school classroom master teachers who had received a district award in the integration and teaching of technology. While the findings indicated that the New Literacy built confidence in students with using the Internet and skills for Internet use, strategies for making Internet searches were lacking. Heeren concluded that the constructivist learning environment formed the basis for the New Literacy. The Internet was being primarily used for information rather than communication. Heeren also confused computer literacy with Internet literacy.

Michaelson (2003) did an ethnographic study into the use of the Internet among middle school students in the sixth and seventh grade. His concern and objective was to evaluate the following: “What counts as Internet literacy? How is Internet literate practices conducted? What opportunities are students afforded for learning Internet literate practices? Did the students demonstrate acquisition of these literacies over time” (p. x)? Michaelson’s results showed that interaction and instruction play a huge role in appropriate Internet usage. This research supports the premise that information fluency is rising to the surface of great pedagogy and that student collaboration is a strong contributing factor to its success. Michaelson points out that a constructivist’s view is at the center of how students appropriate information fluency.

K-12: Eisenberg and Johnson (2002) stated that library media specialists have moved from teaching isolated library skills to teaching information skills: “They found that information skills can be integrated effectively when the skills are (1) directly related to the content area, and (2) they are tied together in a logical and systematic information process model” (p. 62).

Eisenberg and Berkowitz (2003) state that “In this next century, an educated graduate will no longer be defined as one who has absorbed a certain body of factual information, but as one who knows how to find, evaluate, and apply needed information” (p. 206). They recognized that students build their knowledge from their experience and they provided six strategies toward the construction of that information and knowledge. Eisenberg and Berkowitz recommended a skills approach to information problem solving: (1) “Task Definition, (2) Information Seeking Strategies, (3) Location & Access, (4) Use of Information, (5) Synthesis, and (6) Evaluation” (p. 62).

Adult Education: Revercomb (2005) did an investigation into the use of the Internet by senior adults in an Internet Information Literacy (IIL) course at Syracuse University. Revercomb describes IIL as the ability to critically evaluate the structure and type of information found on the Internet and presumes the basic operational skills needed for computer and information fluency. Revercomb moved beyond the basic computer literacy to highlight the information over the operation of the computer. In other words, Revercomb points out that the information fluency is not about computer operations, but about the information. This research is important in that the course was titled Internet Information Literacy and struggled with technology over information fluency issues.

Community College: Nowicki (2002) explored the idea that novice end-users at a community college would benefit from understanding how Web search engines worked. Nowicki used Excite, Google, Lycos, MSN, Northern Light,

and Yahoo with her St. Joseph Community College (CCSJ) students. Students were given an opportunity to use six search engines with search topics of their choice. It appeared, Nowicki reported, that the search engines did not perform well and that “current popular search engines are not effective in retrieving information” (p. 5). Nowicki did cite one issue that caused the failure of CCSJ students to find success on the Internet and that was the inability of “CCSJ students to construct appropriate search engine statements.” (p. 5). Nowicki’s statement supports two issues important in information fluency (1) constructivist theory, and (2) the proper construction of search engine statements. Nowicki’s conclusions point out the need for Information Fluency research strategies to guide inquiry.

Undergraduate Students: Hwong (2003) investigated the use of the Internet among undergraduate college students in Taiwan. Hwong considered four factors that he felt would in the end contribute to more usage of the Internet: (1) Internet literacy, (2) years of experience with the Internet, (3) access, and (4) gender (p. 76). Hwong concluded that his four factors did in fact play a role in Internet searching success and that the only restrictions to this approach were “traffic congestion on the Internet and insufficient bandwidth that caused very slow data transfer” (p. 77). The important factor that Hwong emphasized is that Internet literacy was his number one area of emphasis for success. Those students who had high information literacy skills did better overall

Universities: Matsuno (2006) reported that it seemed to be an industry wide oversight that computer science faculty at most universities claimed that computer literacy courses are no longer needed or relevant. Pre-post self-assessment surveys, were given to urban community college students regarding computer literacy. The course addressed computer literacy to include Internet literacy and multimedia. The results indicated that all the community college students benefited from the computer literacy course equal to or exceeding that of university students. At first glance, it appeared that one of Matsuno’s research results, information literacy, was an important constructivist experience necessary for success in college and lacking in secondary education. Upon a closer inspection of the actual research, it became clear that it was more of a matter of noun-confusion. While the research did in fact stress the importance of information literacy for success in a college setting, the research definition of information literacy actually meant computer literacy. It was more about the technology skills than the research strategies. Matsuno was referring to computer operations and not information literacy. Eisenberg and Johnson (2002) wrote that information literacy is “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” (p. 206). They indicated that while it was agreed that all students needed computer literacy there

was only a “vague notion of what computers literacy really means” (p. 62). Eisenberg and Johnson advocate that computer skills should not be taught in isolation, but should be introduced in the content areas. They wrote that:

Computer classes do not really help students learn to apply computer skills in meaningful ways. There is increasing recognition that the end result of computer literacy is not knowing how to operate computers, but to use technology as a tool for organizations, communications, research, and problem solving. (p. 62)

Porter (1997) did a study with Ohio State University extension educators. The purpose of the study was to identify the level of use of the Internet by Ohio State University Extension educators (teachers). While Porter did not actually delve into the protocol of information fluency and its use, he did conclude that Extension educators need more training on Internet usage. Porter points out those educators themselves lack Internet research strategies.

Graduate Students: Dietrichson (2001) researched 30 ESOL graduate students from the Teachers College at Columbia University regarding five online questions about AIDS, at a single Web site. Dietrichson concluded that “poor construction of the AIDS search engine and inconsistent navigation bars confused the students” (p. 179). Dietrichson concluded that the English speaking students did better than the ESOL students because online search engines are in English. Dietrichson’s research disregarded search engines like Google that can do Internet searches in other languages. It is a puzzle why Dietrichson picked an obscure Web site that was organized poorly for his research focus. None the less, Dietrichson did indicate that more training should be directed at research strategies.

Educators: Smith (2001) conducted research on Literacy and the Internet. Her purpose was to guide educators regarding Internet search engines in the use of hypertext markup (HTML). Smith pointed out four typical factors that are an impediment to reliable Internet searches: “(1) assumes expert adult learners, (2) fails to include the special nature of HTML, (3) overlooks factors unique to hypertext, and (4) ignores learning goals” (p. iii). Smith used the literature of Romeo and Juliet to explore the hypertext factor. Smith’s conclusion suggests that a deeper understanding of hypertext is essential to successful Internet searches. Her research did point out the need for a deeper understanding of how search engines tag information.

Doctoral Students: Zhang (1999) did research on the use and correlation of Rogers’ five perceived attributes of innovation: relative advantage, compatibility, trialability, complexity, and observability (p. 83). Zhang conducted his research on doctoral students’ adoption and utilization of the Internet for research. Zhang concludes that doctoral students

did better with Internet research by using Rogers’ five innovative attributes. Rogers’ five attributes provide a structured approach to information fluency and research that calls for identifying your goals and objectives before conducting your search. Zhang’s research indicates that students at the doctoral level also need Internet research strategy instruction in order to be successful.

Math: Irmak (2006) approaches Internet literacy from a different angle. Irmak investigates the use of algorithms for information extraction and dissemination on the Internet. Irmak stated that “Millions of new pages appear on the Web everyday, and most search engines limit users to searches against pages that already exist. The use of algorithms allows the inquirer to locate new pages on the World Wide Web” (p. 88). On the surface, Irmak’s research might seem strange, but Irmak’s research points to the heart of the problem when it comes to information fluency. What Irmak is saying is that it is not about the “technology.” It is about the technology of how search engines are designed to retrieve information. Without a better understanding of how search engines work, the student of information fluency is lost in a world of deaf ears. Information Fluency is not just about the hardware or the technology, as some put it. Information fluency is also about the design and construction of search engines. Irmak indicates that success with research on the Internet has a lot to with understanding search engine protocols and strategies.

Social and Behavioral Sciences: Galvan (2006) wrote *Writing Literature Reviews* (third edition). It is the text used for this literature review. Galvan devoted all of Chapter 3 to searching a database in order to ensure that his students knew exactly how to conduct a search on ERIC. Galvan actually led his students through several search strategies in hopes of pointing the way to successful Literature Reviews. In addition, Galvan introduced 14 other relevant academic databases and provided 14 steps to selecting a topic and identifying literature for review. His efforts emphasize the importance of mentoring learners into information fluency.

3.1 Search Engine Optimization

Any educator interested in teaching information fluency may want to have a working knowledge of Search Engine Optimization (SEO). The purpose of SEO is to optimize the visitation to a Web site (Kent, 2006). Kent produced *Search Engines Optimization for Dummies* (2006) to make creating a Web page an effective and successful adventure. Kent recommended seven important aspects for a successful Web site: (1) “create a Web page with SEO in mind, (2) register your site with search sites and feeders, (3) use key words, (4) use key words that match content on your site, (5) use a good description tag (6) get other sites to link to you, and (7) use pay-per-click” (p. 345). The seven keys to successful visitations can also be the seven keys to successful search

engine strategies. Successful search engine strategies will always include keywords and content.

3.2 Google AdWords

Google AdWords (2007) changed the nature of searches on the Internet in 2003 when it introduced site targeted advertising and pay-per-click advertising (PPC). Google is the number one search engine in the world. ComScore reported that Google runs approximately 60% of all Internet searches (Jesdanun, 2007). Google set as a basis for searching information the following dynamics: (1) the use of keywords, (2) the use of connecting the keywords with the content, and (3) relevancy and location. Google AdWords (2007) offered businesses the opportunity to advertise locally, nationally, or internationally by Internet Protocol (IP) address relevancy. This relevancy locator finds the requested information and matches it to the inquirers IP address. Information literate instructors will need to know this fundamental change in order to predict successful search engine strategies or at least recognize when it fails.

4.0 Analysis

Some researchers are confused on the nomenclature of the Internet and frequently confuse *computer literacy* with *information literacy*. Search Engines and Educators recognized the noun-confusion of the past and have collaborated with educational organizations like ISTE to identify Internet literacy as Information Fluency. Information Fluency is seen as a process of constructing, evaluating, problem solving and reporting information found on the Internet with the proper use of appropriate search engine strategies.

Constructivism as a cognitive theory is becoming more prominent when researching information on the Internet as evidenced by Heeren (2007), Nowicki (2001), November (2002), and Eisenberg and Berkowitz (2003). The construction of knowledge while using the Internet lends itself to a constructivist learning environment and forms the basis of a new literacy, according to Heeren (2007).

5.0 Conclusion

Research continues to confuse computer literacy with Internet literacy and Internet literacy with Information Fluency. It is generally agreed that computer operations and skills are important; these skills should be identified as *computer literacy*. In addition, it is also agreed that research strategies are not computer operations, per se. There is a need for a more specific vernacular in regards to Internet research. Researchers need to acknowledge the New Literacy and conform to the NETS-S standard of Internet information fluency in order for this impediment to be resolved.

All of the research concluded that information fluency is desperately needed at every level of education. The research proved a continued need for information fluency at the K-12 and post-secondary levels.

Constructivism is an essential cognitive theory in regards to the way that students construct their knowledge. Appropriate search strategies and Internet fluency are grounded in constructivists' theory. Teachers that desire to develop search engine strategies in their student may want to consider the use of constructivism and information fluency models.

Critical thinking skills are an important aspect of information fluency. November (2001) points out that there is no substitute of Internet grammar skills and that revealing the structure of the Internet is the first step to helping students be more astute and careful about how they interpret information on the Web.

Educators need to adapt to the New Literacy, a literacy that advocates the integration of research skills in context and with content. According to Eisenberg and Berkowitz (2003), the New Literacy "is not knowing how to operate computers, but to use technology as a tool for organization, communication, research, and problem solving" (p. 206). Keywords, content, relevancy, and collaboration have brought out into the open the reality of search engine enquiries today. "To the academic research is work, but to the common man research has become entertainment" (N. Ward, personal communication, November 22, 2007).

In conclusion, this study indicates there is a need to teach Information Fluency at every level of education.

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