Facilitating Critical Thinking and Self-Reflection: Instructional Strategies for Strengthening Students' Online Research Skills

By Susan M. Frey

Isolation on the Internet

The ubiquity of the internet has brought about a rapid growth in web based distance education programs (Moore & Kearsley, 2005, p.xvii). But while the internet is recognized as a powerful vehicle for delivering distance education, the complex role it plays as a research tool is often ignored in instructional design (Gillani, 2003, p.10). In courses requiring research papers, instructors have historically directed their students to the campus library where they could find a storehouse of information and to university reference librarians prepared to guide them in their research. But in distance education students are physically separated, not only from their instructors, but also from their campus library. Academic librarians and faculty know that most undergraduates enter the academy with a naive understanding of how to perform quality research. In distance education, reaching these students can be problematic:

> In distance learning programs…[the] lack of understanding of the research process and dependence on the Internet in the isolated situations in which many distance students find themselves can be magnified. Students researching from remote locations may have fewer opportunities for reference consultations, in which they may learn better research skills. In addition, a significant number of distance students are older than the traditional college age and feel anxiety about asking for reference assistance since they believe they should already know how to conduct research efficiently. (Ivanitskaya, Laus, & Casey, 2004, p.170)

Librarians have responded to the needs of distance education students by providing a host of web-based library services, such as online reference consultation, the creation of specialized online tutorials, access to e-books, and expanded interlibrary loan services (Cassner & Adams, 2004; Yang, 2005). In addition to directing students to avail themselves of these customized library services, what types of instructional moments can instructors create that will teach students how to locate, access, and synthesize information?

Information Literacy

In the new information age environment students are challenged to develop competencies that will empower them to handle the plethora of data available to them. John Seely Brown expressed his awareness of the demands the information environment makes on people by stating:

> The new literacy, beyond text and image, is one of information navigation. The real literacy of tomorrow entails the ability to be your own personal reference librarian – to know how to navigate through the confusing, complex information spaces and feel comfortable doing so. (Brown, 2000, p.14)

But Brown provides only a partial definition of what is universally termed information literacy. Although information literacy does imply having a facility with locating information, it also encompasses the skills necessary to evaluate and interpret that information. Information literacy skills focus on clarity of purpose, a self-awareness of strategy, and an ability to critically evaluate data. Literacy in general can be defined as the mastery of skills sets that allows one to decode a specific environment, such as reading in the textual environment. But reading proficiency does not fully describe a literate person, because it is not enough to know how to read to be truly literate. Having the ability to critically evaluate what is being read is also a

requirement. Kymes (2005) adopts Pressley's criteria for reading literacy to help define information literacy. Specifically, she notes the authors' focus on having an awareness of purpose; making associations of prior knowledge with new ideas; discovering new meanings; developing a strategy of capturing data, such as note-taking; questioning and interpreting data; evaluating textual structure and quality; and rethinking about how to use the information in the future (as cited in Pressley, p. 483).

The Association of College and Research Libraries (ACRL) provides a set of criteria for defining information literacy that is universally adopted by US academic librarians. The *Information Literacy Competency Standards for Higher Education* (2000), commonly referred to as the ACRL *Standards*, offers a roadmap for those engaged in assessing and teaching information literacy in colleges and universities. The importance of such standards is expressed by the ACRL:

> Information literacy…is increasingly important in the contemporary environment of rapid technological change and proliferating information resources. Because of the escalating complexity of this environment, individuals are faced with diverse, abundant information choices — in their academic studies, in the workplace, and in their personal lives. Information is available through libraries, community resources, special interest organizations, media, and the Internet — and increasingly, information comes to individuals in unfiltered formats, raising questions about its authenticity, validity, and reliability. (p.2)

In examining how students locate, evaluate, and use information for their classroom assignments, it is useful for instructors to keep these definitions in mind to frame how students' actual behaviors fit into educators' models of information literacy competencies. In other words, as we define how we want students to conduct research, how do our expectations compare to the way students are actually behaving?

Students' Information Seeking Behaviors

The first studies in information seeking focused on the behaviors of experienced researchers and scientists and can be traced back to the 1950s, but it wasn't until the 1980s that studies on students' information seeking behaviors emerged (Weiler, 2005). Information seeking is a complex construct that is influenced by learning style, cognitive development, motivation, and personality (Reneker, 1993). One important question is whether or not students have different information seeking styles. Heinstrom (2007) studied students' online search behaviors and observed three distinctive patterns that she defines as fast surfing, broad scanning, and deep diving. Fast surfers have problems with relevance judgment and want information to be synthesized for them in a few, easy to locate documents. They show difficulty with critical analysis and have a low tolerance for novel data, preferring to ignore information that contradicts their views. They demonstrate low openness to new experiences, cautiousness, and a non-strategic approach in their study habits. Broad scanners seek information from a variety of resources, can judge information critically, are extroverted, competitive, and disciplined in their study habits.

Students in the third category tested as information deep divers. They not only seek depth of information coverage, but are also willing to spend a great deal of time uncovering the information they need. This behavior is related to a high tolerance for accepting novelty and abstraction, an intrinsic motivation to think deeply and critically about information, and a very disciplined, strategic approach to study. Heinstrom notes that these patterns are not always exclusive and could overlap. For instance, a person who is generally one type could exhibit the behaviors of the other two under certain circumstances. Heinstrom notes the limitations of the study in that the data were collected via self-reported questionnaires (p. 36).

Whitmire (2004), who studied the relationship between students' epistemological beliefs and their web seeking, found distinctive behavior patterns in students' analysis of information. She administered an epistemological inventory tool to undergraduates and then interviewed them as they performed assigned web searches. She then recorded their verbalizations as they made judgments about the quality of the information they uncovered. Her study found that searchers who believe that all knowledge is absolute (i.e. black and white thinkers) sought information from what they judged to be authoritative sources. They also showed a low tolerance for controversy and were recorded as saying such things

as, "[I chose] what was close to support my arguments," and, "I eliminated anything that went against my viewpoint" (p. 104). On the other hand students who believe that knowledge is relative (what Whitmire calls reflective thinkers) were better able to judge authoritative websites. For instance, while an absolute believer judged a website to be authoritative simply because it contained a lot of diagrams, a reflective thinker judged a website to be authoritative because it was produced by the Public Broadcasting System's NOVA television series (p. 106).

There appears to be similarities between Heinstrom's broad scanners and Whitmire's absolute believers. Both are poor at analyzing information for authority and content and are intolerant of information that challenges their beliefs. One way to describe the profile for this approach to research is, 'Make it fast – easy – and don't make me think!' There is anecdotal evidence suggesting that this is precisely the student profile that confounding those who teach the research process. Lenger (2002), documenting his experiences teaching at the Harvard University Extension School, remarks, "the youngest students had difficulty imagining a pre-Internet world" (p. 74). To his consternation, when he assigned a research project on Harvard in the 1730s and expressly counseled students that information on this topic would not be available on the internet, students reported back to him that no information existed on this topic because they could not find it on the web. The convenience of the web seems to be attractive to poor and novice researchers. In some instances, even doctoral students do not always realize that the information they require may not be freely available on the internet (Mazurkiewicz and Potts, 2007).

There is evidence to suggest that students are grossly unrealistic about their level of information literacy. In spite of the fact that instructors encounter a preponderance of undergraduates with poor research skills, in surveys students consistently rate themselves as above average researchers (D'Esposito & Gardner 1999; Lubans 1999; OCLC 2002; Pew Internet Project 2002). Studies of distance education students suggest that they are akin to traditional students in their heavy use of the web, and their inflated view of their own research skills (Morrison & Washburn, 2004). What these types of studies reveal is that many students are not information literate as defined by Kymes or the ACRL *Standards*.

Instructional Strategies

Expert researchers know that information gathering is a problem solving activity. In the cognitive sciences studies suggest that metacognitive activities facilitate problem solving (Lin & Lehman, 2001). Some studies indicate that experts and experienced students practice metacognitive strategies more than novices and poor students (Chi, Bassock, Lewis, Reimann, & Glaser, 1989). So if students consistently inflate their online search skills, what types of self-reflective instructional strategies can be adopted to help them think more about the research process? Kymes posits that the multilinear aspect of hypertext provides an unconstrained amount of information for the student. But while printed text is linear, "students are not generally taught to recognize the expository nature of information; they don't receive explicit instruction in the conventions and devices used to direct attention, increase retention, or provide illustration" (p.482). Burke (2002) claims that critical thinking of information resources needs to be addressed by educators, because students confuse their facility for internet navigation with an ability to critically read online text.

Kymes' suggestion is to use think-alouds to increase student comprehension on information gathering and reading of online text. Kymes' think-alouds are akin to the verbalizations captured by Whitmire in her investigations of how epistemological beliefs affect information seeking behavior. In Kymes' instructional technique, which has been used in teaching reading comprehension of printed text, students verbalize their thoughts, moment by moment, as they are engaged in the performance of an information seeking task. When practiced in the classroom the student, fellow classmates, and instructor hear what the individual is saying to help everyone deconstruct the process at hand. As Wilhelm (2001) notes, "think-alouds are a means to an end – an end that is engaged and reflective reading (p. 16). Thus think-alouds are aimed at encouraging students to make meaning from the process of reading text. Although the think-aloud technique has been used to test computer-interface design and in teaching reading comprehension, it has not been widely used in teaching information literacy (Kymes, p.483). To teach greater comprehension of reading online text Kymes modeled the think-aloud technique for students in the classroom and then had them follow suit. The technique proved beneficial in helping students become

more aware of how they relate to multimedia and online information. The author provides examples of how the metacognitive process unfolds by documenting students' think-alouds:

> I need to log on to the Web and do a Google search to find information about acid rain. Maybe there will be a chart or graph or something else that will help too. If I can't find that with Google, I might need to use a different search engine that will let me search specifically for multimedia besides just text. I need to be careful not to get distracted by anything that is flashing, or by chasing links, or even checking my e-mail, because I don't have too much time today. (p. 487)

In this example the student shows an awareness of purpose (as expressed by Pressley) and is mindful not to become distracted. Other examples illustrating new discoveries, "I am not really sure what this word means. Let me click on it," and attempts to interpret online text, "I wonder why the author said that?" (p. 487) help capture and record the thought process of the students. These processes can then be more fully examined by the class at a later time. Kymes claims that as yet there are no research studies assessing the effectiveness of this technique in teaching information literacy (p. 499). However, her approach appears promising since it slows students down and forces them to articulate a process that they usually perform mindlessly. Since novice online searchers are not often careful searchers, this technique might be beneficial for teaching research strategy. Hopefully, by enabling self-reflection, this technique would encourage those that are fast surfers to become more like the broad scanners as defined by Heinstrom. In online learning environments think-alouds could be modeled to students through video streaming or via instant messenger. Students could express their own think-alouds through the same vehicle. Think-alouds could also be captured in Word by students and posted on a folder for the entire class to deconstruct on a discussion board.

While Kymes' approach may encourage fast surfers to be more self reflective in their search strategy, some instructors are embracing a greater acceptance of working within the limits of the fast surfer mentality to encourage students into adopting more productive information gathering behaviors. Federated search tools allow for the simultaneous searching of many databases and have a simple search interface. Fryer (2004) claims that most searchers demand a search interface that is as streamlined as *Google*, promises relevant results, and is easy to learn. Since federated search tools resemble interfaces like *Google*, these features might make federated searching a likely choice for teaching novice researchers how to construct effective online searches. However, a federated search tool is considered suspect by many professional researchers. Federated search technology is in its infancy and there are concerns with "relevancy ranking, de-duplication, incomplete profiling of resources, lack of advanced search capabilities, and inability to utilize thesauri and controlled vocabulary" (Labelle, 2007, p. 238).

McCaskie (2004) suggests that librarians who teach information literacy have traditionally shied away from using federated search tools because the search features are not as fully functional or reliable as standard online resources, and they fear that introducing tools that offer shallow search results will reinforce careless search behaviors in students. She quotes a respondent from an email survey she conducted: "…librarians…are hesitant to tell students to use something that searches across resources because we [librarians] are also trying to make students information literate and to help them learn how to distinguish one type of resource from another" (p. 59).

In spite of this resistance, McCaskie recommends using federated search tools in information literacy instruction because the simple search interface may help students uncover resources from underutilized resources. This strategy may be worth investigating since it has been shown that students show resistance to learning a variety of search interfaces from multiple resources, and persistently seek out one online resource even though they are informed that it may not be the right one for their information needs (Sadeh 2004; Tallent 2004; Webster 2004). In challenging the resistance to teaching federated searching Labelle has constructed a model of teaching information literacy that is correlated to the ACRL *Standards*. She believes that meeting the students where they are, rather than trying to push them to a place they do not want to go, is a better method of teaching online searching. Labelle writes:

> Federated searching represents a major change in information access and retrieval. Librarians are at a crossroads and need to determine how best to utilize the potential that this technology brings to the

> instructional landscape. Should librarians ignore issue-plagued federate search tools entirely or should they admit that these tools, although imperfect, serve a purpose? The stance that librarians take is dependent on a variety of factors, including whether or not instruction is viewed as being instructor, or student centered. From a pedagogical standpoint, it is important to consider students' prior knowledge and behaviors as these contribute to the learning environment in which librarians teach. (p. 250)

Labelle speaks directly to librarian-instructors, but her message is applicable to all professionals who teach database and web searching to students in support of their class assignments. For distance educators who relate to students in an online environment, the use of federated searching may be a first step towards the introduction of more select resources. As Labelle suggests, by introducing students to something they are comfortable with, such as the simple search interface of a federated search tool, and then transitioning them to more complex interfaces with more powerful search capabilities, students might be more open to new search experiences. An assignment comparing the search results generated by the same keyword search strategy performed on a federated search tool, on *Google*, and on a discipline-specific resource, such as the *PsychINFO* database, might help students learn to differentiate between the depth of coverage each information tool provides. Having students write reaction papers comparing their use of simple versus sophisticated search interfaces might also further their understanding of the variety of information resource tools that are available, and may assist them in becoming more aware of their information seeking behaviors. What is clear in reading Labelle and McCaskie is that the biggest determent to experimenting with this type of teaching approach is resistance to change on the part of the instructor-librarian.

Brown, Murphy and Nanny (2003) have designed a series of instruction sessions for undergraduates aimed at breaking down students' resistance to learning information literacy. Recognizing that many students confuse their heavy use of the internet with information literate behaviors, they ask students to analyze content on websites. Such exercises confront students with the task of searching for credible versus fallacious information on the internet. Mathson and Lorenzen (2008) take a similar approach in teaching students how to evaluate online information. The authors illustrate the potential complexity of this instructional task in asserting that most students already understand the low credibility of obvious bogus websites that focus on topics such as "tree octopi" or "male pregnancy" (p. 211). True critical thinking is development when students must analyze websites that are very good at looking creditable. The authors teach critical thinking by focusing on revisionist websites embodying a variety of characteristics that make information appear more believable, such as expert visual design, the presence of an association or loosely federated group, a clear statement of web authorship, or claims that are documented by texts, photographs, etc. The authors write:

> Critical thinking can be taught by challenging students to analyze Web-sites that cover history and the social sciences. For example, how should students interpret extreme claims that Hawaii and Texas are illegally occupied by the United States when no international court has ever made such a judgment? How can students interpret the "overwhelming" evidence of historical revisionists that the Apollo Moon Landing never occurred, that the Holocaust is a hoax, or that 9/11 is a CIA conspiracy when the actual evidence for these events indicates the exact opposite? What is most useful in pointing out the flaws of seemingly well documented but one-sided revisionist websites is to contrast the contributor's claims with those facts that are accepted by international courts, historians, and scientists. (p. 217)

Central to Mathson and Lorenzen's analysis is teaching students to use Taher's, *Six A's for Evaluating Web Content* which involves the careful examination of websites for authority, accuracy, approach, age, audience level, and accessibility (as cited in Taher, p. 215). In the classroom, student teams are given a list of websites to examine and are asked to judge whether the websites are credible using criteria is modeled after Taher. Students must back up their judgments with evidence, such fact checking a site's claims against a more authoritative online resource. Each team then presents their finding to the class for discussion. This approach to in-depth class analysis of websites could be adapted to an online learning environment by asking student teams to present their findings on presentation software such as *PowerPoint*. The class could then discuss each team's findings on a discussion board. A distance education class could also collaborate in the creating of an

annotated list of hoax websites.

Another initiative directed at helping students to be more realistic about their research competencies is a promising assessment program developed at Central Michigan University. Sensing that many students were not attending to their information literacy instruction, the librarians decided to design an instrument that would assess students' information literacy competencies against the ACRL *Standards*. This tool, called the *Research Readiness Self-Assessment* (RRSA), required students to complete several problems and respond to a series of questions in which their research strengths and weakness would be identified. The results of the assessment are delivered to students in writing. The feedback profiles students' research readiness and provides advice on what skills need improvement. The feedback form is extensive and contains precise but neutral language. A small portion of the form might read:

> Your score indicated that your online research skills may not be as strong as you need in order to successfully conduct research in college. Understanding some of the techniques for efficient searching, such as how to choose the right databases for a particular topic and how to find out which terms are used in a particular database, will help you find more precise information more quickly. (Ivanitskaya, et al., p. 175)

In addition to problem-based questions the RRSA includes attitudinal measures since negative or unrealistic attitudes affect information gathering behaviors. Perhaps the most damaging attitudinal disconnect apparent from the studies cited in this paper is that many students think they are expert researchers when they are not. Their inflated view of their research skills can certainly prevent them from seeking further assistance with their research. At the time of writing the authors report that the RRSA has not been administered to a large enough population to be fully validated, but instruction librarians did notice that students who had taken the RRSA where more attentive during information literacy instruction (p. 180). The implications for using such a tool are far reaching. If instructors can ask their students to take a standardized information literacy test they might raise awareness of the complexity of the research process and the expertise required to navigate today's confusing and overwhelming information environments.

Librarians as Instructional Designers

It's not enough, as John Seely Brown believes, for people "…to know how to navigate through the confusing, complex information spaces and *feel comfortable* [author's emphasis] doing so" (2000, p.14). Since studies show that students have a tendency to inflate their level of information literacy they are navigating information spaces with inadequate research skills, and sadly they "feel comfortable" about it. This calls for instructional strategies designed to encourage students to engage in self-reflective behaviors that will lead them to a more realistic self-assessment of their research skills, and a deeper understanding of the complexity of the research process. Librarians, with their immediate knowledge of students' information seeking behaviors inside the library, are well situated to design instruction that encourages such self awareness in distributed learning environments.

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