

“Beyond Search: A Preliminary Skill Set for Online Literacy”

A Transliteracies Research Paper by
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Today’s online reading experience is a convergence of search engines, blogs, wikis, forums, social networks, RSS feeds, and traditional web pages (Lieu & Kinzer, 2000). Efforts such as Google Books, Yahoo’s Online Content Alliance, and digital libraries are increasing the rate at which resources such as journal articles, books, periodicals, and informational websites are published online (Carlson & Young, 2004; Gorman & Wilkin, 2005; Hafner, 2005). Correspondingly, an increasing percentage of the U.S. population (73% in 2006) is turning to online resources for work-related research, education, and general information about hobbies, health and shopping (Madden, 2006). Online users now have access to vast amounts of information but may not know how to use it (Azevedo & Cromley, 2004; Rouet, 2006). The risk of information overload, combined with the seductive distractions of online media, challenge users to develop savvy navigation and filtering skills. Faced with over eight billion pages of information (Lyman & Varian, 2003; Markoff, 2005) and unlimited opportunities for interaction, how do online users select what they need and know when to stop?

Simply, some don’t. Others, though, seem to develop an understanding of informational hierarchy and demonstrate high level filtering skills. For example, Wineburg (1991) discovered when studying expert and novice readers in the field of history that expert readers pay close attention to the credibility of the source of a document and attempt to corroborate facts across documents, whereas novices do not. Savvy users seek credibility in their online contacts, whether through source materials on sites such as Wikipedia or friend networks on Facebook or del.icio.us. Whether they learn from past experience or from peer instruction, many online users are effective gatherers of information and appear to avoid the pitfalls of information overload.

If the new form of literacy for the information age, then, is the ability to manage, process, and filter multiple documents, what types of cognitive skills do readers need? Access to information is no longer a problem, instead the challenge lies in distilling meaning.

While the availability of information online has been a promising advancement, research shows that its potential is weakened by the difficulty in finding and sorting credible materials (Brand-Gruwel, Wopereis, & Vermetten, 2004). Peterson (2001) touts the accessibility of “diverse information” that would otherwise not be available to users; however, other studies warn of the increased cognitive load that may result from information overwhelm (Azevedo & Cromley, 2004; Macedo-Rouet, Rouet, Epstein, & Fayard, 2003). Increased cognitive load, resulting in this case from the process of sorting large amounts of information, clicking links, determining the

relevancy of source material, and processing both text and graphics simultaneously, normally results in decreased comprehension and retention (Mayer & Moreno, 2003; Mayer, Moreno, Boire, & Vagge, 1999). Therefore, identifying the cognitive processes involved in online document use is essential in developing an understanding of the skill set necessary for online literacy. As a starting point for understanding online literacy, I first consider the multiple literacies and cognitive competencies required for reading online, then explore the significance of online formats, and conclude by summarizing skill sets essential for effective online document use.

What is online literacy?

There is consensus in the literature that while the traditional definition of literacy as purely “reading and writing” provides a foundation for understanding literacy in online contexts, it must be expanded to include the multiple mediums and competences inherent in reading online (Barton, 2001; Gee, 2003; Glister, 2000; Hooper-Greenhill, 2000; Ong, 1986). Definitions and descriptions of *literacy* vary and multiply according to the mediums and genres described; however, Mayer (2000) describes the essence of literacy as “knowing how to gain knowledge” (p. 363). When considering literacy in online environments, this definition must also include a convergence of multiple modes and information sources.

In his description of *digital literacy*, Glister (2000) includes the unique challenges of interacting with text and other materials online. He emphasizes the functional nature of digital literacy: the ability to assimilate multiple sources across multiple modes to construct meaning. Likewise, Mayer’s (2000) definition of *multimedia literacy* describes a sense-making process of selecting words and images, organizing each into a coherent mental model, and integrating them to form an understanding. Rouet (2006) further supports this functional view of literacy by defining literacy in relation to task completion: “Functional literacy is the art of interacting with printed and digital documents in order to fulfill various types of tasks or activities” (193). Any attempt to define online literacy must therefore not only consider its function, but also the medium in which it is delivered.

Visual literacy, or the construction of meaning from images, is also an essential component of interaction with online materials. Hooper-Greenhill (2000) provides a strong model for meaning making in relation to visual images that complements Mayer’s (2000) elements of multimedia literacy. To construct meaning when viewing a painting, for example, Hooper-Greenhill explains that viewers must call upon prior knowledge from a variety of fields. Thus, a viewer’s competence in the area of art is not based solely on fluency in a subject such as art history, but on the viewer’s ability to identify what needs to be known and to access this information. Extending the understanding of literacy beyond reading and writing, then, Hooper-Greenhill describes a process of understanding a visual image that includes access to prior knowledge, comparison of similar and disparate information, and analysis of details in consideration of the image as a whole.

Combining image and text in his study of multimedia literacy, Lemke (2004) further asserts that meaning can never be made solely with language, but that “all literacy is multimedia literacy” (p.

72), an understanding of the integrated meaning constructed by the blending of words, images, and the contexts they inhabit. He focuses on two forms of new literacy: *informatic literacy* (categorizing and organizing information) and *multimedia literacy* (interpreting meaning across multiple media). Similar to the definitions previously described, Lemke identifies literacy as an interactive process that engages the online user in a recursive dialogue with the information.

Online literacy, at its most basic, is, as Rouet (2006) and Glister (2000) describe: the processing of multiple documents from multiple information sources. The “processing” portion of this definition is open to further development. While a comprehensive definition of online literacy will continue to evolve as the functions and media demand, certain themes remain consistent in the literature. The cognitive processing of information online certainly involves literacy in the traditional sense: reading and writing competency. In addition, this processing involves computer literacy (Hölscher & Strube, 2000; UNESCO, 2006), accessing prior knowledge (Hooper-Greenhill, 2000; Mayer, 2001), the construction of a mental model in order to make sense of the material (Azevedo & Cromley, 2004; Haas, 1995; Mayer, 2001; Wineburg, 1991), and goal-setting (Mayer, 2000; Rice, McCreddie, & Chang, 2001; Rouet, 2006). To understand the cognitive processes involved in online literacy, we must first consider the forms in which information is available online.

Why does the medium matter?

An examination of online document use skills must first begin by exploring the concept of affordances. First introduced by Gibson (1979), *affordance* refers to the characteristics of an object that make it useful. Paper documents, for example, allow us to write notes in the margins, spread multiple pages out on a desk to visualize the information, and visually manipulate the page order (Sellen & Harper, 2003). According to Gibson’s theory, users become accustomed to the affordances objects such as paper provide and adjust their mental processes and strategies according to this use. That said, what must be emphasized about affordances is that the usefulness of an object is inherent in the object itself; the physical make-up of the object permits ease of use and thus creates its usefulness (Gibson, 1979). As in the example of paper, the ability to lay out different pages and see the entire document at once allows for easy organization and re-organization (Sellen & Harper, 2003).

In their study of worker behavior at the International Monetary Fund, Sellen and Harper (2003) discovered that a majority of people (89%) edited documents with paper and pen in tandem with using their computer. Supporting Sellen and Harper’s assertion that paper has necessary affordances, Macedo-Rouet et al. (2003) further delineate the differences in accessing and understanding text when using paper versus an online medium. In their comparison of online reading versus reading printed texts, Macedo-Rouet et al. found that online reading resulted in increased cognitive effort and reduced comprehension. They also found that online text is less legible, partly because “the display area is bound by the physical size of the computer screen,” (p. 101) whereas printed documents can be spread over a larger display space. Macedo-Rouet et al. further confirmed that searching for information in a paper-based medium versus online medium is quite different. Most significantly, material can be easily scanned when searching through printed documents and the amount of material is clearly visible, whereas in browsing a

user must select links to view this content and the amount of information available seems infinite (Macedo-Rouet et al., 2003). In his recent work, Rouet (2006) further claims that, given the challenges of navigating information in an online environment, people get lost because they lack the metacognitive skills necessary to process such large amounts of material. Rouet recommends providing online users with guidance and training in using multiple documents in web-based systems.

What skills are necessary for online literacy?

Experts versus novices: Differences in interaction with primary source materials

Wineburg's (1991) study of students' and historians' evaluation of primary sources provides a strong starting point for considering the essential skills for online literacy. Wineburg used multiple types of written documents, including diary entries, newspaper reports, formal letters, and legal documents for his study. Additionally, he used three paintings and identified methods for assessing their accuracy. Students and historians were asked to describe how they evaluated each source and also rank each source's "trustworthiness" (p.75). Although these sources do pre-date the Internet, they are representative of the challenges readers face when processing multiple modes of information.

Expert historians in this study consistently employed three strategies in their document use: corroboration, sourcing, and contextualization (p. 77). Interestingly, students rarely incorporated these strategies, which, as mentioned above, negatively affected their comprehension of the materials. *Corroboration*, as Wineburg describes, involves checking details against each other, either in other sources, or within the same source, to confirm their accuracy before accepting them (p. 77). *Sourcing* is described as verifying the author or source of the document prior to reading the material (p. 79). *Contextualization* for historians involves considering when and where the event took place; however, this term can be generalized to situate claims within the condition of their occurrence (p. 80), which could include, for example, the author's biases, or the cultural context of the material.

By comparing the ways students and historians approached multiple sources, Wineburg discovered that expert historians used a consistent schema in their information searches that students lacked. The lack of this schema proved to 1) negatively affects students' comprehension of the materials, 2) impede their ability to process the information, and 3) result in confused or inaccurate interpretations of the texts.

Reading without editors: Credibility in a communally-created information environment

Wineburg's (1991) study serves as a foundational text when defining a skill set for online literacy. In the following section, I summarize additional studies that focus on effective online document use.

Online reading, unlike most experiences of reading from printed documents, first involves sifting through vast amounts of resources to locate specific information. Because vast amounts of

information is available online, high-level searching and filtering skills are essential for navigating the online environment. What are the components of a successful search? As Azevedo and Crowley (2004) discovered, successful searches depend on *goal-setting*. In their study of undergraduate students using hypermedia materials, the students who set specific goals for their search tasks performed better focused and more productive searches. These results are further corroborated by Bransford, Brown, and Cocking (2000) who found that experts set more targeted goals for their search behaviors. Goal-setting is also inherent in Glister's description of targeted reading. Rice et al. (2001) differentiate between browsing for pleasure and browsing for purpose, with the purposeful browsing most used for research and work-related tasks. With a goal in mind, therefore, readers are more likely to practice targeted, purposeful, browsing and thus enjoy more productive searches.

The challenge in finding information, once credibility has been established, is sorting through the sources to find what is truly relevant. In Rouet's (2006) analysis of document use skills, he identifies *filtering* as a key component of online literacy. Filtering is the ability to identify and select materials according to an established criteria. Of course, establishing this criteria is a challenging strategy on its own. Filtering online documents presents nearly the same challenges as filtering information in print, only on a larger scale. This first step in filtering, limiting an information search to specific sites, is more likely to be practiced by experts because they have a familiarity with either the field or successful search strategies than by novices who cast a wider net in their initial searches (Brand-Gruwel, et al., 2004). Thus Wineburg's credibility criteria, including sourcing, corroborating, and contextualization, are essential first steps. Filtering continues throughout the information gathering process: assessing the quality of information, determining which information is relevant, and eventually selecting material to use in knowledge assembly (Glister, 2000; Rouet, 2006).

In Glister's (2000) overview of digital literacy, he emphasizes assessment of content quality as a key factor in effectively navigating the digital landscape. He describes the Internet as "unfiltered by editors and open to the contributions of all," which, in his view, necessitates the development of high-level filtering skills. Similar to Wineburg's emphasis on sourcing, Glister sets forth a list of competencies that first focus on determining credibility:

- Make informed judgments
- Think critically about information presented
- Distinguish between content and presentation (p. 216)

Much of what is available on the Internet, according to Glister, lacks credibility. He urges readers to critically examine the information they encounter. By employing the sourcing skills identified by Wineburg, readers could verify the credibility of information sources by either corroborating stated claims with other materials or conducting further research about the origins of the document. Glister further states that, unlike print media which is traditionally easier for readers to determine the quality of the publication (based on layout, colors, binding, etc.), non-professional designers can easily create a credible-looking website. Thus, readers should also separate content from presentation. Sourcing and critical consideration of the material therefore become significant skills in evaluating online documents.

Knowledge assembly, as described by Glister (2000) and Rouet, (2006) involves the process of selecting, comparing, and, finally, synthesizing the information. In this crucial final process, readers mentally move the online information they have collected into bits that can be organized into meaningful categories. Whatever the problem or question they are trying to answer, at this stage, the reader should begin to construct a meaningful mental model in which disparate elements become part of a coherent whole (Mayer, 2001). Information gets compared against other sources, and is selected, or discarded (Rouet, 2006). Blending various claims, arguments, and resources together to create this whole is part of the *synthesis* skill. Just as in reading offline, at this stage, the challenge lies in making sense of the material and determining relationships within and between the sources.

Skills of online literacy

Based on a review of landmark empirical and theoretical studies, I have developed a preliminary skill set for online literacy. At its core, this skill set represents effective strategies for document use, both online and offline; however, I also consider the unique challenges online reading poses. Beginning with goal-setting, online readers must determine the purpose of their task. Next, they must employ effective search skills, including targeting their search and identifying the most effective search process (site-specific or targeted keywords). Filtering, including seeking credibility, corroborating sources, and assessing the quality of information is the next necessary step. Following filtering, readers must engage in knowledge assembly, in which they organize the information into meaningful categories, construct a mental model, and synthesize the material.

Table 1: Summary of online literacy skill set

<i>Skill</i>	<i>Description</i>
Goal-setting	Identify task and desired outcomes
Search	Target and narrow
Filtering	Confirm credibility, corroborate, assess quality of information
Knowledge Assembly	Organize, construct mental model, synthesize the material

Online literacy involves complex cognitive processes and multiple media. Identifying a term to describe the process, let alone a skill set for effective use of online documents, is a preliminary step in what is and will be an ongoing, challenging research effort. In this report, I have synthesized the findings of a few landmark studies and ideally contributed to our collective understanding of online literacy practices.

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