Kate Sandberg
College Student Academic Online Reading: A Review of the Current Literature

Having taught reading to college students for 27 years is among the highlights of my life. I loved learning about reading theory and practice; I loved teaching students how to read successfully for college courses; and I loved applying what I learned from colleagues. During those years, teaching college students how to read online was not an issue. My colleagues and I did instruct students on evaluating websites and using digital library resources, but teaching how to read academic text online was only beginning to be necessary.

Now, however, teaching college students how to read online effectively is an important area of concern. Libraries have become digitized with online articles and e-books; e-textbooks are available and used; and instructors routinely assign online articles of some length. It is critical that instructors who teach reading at the college level understand the theory and practice of academic online reading. The reality of this need became apparent when I listened to a presentation about college students' reading preferences of paper versus screen (Hamer & McGrath, 2010) at the College Reading and Learning Association's conference in Salt Lake City. During the session, attendees discussed ramifications of the presenters' research, but they also clearly wanted strategies for students. They needed those strategies to take back to their classrooms. I decided then and there to see what the current literature says about college student online reading.

What follows is a review of the current literature on college student online reading for academic purposes. The review includes an explanation of important terms used in the field; studies of student online

reading preferences, comprehension, and strategies; and problems with online reading for students. It does not include a critique of the studies mentioned or research earlier than 2003.

Method

After browsing the literature, I made a grid with a list of keyword sets that came up most often and the databases that seemed to give the most results. I searched each database with every set. The databases were Academic Search Premier, Applied Science and Technology, ERIC, Education Abstracts, ScienceDirect [sic], and Wilson Select Plus. The keyword sets that I used were (a) online reading + college, (b) transliteracies + college, (c) digital literacy + college + student, (d) information literacy + college + reading, (e) college + online reading + gender, (f) e-reading + college, and (g) onscreen reading + college. The most successful, prolific set was online reading + college.

With one exception (Wilder, 2005), I read only peer-reviewed articles and arbitrarily chose 2003 as the cut-off date for "current" literature. The digital world evolves so quickly that I thought earlier articles, most likely written about research from 2002 or earlier, would not reflect the state of students' current usage trends. I excluded articles that investigated English-language-learning students reading online, college faculty online reading practices, general teaching methods for online environments, online writing, secondary student online reading, and research in third world countries. There are articles in these areas, but I kept a narrow focus for this review.

Definition of Terms

The literature of college student online reading has several terms that appear often enough that an explanation of them seems appropriate.

Online reading, onscreen reading, and *e-reading* are seemingly interchangeable terms that do not appear to be defined in the literature but are assumed to be part of our lay vocabulary. All three mean the reading of text, video, and graphics on an electronic screen, whether it is a computer, television, or hand-held device. This type of reading is contrasted to reading on paper in books, magazines, journals, and from a printer. There was one exception to the definition of online reading (McCrudden, Magliano, & Schraw, 2011), where it meant "moment-to-moment processing of text during reading" (p. 70) on paper.

Hypertext is the result of computer programming so that text can be read non-linearly (Le Bigot & Rouet, 2007; McEneaney, Li, Allen, & Guzniczak, 2009). A reader may click on a word or phrase (colored blue and called a hyperlink) that appears in the sentences or graphics

of the piece. The reader then goes immediately to another web page and reads more about that hyperlink's concept. If that second page has hyperlinks, a reader may click on any or all of them too. This type of programming allows the reader to continue to click on hyperlinks in an infinite number of paths; therefore, every reader may have a different reading path. It is this non-linear, non-ordered reading that is so different from reading paper text.

Digital literacy and *information literacy* are two terms used extensively in the academic library literature. College and university library personnel vigorously debate the definitions of these terms and how to best serve their students in the electronic age (Orme, 2008; Wilder, 2005), but with little agreement. The variety of definitions of these terms is most likely due to the infancy of the field and how quickly librarians have had to make the best decisions for their libraries.

However, Eshet-Alkalai and Chajut (2009), education psychologists, have a definition of digital literacy that seems appropriate: "the ability to employ a wide range of cognitive and emotional skills in using digital technologies" (p. 713). They, along with Eshet-Alkalai and Amichai-Hamburger (2004), use a conceptual model of digital literacy that includes photovisual literacy, reproduction (creation of products) literacy, branching (nonlinear navigation) literacy, and socio-emotional literacy. Eshet-Alkalai and Chajut add real-time thinking, which is the ability to process information, such as in chat rooms or games. This review will show that the teaching of branching literacy or nonlinear navigation of hypertext is particularly important to college teachers of reading.

Transliteracies is a term used in a 2005-2009 University of California, Santa Barbara project. The Transliteracies Project, directed by Dr. Alan Liu, (http://transliteracies. english.ucsb.edu/category/research-project/) focused on online reading. The project's working definition of online reading was "the experience of 'text-plus' media by individuals and groups in digital, networked information environments" (http:// transliteracies.english.ucsb.edu/category/research-project/ definition-of-online-reading). The project appears to be finished in late 2009 with no peer-reviewed articles. Then the term morphed into the singular "transliteracy" in later, unrelated projects that do not focus on online reading (Ipri, 2010; Thomas et al., 2007). For our purposes, transliteracy(ies) is a nice-to-know, but not critical, term.

Student Online Reading Preferences

The previously mentioned Hamer and McGrath presentation (2010) focused on undergraduate, good readers' preferences (n = 237) in a convenience, not random, survey. Those readers reported that it is

easier to concentrate with text on paper than screen (72.6% vs. 7.2%), easier to remember more information with paper than online (60.8% vs. 5.9%), and if given the choice, 71.7% would ask for paper text. All other studies in this section also used a convenience survey method.

Longhurst (2003), who teaches history at Carnegie Mellon University, discovered that "even technologically proficient students, though generally enthusiastic about the use of online materials in undergraduate courses, have deep reservations about reading assignments located on the web instead of paper" (p. 343). Longhurst and his colleagues surveyed their introductory history students (n = 318) and found that 64% preferred printed materials rather than online ones for readability. Almost all the surveyed students printed out their reading materials. Because of this clear preference, the faculty reduced the number of web-based reading assignments and changed online readings to pdfs, exact online replicas, of original documents.

Spencer (2006) echoes those findings with a survey of 254 graduate and undergraduate business students in British Columbia, Canada. The author found that 92% of the students printed out the item when they worked concurrently with something else, 82% printed it out if it was long or complicated, 80% printed it out if they wanted to study from it, and 75% printed it when they wanted it to take notes. Flexibility, portability, reliability, and the physical holding of the material were cited as reasons for printing.

Liu (2006) surveyed graduate students from a variety of disciplines. These 133 students went first to online library text resources (51.9%) or the World Wide Web (28.6%) rather than paper text, but 80.5% always or frequently printed out the document and read the printed text rather than online.

The only article I found on gender differences and preferences (Liu & Huang, 2008) was done at a major university in China. The convenience sample of 203 graduate and undergraduate students found female readers to report a stronger preference for paper (73.2%) than males (51.3%). The survey showed that these women annotated more than men, printed out the documents more, and were less active browsers, which may account for the difference between the sampled men and women.

Reading e-books, whether from the library or as an e-textbook, appears to be problematic. Berg, Hoffman, and Dawson (2010) used a prompted, think-aloud method for 20 undergraduates to investigate how the students used e-books versus print books. The authors concluded that even though these students were highly computer literate, they did not know how to navigate and use e-books effectively. Students expected the e-book to progress in a linear fashion, which was not the case, so

they would get lost and become disoriented. Woody, Daniel, and Baker (2010) found that students preferred print textbooks to e-textbooks, even after experience with e-books and a high comfort level with computers.

Online Comprehension and Strategies

McEneaney, Li, Allen, and Guzniczak (2009) reported on two studies of undergraduates' and graduate students' reading of hypertext based on instructor prompts. In the first study, the researchers wanted to find if prompts influenced the understanding of hypertext. They prompted 69 students to read with either an aesthetic (immersion in the text, lived-through experience) or an efferent (practical) stance before the students read online. After reading online, the students filled out a T/F test and wrote an essay. Researchers found that the prompts did affect reader stance (purpose) and that aesthetic readers achieved higher levels of understanding. The second study in the article involved tracking students' navigation of 36 hypertext links within the text after receiving either an aesthetic or efferent prompt. McEneaney et al. found that reading rates changed during reading with more time spent early in the session when readers used a more complex navigation system than later when they were more linear. These findings, the researchers suggest, may correspond to the need for previewing.

Le Bigot and Rouet (2007) studied the importance of previous knowledge, task assignment, and format on comprehension of multiple online texts. The authors had 65 volunteer undergraduate and graduate students read hypertext selections that had various combinations of keys, menus, and rhetorical aids. The researchers measured comprehension by a multiple-choice test and an argument or summary essay. They reported that the usability of hypertext is strongly related to the organizing devices and rhetorical structure of the piece. Readers constantly tried to maintain coherence as they navigated through the hypertext. Less complex rhetorical devices that work in linear reading did not work in hypertext. Through quantitative measurement, the authors concluded that prior knowledge does increase comprehension, the argument assignment brought better essays than the summary, and students need specific directions or study aids to help them build necessarily complex, non-linear navigation strategies.

Yang (2010) studied an instructional technique called Reciprocal Teaching in a Taiwanese college remedial online reading environment. Reciprocal Teaching involves the instructor modeling and providing scaffolding for predicting, questioning, clarifying, and summarizing (Rosenshine & Meister, 1993). The students then begin to provide scaffolding and guidance for their peers. Yang had 129 college students

follow this protocol online and qualitatively analyzed their reactions. From students' comments, Yang found annotation and questioning to be the most beneficial strategies.

Authors Johnson, Archibald, and Tenenbaum (2010) studied individual and social online annotation and whether these strategies improved comprehension, critical thinking, and meta-cognition. The researchers used HyLighter (www.hylighter.com), a program designed for group editing and annotating documents. The first study had 254 undergraduates use five different combinations of highlight and annotation guidance on five different articles, but not with group face-to-face discussion. Researchers found no improvement or harm in any combination of guidance. The second study (n = 267) used the same five combinations of guidance, but with small group face-to-face interaction about the readings and annotations. Researchers found improvement in comprehension and meta-cognition, but not critical thinking.

Hsieh and Dwyer (2009) examined online during-reading strategies and their effectiveness for different learning styles. They chose rereading, keyword, and question/answer as the three strategies to investigate. The selection of these three strategies came from the research of reading on paper, not online. Undergraduates from various disciplines (n =169) answered a questionnaire to be identified as having either an external or internal locus of control learning style. Next, students were randomly assigned a strategy group and read a 2,000-word online selection about the physiology of the heart. Students then took four types of comprehension tests. Through quantitative measures, Hsieh and Dwyer found that learning style made no difference in comprehension. They also found that rereading made the biggest positive difference of the three strategies for comprehension.

Finally, Kauffman, Zhao, and Yang (2011) investigated if several types of online note taking and teacher-constructed self prompts improved college student online learning. Their two experiments suggested significant learning advantages with matrix-style note taking coupled with self prompts. The second most successful style of note taking was outlining, and the least successful was listing. Even without prompts, students who used matrix note taking fared better in testing than the other note takers.

Problems with Academic Online Reading

From the preference studies reported in this article, students clearly prefer paper to online text at this point in our literacy history. The significant problems that students face when reading online may account for this strong preference. Here I address some of the practical problems that hamper students' online reading.

As seen in Le Bigot and Rouet's (2007) comprehension study, the usability of hypertext may be related to how well online text is organized and its rhetorical devices or reading cues. Therefore, if online text with hypertext is difficult to navigate and understand, students will prefer paper, which they overwhelming do now. This difficulty with comprehension may be because writers of college e-textbooks and articles have not reached a point where they fully understand how to manipulate hypertext so that it is more easily comprehended and studied. As well, instructors often require students to read articles online that were written for paper, not screen. Articles might then seem long and difficult to study.

As students try to sort out the organization and important ideas while they read online, cognitive overload also may be a significant problem (Kauffman, Zhao, & Yang, 2011). Dealing with hypertext navigation, interactive graphics, eyestrain, strangeness of this type of reading, and lack of appropriate structural cues could all contribute to cognitive overload and discouragement. To add to student woes, researchers and practitioners don't yet agree on the most effective strategies to deal with any of these issues.

Larson (2007), a member of Microsoft's Advanced Reading Technologies team, related that it is not anyone's imagination we get tired while reading online. According to Larson, the font is a large part of it. Microsoft now has specific fonts developed for the screen, such as Cambria and Calibri, but these are not perfect. Because of pixel limitations, some letters are too pointy, too hazy, too thin, or too wide. The company is also working on screen resolution—pixel density, color-coding, and spacing—as well as screen portability. Liu (2005) also noted the reader fatigue problem, and Berg, Hoffman, and Dawson (2010) asserted "eyestrain and fatigue from reading on a computer for a prolonged time is perhaps the most common usability complaint among e-book users" (p. 519).

Probably one of the more surprising results of research—at least to students—is the strong evidence that electronic multitasking cannot be done well, but students continue to do it. Students are not able to read an online text and text to friends, listen to a lecture and text to friends, tweet and read, or any other type of media multitasking. Public Broadcasting System's show from *Frontline* titled "Digital Nation" (Rushcoff & Dretskin, 2011) demonstrated well that college students think they can multitask, but they actually cannot. Lauren, a student from Massachusetts Institute of Technology said, "I feel like the professors here do have to accept that we can multitask very well and that we do it at all times" (http://www.pbs.org/wgbh/pages/frontline/digitalnation/etc/script.html).

However, Professor Clifford Nass of Stanford, who gets the same story from his students, has investigated whether students actually can multitask. He said in "Digital Nation" (Ruschcoff & Dretskin, 2011), "Virtually all multitaskers think they are brilliant at multitasking. And one of the big discoveries is, You know what? You're really lousy at it! It turns out multitaskers are terrible at every aspect of multitasking. They get distracted constantly. Their memory is very disorganized" (http://www.pbs.org/wgbh /pages/ frontline/digitalnation/etc/script.html). His research (Ophir, Nass, & Wagner, 2009) confirmed that heavy multi-taskers cannot filter irrelevant stimuli like they think they can.

Fox, Rosen, and Crawford (2009) agreed with Nass. These researchers had 69 undergraduates who were highly experienced at instant messaging (IMing) participate in a study to see what the compre-hension and grade effects are of IMing. In a laboratory experiment, the students were given the option of whether or not to continue IMing while reading a college-level reading passage on paper. Those who continued to IM while reading did more poorly on a comprehension test than those who did not. GPA was also negatively related to time on IM. Yet Bowman, Levine, Waite, and Gendron (2010) found that instant messaging while reading impacted the time to finish the task, but not test scores.

Conclusion

If the future of reading and writing will be vastly different from what it is today (Bromley, 2010), college students' preferences and abilities will need to change to keep pace. Students still overwhelmingly prefer paper to screen when reading multiple pages of text. This preference may be due to current limitations of screen technology, unreadable text, cognitive overload, or a lifetime of reading this way. Whatever the reasons, today's college instructors and writers need to heed this clear preference when designing online course work and materials.

Existing comprehension studies of online reading and use of hypertext are varied and few. However, it is clear that the reading of hypertext is vastly different from reading on paper, and instructors must learn for themselves how to navigate non-linear readings of this type and identify predictable organizations, rhetorical devices, and patterns. Once these are identified, researchers and practitioners need to work together to discover what are the most effective strategies for reading online with and without hypertext. Variations of prompts, matrix notes, advanced organizers, previews, concept maps, and questions may be among the more important strategies for reading online.

There is little doubt that we are in a quickly changing digital world, and as researchers and practitioners of college reading, we need to know how to help our students succeed in it. As this review shows, the journey has just begun.

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Kate Sandberg *is Professor Emerita of English at University of Alaska Anchorage. She taught various levels of reading, study strategies, critical thinking, and composition there for 26 years. Kate led CRLA as president in 2003-2004 and became a Fellow of Council of Learning Assistance and Developmental Education Associations in 2006.*