

Moving Toward New Classroom Literacies:

A Review of Literature on Changes in Reading Behaviors in the Digital Age

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## Introduction

As technology increases, so does society's dependence on the internet and the information resources stored there. Regardless of what we read (news, expository texts, or literature), how we read is shaped by the technologies with which we read (Mangen, 2008). The complex web of information is not only increasing in volume on the internet, but the *way* in which children interact to retrieve this information has changed drastically in a very short amount of time. Where there may have only been a button to push or a mouse to click in the past, there are now screen swipes, pinches, and myriads of multi-touch linkages that take place in split-second intervals the moment a device is placed in a child's hands. These evolving media behaviors have invited much discussion concerning technology's role in the classroom and learning outcomes, even reporting that student's neurobiology has been in state of change with increasing exposure to the online environment (Mabrito & Medley, 2008). Current theories state that a new kind of learner called a *digital native* exists who "think and process information fundamentally differently from their predecessors" (Prensky, 2001a, p. 2).

Society seems to have entered into the golden age of information where access is granted to all via the internet. However, educators struggle with keeping up with effective reading strategies for this largely unfiltered array of information and how to incorporate it into classroom practice (Sutherland-Smith, 2002). Students approach reading on the internet in a nonlinear, interactive and nonsequential way and literacies are emerging that require a rethinking of the skills needed by the literate being in the 21st century. As Sutherland-Smith (2002) explains, "The Internet provides a gateway to content, and Web literacy represents the digital bridge that will reshape our teaching of reading skills in this new millennium" (p. 668). In this paper, we will examine the evolution of reading habits in the context of the internet with the goal of helping educators develop strategies for effectively teaching reading skills to a new generation of *Digital Readers*.

## Digital Readers Engage in Collaborate Text

Children today are growing up in a vastly different media environment than the previous generation (Mabrito & Medley, 2008; Liu, 2005; Prensky, 2001a). Coming of age in an environment infused with technology, where virtual worlds interact more and more seamlessly with the real world, means that these students represent the first generation of digital learners—learners accustomed to seeking and building knowledge in a technology-enhanced environment (Mabrito & Medley, 2008). This suggests that the Digital Reader participates in a unique knowledge delivery system, distinct from traditional print. Lanham (1995) compares the difference between print literacy and digital literacy:

In the world of print, the idea and its expression are virtually one. The meaning takes the form of words; words generate the meaning. Digital literacy works in an inherently different way. The same digital code that expresses words and numbers can, if the parameters of expression are adjusted, generate sounds and images. This parametric variation stands at the center of digital expressivity, a role it could never play in print. (701)

Surrounded by digital media and technology-enhanced texts of all kinds, these students

have developed specific skills and knowledge to read, understand, and create these texts (Mabrito & Medley, 2008). Sutherland-Smith (2002) describes digital text reading as different from print text reading because digital text has added features, which means alternative reading strategies are required to decode meaning. Reading web-based text:

- permits nonlinear strategies of thinking;
- allows nonhierarchical strategies;
- offers nonsequential strategies;
- requires visual literacy skills to understand multimedia components;
- is interactive, with the reader able to add, change, or move text; and
- enables a blurring of the relationship between reader and writer (Sutherland-Smith, 2002, pp. 664-665).

These texts often serve to introduce the author to the digital world and may be collaboratively composed and edited; they are frequently multimodal, integrating words, graphics, sound, and video. Texts may also be visual, presented via photo- and video-sharing sites like Flickr, Facebook, and YouTube. Finally, the texts of this generation may take the form of virtual worlds, such as *Second Life*, where the text is virtual reality, a graphical representation of a space that a reader may navigate in the form of an avatar (Mabrito & Medley, 2008).

Students today are gaining more than a special knowledge, or even a skill set, to navigate the online environment. They are forming very specific social connections that are enabling them to create the various modes of text they engage in. How did message boards come to be if not driven by the need to connect with like-minded enthusiasts? Mabrito and Medley (2008) claim that digital texts are the media by which these learners develop social identity, as well as interact and engage in collaborative knowledge building. Consider, for example the popularity of online sites such as MySpace, Xanga, and LiveJournal, all of which started out essentially as online diaries but that have now spawned vast social networks that afford opportunities for students to publish everything from words to multimedia while interacting with a community of learners. Sometimes these texts more closely resemble traditional text, such as in blogs (Blogger, WordPress), but even blogging is rich with opportunities for collaboration and interaction not available within the confines of traditional text (Mabrito & Medley, 2008).

Because the content of these texts are non-linear and dynamic, students have developed ways of thinking that differ altogether from those of their professors who were educated in the previous Industrial Age (Nandini, 2005; Prensky, 2001a). Mabrito and Medley (2008) point out that when teachers can only see linear, print-based texts as a benchmark, digital texts may seem to fall quite short. However, these digital texts contain more style, coherence, or organization than an instructor might be familiar with. For example, spending time on Instagram posting images might appear to be a random social activity on the surface. But on second look, with added authorial comments and tags, more closely resembles a traditional essay. With the time spent on such a project, the desire to share it with others, and its ability to communicate meaning can certainly be equal to the investment required by the traditional essay—and the end result may actually provide more meaningful connection for their intended audience (Mabrito & Medley, 2008).

The digital culture and its texts have allowed students to cultivate the ability to adapt to new tools and languages as they are developed within digital spaces (Mabrito & Medley, 2008; Liu, 2005; Prensky, 2001a; Sutherland, 2002). These spaces are highly active learning communities, producing the virtual textbooks of this generation's life—constantly changing artifacts that may provide a glimpse into how these learners have evolved as readers and writers

of virtual texts (Mabrito & Medley, 2008). This is a key concept to grasp as teachers structure their classrooms and lessons to reach the modern digital learner.

### **Digital Readers Interact Differently with Online Texts as Compared with Paper Texts**

One observation of screen-based reading is that students employ a superficial hop-skip-and-jump kind of surface scanning that inhibits the deep kind of immersive learning found in print books (James & Kock, 2013). With printed materials, the common behavior of flipping and scanning aides the reader in locating information in a document, as well as getting a sense of the whole text (Liu, 2005). But scrolling on a computer screen does not seem to support this mode of reading and information processing. James and Kock (2013) argue that hyperattention—the state commonly associated with screen-based, digital reading—invariably results in a process of “neurocognitive shallowing” (p. 4). Carr (2010) explains that shallowing is caused by internet reading skills such as scanning, and the common acts of performing several tasks at once—what should I read first? What link should I push? Should I “like” this page on Facebook—and are seen as overriding cognitive space previously reserved for thinking deeply. Carr (2010) further suggests that learning or engaging with a text in a digital environment causes the reader to expend energy making decisions and problem-solving at the expense language, memory and visual processing skills, thus sacrificing the “deep attention” (p. 122) promoted by the quiet linear act of traditional, paper-based reading. When it came to online searching, Sutherland-Smith (2002) observed that students felt a need to hurry and employed a frenetic “snatch-and-grab” (p. 666) technique by skimming text to identify a key word or phrase and quickly grabbing the text for saving.

In Mangen and Kuiken’s (2014) important study, they found that iPad-readers generally reported spatial and temporal dislocation within the text and that having a good spatial representation of the physical layout of the text (print on paper), moreover, supports reading comprehension. Readers tend to locate items on a page and within a document by establishing visual markers. Scrolling can weaken this relationship. They report that, “the intangibility and transient quality of a digitally displayed text (in the iPad condition) may have hindered the representation of such spatial information. That is, when reading on the screen ‘page,’ readers’ sense of location may have been limited to what was visually provided in only two dimensions” (Mangen & Kuiken, 2014, pp. 164-165). Books, on the other hand, gave readers a stronger sense of location by offering them visual cues in addition to tactile ones: as pages were turned and increased to one side, the readers were able to grasp plot sequence and details of the story.

Shallower and less in-depth reading can also occur when there are too many tasks competing for readers’ attention (James & Kock, 2013; Liu, 2005; Carr, 2011). One student in a study by Liu (2005) reported, “It is hard to concentrate on reading documents on the web. I need to learn how to ignore distracting colorful or blinking graphics. Having to continually close unwanted pop-up windows is also very distracting” (p. 707). When multiple windows are open, another participant in the same study said that his/her reading concentration is interrupted by other tasks (e.g. e-mail). Having to decide which hyperlink to follow, which text to read, and whether to scroll down a page makes it difficult to devote full attention to reading continuously (Mabrito & Medley, 2008; Margolin, Driscoll, Toland, & Kegler, 2013; Liu, 2005; Carr, 2010). When given a task to perform, students spent too much time deciding on which website to visit or which source to follow. The result of their searches often ended with vast amounts of information to sift through only to realize none of it was pertinent to their work. This caused

frustration and mental overload with many students deciding to opt out of the assignment altogether (Sutherland-Smith, 2002).

There is a growing body of evidence that supports a complementary perspective from that of the “neurocognitive shallowing” (James & Kock, 2013, p. 4) presented in this section and worth discussing here. It is complementary because it does not oppose the aforementioned evidence, but builds from the position that as a result of this generation growing up in and acclimating to the digital space, their capacity to process multiple pieces of information has increased (Prensky, 2001ab; Mabrito & Medley, 2008; Selwyn, 2009; Mozuraite, 2015; Nandini, 2005). To explain, Selwyn (2009) argues “that internet use enhances the capacity for young people to possess greater working memory and be more adept at perceptual learning” (p. 367). Prensky (2001a) coined the term for these learners as “digital natives” (p. 2) because of their familiarity with the digital world and ability to receive information rapidly. He observes that “they like to parallel process and multi-task. They prefer their graphics before their text rather than the opposite. They prefer random access . . .” (p. 4). Prensky (2001a) goes on to describe how these new learners have been networked most or all of their lives, therefore have little patience for the slow, step-by-step style instruction taught in most schools today. He calls for a major change in educational methodology—patterning learning after a “game-based” (Prensky, 2001a, p. 5) model whereby students learn in away more accustomed to the digital natives’ connected online world. In the digital world of the learner with access to technology, children learn to read much faster than did their peers in the pre-computer era, process information more quickly, and are able to split attention between several sources of information with greater ease (Mozuraite, 2015).

### **Digital Readers Learn to Navigate Hypertext and Hypermedia**

One of the best-documented examples of digital distraction is the hyperlink: a highlighted word or phrase allowing readers to navigate to a related location on the internet. James and Kock (2013) define a hypertext environment as being made up of network-like information structures in which fragments of information are stored in “nodes” (p. 12) that are interconnected by electronic hyperlinks. According to Carr (2010), early commentators suggested that hyperlinks would be a boon to learning, but in his review of a number of the studies, Carr concludes that “hypertext substantially increases readers’ cognitive load and hence weakens their ability to comprehend and retain what they’re reading” (p. 126). Carr’s review highlights the same finding for hypermedia (images, sounds and moving pictures) located within a text: it weakens comprehension and learning rather than strengthening these functions.

Hypertext and hypermedia can overwhelm students, impacting motivation and impairing learning (Liu, 2005; Carr, 2010; Kock & James, 2013; Kushnir & Berry, 2010). Kushnir and Berry (2010) caution that hypertext done badly can disorient users, causing them to feel lost and frustrated, thus increasing their cognitive burden. For example, if the online environment is noisy, contain irrelevant material, too many links, or hinder their learning goals, it can affect learning outcomes. In their qualitative study of 208 students, Kushnir and Berry (2010) found “that students using online learning environments seem to have misconceptions about the amount of information with which they are presented . . . that they felt overloaded and believed that they were presented with significantly more information than was actually presented” (p. 708). The results from their particular study suggest that any sort of hypertext, whether relevant or

irrelevant, had a negative impact on students' performance compared to students who scrolled through the same material without hypertext.

Time spent on non-linear reading is on the rise, indicating a decline in sustained attention in reading (Liu, 2005). The presence of hypertext facilitates more non-linear reading (e.g. jump), so the more links encountered, the more possible options in reading path. Hyper-reading may also contribute to more fragmented and cursory reading, since each page has to contend with many other pages for the user's attention (Liu, 2005; Mozuraitė, 2015). Digital environments tend to encourage people to explore many topics more broadly, but at a surface level. Thinking deeply about a single subject is often hindered by colorful, flashing hyperlinks. In a study of readers who read either a text with active hypertext or the same text in linear form, Miall and Dobson (2001) found that "hypertext discourages the absorbed and reflective mode that characterizes literacy reading" (p. 707). Scanning offers an effective way to filter through the vast amount of information. Therefore, to prepare the e-texts for reading on the screen, authors try to cut them into smaller parts for the convenience, and this leads to the impoverishment of the text and reading skills (Liu, 2005).

However, studies in this area have had conflicting results. Hypertext and hypermedia can be suitable for various learning styles and make online learning more effective (Prensky, 2001a, Sorapure, Inglesby, & Yatchisin, 1998; James & Kock, 2013). The very nature of the online environment is one of seamless shifting from text to text, and as Sorapure, Inglesby, and Yatchisin (1998) point out, "offers the opportunity to extend literacy skills—such as associative logic, visual rhetoric and interactivity" (p. 410). Prensky (2001b) argues that children raised with computers are developing hypertext minds: "They leap around. It's as though their cognitive structures were parallel, not sequential" (p. 4). He further writes that through games and web-surfing, children are energetically retraining their brains in even newer non-linear ways.

The internet provides non-linear thinking models to students and presents alternative forms of organization beyond the vertical, linear-sequential model that serves so well in the world of print media (Sutherland-Smith, 2002; Sorapure et al., 1998). In this environment, children need to be taught non-traditional ways to find information that is not immediately made available through "googling." This is where building on the concept of word families can be most helpful—using related words and synonyms to search laterally can be a good way to help kids find the information they need more quickly. Also, teaching active searching on the web can also help develop visual literacy skills in students since discernment is needed to determine which visual images are important and which are present just to make the site look pretty (Sutherland-Smith, 2002).

## **Conclusion and Implications**

Children today are growing up in an increasingly digital environment and developing distinct screen-based reading behaviors as a result (Mangen, 2008; James & Kock, 2013; Liu, 2005). Students need a variety of strategies to cope with multimedia where efficient and effective learning is obtained when information is presented using organized principles of text, graphics and audio in different couplings for learners who enjoy the digital atmosphere. Classrooms will learn to celebrate not just individual knowledge stored in the head, but distributed knowledge obtained from networking with others, using tools and technologies from the internet. While traditional classrooms continue to foster interaction, models for pedagogy can be adjusted to include the growing population of learners whose education is done in environments where

unstructured, hyper-linked, associative logic and parallel processing takes place. Mabrito and Medley (2008) tell us that texts that do not look like books and essays and that are structured in unfamiliar ways may leave educators with the perception that the authors of these texts lack necessary literacy skills. Are these students missing something, or are they coming to us with skills as researchers, readers, writers, and critical thinkers that have been developed in a context that faculty members may not understand and appreciate?

This report does not place favor over the print or digital delivery systems. It is a closer look at how habits have changed with the advent of digital technology and pays particular attention to how these changes can be addressed in learning environments. It is not the author's goal to proclaim that the printed book will be relegated to the annals of history along with the scroll of times past. That is unlikely to happen in the near future, if at all. What is needed is identification of what is being gained by this technology and what is being lost. Even in his influential essay "Digital Natives, Digital Immigrants," Prensky (2001b) acknowledges the importance of the type of reflection encouraged by traditional text-based books. He argues that one of the most interesting challenges is "to figure out and invent ways to include reflection and critical thinking" (p. 5) in the education of digital natives, but that this should be done within the realm of the digital native's online space (2001b). I am suggesting that wisdom and insight be applied to an inevitable element of the literate being's 21<sup>st</sup> century future, while moving towards what Liu (2005) says: "Understanding changes in reading behavior would help in designing more effective digital libraries and empower users in the digital environment" (p. 700). Research in this area is still in its infancy. Future studies should include:

- The link between online reading activities and metacognitive strategies. As the reading of both printed and electronic texts become one of people's daily habits, the relationship among different online reading activities, knowledge of metacognitive strategies, and reading literacy.
- New models will need to be developed to help researchers and educators to address the advantages and disadvantages to using new technologies for reading texts.
- More empirical and longitudinal research on the "Digital Native" is needed as it pertains to what extent and in what sense the effects are due to patterns of cohort media habits.
- Empirical data on gap between reflection and critical thinking in learning from digital and print.
- How multimedia arrangement contributes to comprehension/confusion in learning environments.
- Study of individuals that have different cognitive profiles and/or digital experience and impact on learning outcomes.
- The use of imagination in the online environment: Is imagination impeded or aided in digital reading formats.

We must rethink the learning spaces that Digital Readers participate in. These environments are cooperative and collaborative at the core and build a skill set that will carry students into real-world industries in their futures. If teachers can consider Facebook a part of the social extension of their classrooms, then it will not be a far leap to consider that working as an engineer for Facebook will not only include coding and mathematical skills, but an intrinsic understanding of the social connectivity that operating in this web-based environment requires. These classrooms will look more organic in their appearance, but will utilize multidisciplinary and cross-disciplinary approaches to learning, as well as an emphasis on experiential learning. When we find ways to overcome this "information processing gap" (Mabrito & Medley, 2008, p.

6) between how students engage in internet culture at home and school, we can help students cultivate the research and writing skills that they have developed online, and package course content in ways that match their learning styles and optimize their strengths.



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## Appendix—Strategies for Teaching Web Literacy

The following is a compilation of effective classroom strategies for structuring web lessons devised by Sutherland-Smith (2002, pp. 665-667), and is listed here as an additional resource:

- Use the snatch-and-grab reading technique. Students skim the text to identify a key word or phrase and grab the text onto the disk/flash drive/cloud, or save the site as a bookmark. The aim is that students only read superficially, with limited comprehension of the completed text, and compile a grab-bag of references. This is effective with limited class time, and students can go back later and read more slowly while gathering the right material.
- Focus on refining key-word searches. Teaching students to design a set of focus key words or questions before searching the internet was useful. For example, searching the phrase printing press on the internet located 595 hits, but it is not until search number 52 that Johannes Gutenberg's invention is mentioned. Teacher modeling of how to narrow the key word search from printing press to invention of or history of the printing press immediately refined the search. This strategy cut extraneous sites from 595 for the general printing press search to 12 sites for history and two sites for invention. It applied equally well to whichever search engine was used. Therefore, students need to be explicitly taught how to narrow the scope of their key-word search to find information more efficiently.
- Exploring ways to help students overcome the panic that can beset them when confronted with the sheer volume of information on the web is essential. Often clear guidelines as to the purpose of the search and an approximation of how many searches may suffice assisted students who perceived the task as monumental. Clear purpose statements also help overcome the problem of students who have poor technical and task orientation skills. Some students often pressed the "back" key on the web toolbar, but did not really comprehend how or why they arrived at that point in the first place or where they should try next. Quite often these students resorted to "channel surfing" which meant they scanned text randomly, in very short bursts, with no overall sense of coherence or meaning in the search. Their searches were too general, vague, or ambiguous, and not organized so that a topic could be coped with in small chunks.
- The chunking technique is a term Sutherland-Smith coined to show students the ways in which a complex topic could be broken down into manageable sections or chunks. For example, when researching the creation of Qantas, Australia's first airline, the teacher explained how students could think about the topic in chunks: Qantas the airline, its historical significance for Australia, when and why it was created, and its effect on remote communities. Students then brainstormed words and ideas to use as a search focus for the "chunk" of information they would deal with, for example the historical focus, before moving to the next chunk. This technique assisted students who possessed poor

search or organizational skills and encouraged a broader conceptualization and more lateral thinking about project topics.

- Teachers also need to help overcome student frustration with technology. In addition to coping with the usual technical problems such as terminals not working, the internet crashing, sites having moved, and dead-end links, students became disillusioned when they could not immediately locate information. This frustration is often heightened for primary-age students, as movements between links make it increasingly difficult for the reader to predict results as more links appear. When this happens, many readers simply opt out of the process in frustration.
- Provide short-cut lists to sites or search engines. Teachers can assist students by providing preset lists of short cuts or bookmarks to reliable sites and hints for students to effectively organize their lists of web addresses. It is essential for us to realize that these strategies must be explicitly taught, as they are not obvious to many students in computer-mediated classrooms. A most effective method was teacher modeling of explicitly taught search techniques, following a handout that was distributed to students as a step-by-step guide.
- Limit links. One strategy assisting weaker students was to limit the number of links students followed. As some of the weaker students tended to follow many links and became confused about their topic, they were easily distracted from the focus questions. Consequently they finished the class with little tangible progress. This is not to suggest that learning did not occur, but frustration was displayed by students when limited progress in tasks was evident.
- Evaluate nontextual features (images, graphics). Evaluation of nontextual features is crucial to web literacy. Visual elements can distract readers and cause difficulty finding written information on the web. This is not to suggest that written text is of greater importance than images; rather, some students need explicit instruction in how to decode the image and not regard it merely as an illustration. Many sites simply have a vast array of visual images that are focal points, where the image as well as the text conveys pertinent information. To train healthy skeptics in terms of internet information, we need to expand student consciousness of the possible disparity of text and visual images on a website and show students the ways in which visual information can be manipulated and how images can lie and create false visual perspectives.