The Reading Matrix © 2009
Volume 9, Number 1, April 2009

The Psycholinguistics of Literacy in a Flat World

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ABSTRACT

If Friedman is right that the world is "flat," we need to understand the linguistic implications of that claim. In this increasingly flat world, classical critical literacy is both urgently needed and poorly understood from a linguistic perspective. Three claims based on research on reading can improve both the understanding of the common psycholinguistic features of literacy and the practice of critical literacy: The first claim is that in this flat world, psycholinguistic research on literacy shows that humans' underlying abilities are constant from page to screen, drawing on basic cognitive and linguistic processing mechanisms including recognition, identification, categorization and others. The second claim is that literacy is the highest level in the on-going evolution of human language abilities. Finally, the third claim states that the forms of literacy are evolving in new media across digital and linguistic borders of all kinds. Psycholinguistic research provides a deeper understanding of and evidence for all three claims. This paper explores the implications of these claims for literacy in a flat world.

INTRODUCTION

If Friedman is right that the world is "flat," we need to understand the linguistic implications of that claim. The forces creating the flat world enumerated by Friedman in *The World is Flat* (2006) include political and technological changes. According to him, the world has been flattened by the global changes in where and how work gets done. The Internet, outsourcing, and extensive changes in communication technology (cell phones and other devices) are all forces that tie us increasingly to screens and digital displays that include text and visual material. In this increasingly flat world that entails more information availability in an ever-wider array of forms and formats, classical critical literacy is both urgently needed and poorly understood from a linguistic perspective. This paper makes three claims based on research on reading that can improve both the understanding of the common psycholinguistic features of literacy on both pages and screens as well as the practice of critical literacy: I propose, first, that in this flat world, psycholinguistic research on literacy shows that humans' underlying abilities are constant from page to screen, that literacy, secondly, constitutes the on-going evolution of human language abilities, and finally, that the forms of literacy are evolving in new media across digital and linguistic borders of all kinds.

LITERACY NEEDS ACROSS BORDERS

Research on adult literacy abilities suggests that the absence of strong literacy skills is a widespread problem in America and around the world. The United States Congress was sufficiently concerned about the reading ability of the population at large that it commissioned a national survey of adult literacy, first completed and reported in 1992 as the National Adult Literacy Survey (Kirsch, Jungeblut, Jenkins, & Kolstad, 1992), and a second similar survey, the National Assessment of Adult Literacy completed in 2003 (U.S. Department of Education, 2006). Yet another similar study has also been done internationally, among the OECD countries (Organisation for Economic Co-operation and Development), a group of nations that represent more than half of the gross domestic product in the world, i.e., most of the developed countries on the planet (*Literacy,* 2000) .

These studies (referred to hereafter as NALS, NAAL and IALS) are particularly interesting and important for a number of different reasons. First, the studies are noteworthy because of their shared methodology of direct testing: they ask respondents to perform a series of increasingly complex literacy tasks using a variety of materials drawn from prose, documents, and quantitative sources. The survey population was constructed to reflect the population at large in each case, using national census data as the base for constructing the sample. Because of their shared methods and demographics, these surveys provide a clear overall picture of the state of human literacy, and their findings are not convincing. Although all of them share some key limitations, including asking readers to work with only brief passages, they do not measure readers' abilities to work with online materials and make no attempt to measure such advanced critical literacy skills as analysis, synthesis, or evaluation. The picture these studies provide is not positive. Less than half the population functions at the highest levels of literacy on any of these surveys. Writing in the *International Review of Education* in 2000, Hautecoeur, a senior researcher for UNESCO and adult literacy scholar, notes that across all the countries in the IALS study, somewhere between a quarter and half of the population does not have sufficient literacy skills to function in society.

The economic and social implications of these results bear on countries' long-term sustainable development, prosperity, and social cohesion, not to mention their ability to participate in the increasingly flat, globally connected, digital, marketplace (Hautecoeur, 2000, pp. 357-359). In response to these and other findings, the United Nations declared a "literacy decade" in the years 2003-2012 and designated UNESCO to lead its efforts to address literacy problems around the world (Muller & Murtagh, 2002). The UN declaration makes clear that literacy needs to be the center of attention, not just in the United States and not just in public schools, but around the world, in all school settings, colleges and universities, community literacy programs, and everywhere else.

The findings reported in NALS, NAAL and IALS are not the only results that show the need for much more attention to literacy, particularly in the U.S. The recently released National Endowment for the Arts study *To Read or Not to Read* (United States, NEA, 2007), as well as a prior study (NEA, 2004), both show a continuing decline in reading in the population at large that has political, economic and social implications in addition to the educational ones. The NEA findings are, like the surveys discussed previously, limited, albeit in a different way. For the most part, the NEA reports rely on self-report data from those surveyed rather than on direct tests or other more objective types of data. Their findings show a marked decline in reading, and the

NEA is not alone in this observation. For example, Friedman (2006) also makes this point in his critique of education in the U.S. Similarly, the recent report of the Spellings Commission on the future of higher education makes note of the findings of NAAL, pointing specifically to a decline in prose literacy among college graduates (United States, *A Test*, 2006, p. 3). And finally, a careful study of 563,000 high school students' reading scores and success in college by the American College Testing organization shows that roughly half of high school seniors tracked over three years do not have reading skills essential to success in college (American College Testing, 2006). These studies and the psycholinguistic research to be discussed below show that there is no question about the need to improve literacy among the young and across the whole population in the U.S. and around the world.

Three Specific Claims About Literacy in a Flat World

The point of the discussion thus far is not only that the need for superb reading and literacy skills among all citizens, in school and out, at the public school level, in higher education, community education and literacy programs is essential for successful participation in our ever-flatter world, but also that it is not being met. One explanation for the weakness in literacy skills is a lack of understanding about the common features of literacy on printed pages and digital screens. While scholars in new media claim that digital forms are all new and different from traditional forms, psycholinguistic research shows that on the whole, reading and writing on pages and screens entail the same fundamental processes. There are a few new features and abilities people need to be literate in digital environments, but as the following discussion will suggest, they are small in both number and significance. This observation is based on three major claims about the psycholinguistics of literacy.

Claim 1: *Literacy is based on common processing mechanisms and features of language*

The first claim is that the perceptual, cognitive, and linguistic abilities required for literacy are consistent across print and digital environments, arising through processes like those in acquisition and in emergent literacy. Research of psycholinguists Goodman (*On Reading*, 1996), Kucer (*Dimensions of Literacy*, 2005), and Smith (*Understanding Reading*, 2004) provide the basis for this claim. Psycholinguistic analysis shows that reading entails processing language in essential ways that remain the same whether the text is on paper or a screen, with text, images, and so forth. To deal with print and digital texts, the following definitions and examples show that humans identify, categorize, discriminate, predict, and make use of short-term memory, syntactic elements, and psycholinguistic redundancy.

The first of these cognitive processing abilities is the ability to identify, that is to say, to be able to recognize and label the various parts of language. Humans can also categorize parts of the language, separating the categories of consonant and vowel sounds, the parts of speech, the types of sentences and so on, a second cognitive capacity. Third, humans could not exercise their literate capacities without the ability to discriminate, judging the similarities and differences among language bits. This ability makes it possible for us to look at both 'A' and 'a' and conclude that they are the same letter. Similarly, we can look at 'E' and 'F' and note that they are different. Humans also have the ability to predict based on prior knowledge of language and the world. Prediction allows us to create expectations about texts as we engage with them, and to confirm or change them as the text unfolds. The abilities are all limited to some degree because

they rely on a fifth feature of human cognition, the limitation of short term memory to about seven unrelated items (Miller, 1956). All five of these basic cognitive skills underlie critical literacy, regardless of whether it is practiced on a printed page or on a screen. It seems likely that the evolutionary process of natural selection has endowed us with these abilities because they provide the basis for literacy, our most fully evolved human language ability.

Human language capacity also relies on two basic linguistic abilities, involving syntax and psycholinguistic redundancy. Human capability with syntax is the sixth of the basic processing mechanisms that make literacy possible. Human knowledge of syntax makes it possible for us to judge grammaticality and acceptability of strings of words in our language (Fromkin, Rodman, & Hyams, 2002). It also makes possible the infinite creativity with language that allows people to use it in both printed and digital environments. That language is arbitrary and can be used in a displaced environment further enhances our options with printed and digital forms, characteristics made possible by the syntactic structure of any human language.

Finally, there is the ability to recognize and use the inherent redundancy in language at all levels (Smith, 2004). Without this ability, humans would be in a constant state of information overload. Both conscious and unconscious awareness of redundancy allows humans to disregard parts of any language-based presentation, printed or digital, that are not essential in order to get meaning. A few quick examples of redundancy at various language levels might be helpful. In terms of letter sequences, redundancy comes into play in English with the letter ‘q’ which is always followed by a redundant ‘u.’ Anyone who knows written English knows this fact and can skip the ‘u’ in a visual display. In terms of words and sentences, if a reader looks at a sentence like, “The students were reading their books,” there are three or four different opportunities to get the idea that the sentence is plural: the –s marker on students, the plural auxiliary were, the plural pronoun and the –s marker on books. At the level of discourse, Aristotle’s rhetorical advice of “tell ‘em what you’re going to tell ‘em, tell ‘em, and tell ‘em what you told ‘em” builds in discourse-level redundancy. Visually, there might be redundancy in bold print and important content, or a bright color or different font used to highlight key ideas. No claim is made that any of this is necessarily conscious, only that redundancy makes high-speed processing of text possible on a page or screen. Exercises in Goodman’s (1996) and Kucer’s (2005) books show how these abilities work.

These seven basic processing mechanisms are fundamental to human literacy ability and apply to processing of both printed and digital texts. In addition to the basic processing mechanisms for language, the distinctive features of written language itself also help account for the consistency of literacy activities across pages, screens and borders. There are four levels of distinctive features in written language, and again, these features appear in both printed and digital texts of many kinds. The following discussion makes clear that the distinctive features include rudimentary and basic features as well as those at intermediate and advanced levels.

The rudimentary level of distinctive language features includes the orthography of English or whatever language is being used for reading and writing. Humans use the features of letters to make reading and writing possible/doable. At the basic level, people use words, word meanings and their structures (roots, prefixes, suffixes, grammatical inflections and so on) in order to read and write. To use the written language, the features of the words of the language and also the punctuation of basic language forms are key components. Beginning writers must learn which pieces go where; these underlying principles develop in a stage-like fashion well documented in the work on emergent literacy (Teale & Sulzby, 1986).

The third level of distinctive features, the intermediate level, includes the distinctive forms that documents can take, both visually and in terms of the genres of language. The visual area includes the standard array of visual aids used in printed materials such as pie charts, line graphs, tables, and diagrams. Digitally, these forms are also used along with pictures, videos or animation and graphic arrays. In genres, there are the basic forms of fiction, poetry, drama, and non-fiction prose and, of course, the many literary forms within these various genres. Fiction includes short stories, novellas, novels, and so on, while non-fiction includes essays, newspaper reports, contracts, warranty statements, wills and a myriad of other types of documents. Finally, the advanced set of distinctive features brings in the rhetorical modes and forms of argument. This array of distinctive features is also used in both print and digital environments.

It should be clear that human literacy requires these processing mechanisms and distinctive features whether it is being conducted on paper or screen. The venue in which literacy activities occur is irrelevant because the underlying psycholinguistic processes are the same in both print and digital media; they operate on the distinctive features of written language. There are two additional processing abilities needed for digital literacy, and some new features as well. Before examining these new processes and features involved in digital forms of literacy, a second claim about human literacy, which runs counter to the view of many linguists, must be explored.

Claim 2: *Literacy is currently the most highly evolved human language ability*

Linguists like to say that simply having language in spoken form is the chief capacity that makes us distinct from all other animals. In contrast, I propose that human literacy, regardless of the venue in which it is purveyed, represents the most evolved form of human linguistic achievement. Here, I draw on the work of biologist Richard Lewontin (2000), whose work focuses on genetic and environmental factors, and literacy scholars Gunther Kress (2003) and Barbara Warnick (2002) both of whom primarily deal with new notions of literacy in the digital age.

Human language ability has evolved and is evolving, particularly in the current digital environment. Clearly, the digital landscape is changing as new forms of communication are developed such as text messages, blogs, and social networking. I offer some observations about the evolution of these forms in my third claim below. In addition to the on-going development of new forms, however, the ability to deal with written language on page or screen is simply the most sophisticated or highly evolved human language ability. It moves us well beyond spoken language to a much higher level.

A few definitions from the dictionary and Lewontin's (2000) work help make clear why this is the case. The dictionary defines evolution as "the continuous genetic adaptation of organisms or species to the environment by integrating agencies of selection, hybridization, inbreeding and mutation" (Stein, 1966). The four processes incorporated in this definition of the biological process of evolution will be useful in describing the developments in critical literacy.

The new venues require the use of the processing mechanisms already mentioned and require only two additional abilities, probably derived through selection and hybridization of abilities we already have: the ability to deal with bricolage (assembling from parts) and juxtaposition (positioning items in meaningful configurations). This claim is based on the work of literacy scholars Burbules (1998), Bolter (2001), and Faigley (2004). These additional abilities make critical literacy possible on the web. Both of these are visual matters, because the Internet

focuses attention on the visual in a way that printed text does not. As psycholinguist Kolers (1967) has said, reading of print pages in general is only "incidentally visual." The web, by contrast, is specifically visual, so visual processing becomes much more important.

Bricolage, then, is the ability to put together parts, according to digital rhetorician Burbules (1998, p. 107). Burbules defines bricolage as "*assembling* texts from pieces that can be represented in multiple relations to one another" (p. 107). The bricolage in a website involves putting together text and additional distinctive features to be discussed below to make a complete site. Part of what makes digital literacy engaging is that it requires this ability to assemble various parts into a unified whole. However, it is important to remember that bricolage refers to assembly or composition. Thus, it is not an entirely new ability, but rather, a blend or hybrid of extant abilities, such as dealing with pictures, graphics, and color, among other things.

The second ability needed to deal with the Internet in terms of both production and perception is juxtaposition (Burbules, 1998, p. 107). In foregrounding the visual, a web page asks readers to see images as they are arrayed, next to each other for various specific purposes. Part of the point is to see and notice and attend to how the various pieces of a web page are related to each other by their position on the screen. Burbules notes that these abilities are supplements to those other more conventional mechanisms, adding to the list but not deleting any of the others discussed earlier (p. 107). Thus, bricolage and juxtaposition both represent the on-going hybrid development of our evolving literacy ability. Juxtaposition entails layout skills used in print together with newer configuration strategies technology allows. These abilities can be taught and practiced easily in both print and digital environments. However, to move beyond these specific visual abilities, the deeper aspects of critical literacy, including analysis, synthesis, evaluation and application can best be developed through work with traditional, extended texts in print.

Claim 3: *Literacy forms are evolving in new media*

These most evolved human language abilities work with the distinctive features of web pages in various ways. It is important to see that the forms themselves are evolving constantly, so that the digital environment offers new distinctive features in addition to changing processing abilities. The additional distinctive features of web pages specifically include links, images, sounds, and movement. Burbules (1998) states that the key or distinctive feature of hypertext are the links, which all work the same way, in that they produce a new page on the screen. All require hyperreading or critical reading. Burbules points out that links are fundamentally rhetorical in nature (p. 104); they can be categorized in terms of the figures of speech through which they function to shape readers' responses to text (pp. 110-117).

The hypertexts we find on the web are like paper texts in some ways, but have some distinguishing characteristics. Internet scholar Bolter (2001) has made this observation, noting for example that hypertext is close to the way we think, through associations (some examples of links appear in Bolter's Storyspace program at http://www.eastgate.com/storyspace/index.html). In contrast to print reading, where according to psycholinguist Smith (2004) the text is thought to be transparent so readers look directly at meaning, hypertext expects readers to attend to its form: "In following hypertextual links, the reader becomes conscious of the form or medium itself and of her interaction with it" (Bolter, 2001, p. 43). The ability to hyperread relies on those fundamental processing abilities because it relies on print reading ability. As Bolter (2001) states:

> Instead, the World Wide Web offers us the experience of moving through a visual and conceptual space different from the space of the book, although this experience still depends on our intuitive understanding of that earlier writing space. Indeed, we depend in a variety of ways on our knowledge of print in order to read and write hypertexts. (p. 45)

Hyperreading is particularly visual in nature. It also draws on the hybridized set of distinctive features, again related to and similar to those for printed text, but adding to them. Hyperreading, according to Burbules (1998) entails a different kind of relationship to text, a different kind of reading. He suggests that there may be, or already are, some new orientations to reading. One example he cites is the practice of surfing, applicable not only to the Internet, but also to TV channels via remote control, radio stations via push-button tuning, and CD sampling. This behavior has both positive and negative consequences:

> With a surfeit of stimuli competing for people's attention, they are, on the one hand, becoming more adept at screening information very quickly, making rapid judgements about whether it is desirable, and 'parallel processing' different materials simultaneously. On the other hand, their capacities for sustained attention to any single textual source are affected as a consequence. (Burbules, 1998, p. 108)

The fundamental nature of reading is evolving as strategies like surfing develop and expand. However, my argument is that reading, and particularly the need for critical reading as part of critical literacy, remains consistent, regardless of the venue. Burbules (1998) goes on to point out that reading is also increasingly driven by a consumer orientation to various types and sources of information. Critical literacy is much more challenging when TV, newspapers, web materials and other sources are all merged together, their relative levels of authority mostly lost. As he notes, "As a result, the processes of selection, evaluation, and interpretation that develop information into knowledge and understanding are atrophying for many readers (or are not being developed in the first place)" (p. 109). The critical literacy skills Burbules describes must be much more thoroughly and carefully taught now than previously, as readers' and writers' responses to texts are shaped by the Internet.

My third claim, then, is that the forms of literacy are themselves evolving through the development of new media that reflect the evolutionary processes defined previously: selection, hybridization, inbreeding, and mutation. Image, sound, movement, and links are all part of the ongoing evolution of print and digital forms, as are cell phone novels, a hot trend in Japan according to a recent report in the *New York Times* (Onishi, 2008), course management software, and the social networking sites. Each evolutionary process is clear in current digital forms, as the following examples show.

Selection, first of all, means that evolution occurs through choice of the best characteristics that can be inherited or transferred from one generation to the next. For example, the best features of word processing appear in text messaging and course management software. Hybridization is a biological process that involves combining different types of organisms to give rise to new forms, much like social networking is a hybrid of text and images. Inbreeding entails the mating of related individuals in ways that stabilize their basic makeup. Similarly, websites pull together text, image, sound, movement, juxtaposition, bricolage and so forth as they continue to evolve and improve. The "way back machine," an archive which has been

taking pictures of the Internet since it began, shows how inbreeding has stabilized the patterns of websites. Finally, mutation is a sudden, sharp difference from a parent type of plant or animal, caused by some fundamental genetic change. Would the blogosphere be one example of mutation? Or would XML systems that allow easier information exchange between different computers, mentioned by Friedman (2006, p. 82), or another feature of Web 2.0 or a future development provide such an example? It is hard to know.

The distinctive features of web pages involve all of those that apply to printed written forms (letters, words, sentence structures and so forth), as well as some additional distinctive features that play a role in digital critical literacy; these include links, sounds, movements and images. Links allow readers to move from one site to another; click a link and the screen displays a new page. Navigation from page to page within a site or from site to site is a key distinctive feature of websites and one that designers must work with carefully to insure that all the links work and take readers to the intended destination. Even web authoring templates like those in course management software (such as Blackboard) allow designers to set up links to other sites or pages on the web.

There can also be sound with web pages. In my course on the history and variation in English as a language, for instance, I send students to the web page of the American Dialect Society (http://www.evolpub.com/Americandialects/EngDialLnx.html) by using the link to the Society's website where it is possible to hear recordings of dialect samples. Sound is of course also available as many radio stations which now broadcast or stream their signals via the web (such as the public radio station WDET in Detroit, Michigan found at http://www.wdetfm.org/) and can put sound through computer speakers. Sound can also be sent as part of a greeting card; many web greetings will play a little tune as the card is displayed on the screen.

Movement is yet another distinctive feature of web pages. Electronic birthday cards (as for example, at http://free.bluemountain.com) often entail animation of figures or letters or other images on the screen as the message is delivered, sometimes also with sound, musical or otherwise. Those annoying pop-up ads that appear on the screen on certain sites often have movement of some kind, where parts of the array change, figures appear to dance or other kinds of movements appear. Naturally, there is plenty of movement in all the material available now on YouTube and all other kinds of streaming video.

The final kind of digital distinctive feature is the image or other kind of graphic element. These are often pictures, but diagrams, charts, graphs, cartoons and other visual arrays can also be found on web pages. The search engine Google, for instance, has a whole area devoted exclusively to images that are available on the web. Visual items that appear on the screen though, are again not different from those that might appear on books—books have had pictures, charts, graphs, diagrams, cartoons and other kinds of visual material for a very long time. Here, again, what appears on the web is hybrid, not entirely new. Perhaps the images are ones not readily available in books, but they are like those in books just the same.

It is fair to say, then, that the web entails the use of four additional distinctive features: links, sounds, movements, and images. Not one of these, however, is an entirely new form. Instead, they are evolving features already familiar to us from print and other media like television and radio. Their appearance and our use of them in the new digital environment does not make them entirely new, but simply reflects the on-going evolution of critical literacy. Moreover, it is essential that we not get seduced by these selected, hybridized, inbred or mutated forms and focus all our time and attention on the forms themselves. It should be clear that the core, the critical reading and writing abilities that human beings have had for hundreds of years

are still the abilities we need, regardless of the venue in which they appear. The need for these abilities and for increasing critical application of them continues to grow as the world becomes flatter and more digitally connected.

CONCLUSION

As the world becomes more globally connected through the flattening forces of political, social, and technological change, the need for critical literacy continues to increase. Recent studies make clear that people's reading abilities, even of the limited type tested in national and international surveys, are declining in the United States and elsewhere in the world. If everyone in a flat world needs to be able not only to read and comprehend, but also to achieve such critical abilities as analysis, synthesis, evaluation, and application, it is clear that there is much work to be done to improve literacy in the whole population.

In a flat world then, we all will need more, better, faster literacy skills. Our literacy abilities, however, rely on the same essential cognitive processing mechanisms and features whether we are working with text on paper or text and visual material on screens. Our literacy abilities are currently our most highly evolved language abilities, moving us well beyond spoken forms. Finally, the forms on which the processing mechanisms and features operate are themselves evolving and incorporating hybrid features. While literacy is the most evolved human language ability, and while the forms and venues continue to change, the fundamental abilities on which reading and writing are based remain constant and ever more essential across all borders.

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