READING THE WORLD WIDE WEB: CRITICAL LITERACY FOR THE NEW CENTURY

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Abstract

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Critical literacy in the new century will draw on critical literacy as we have known it from centuries past. It will continue to draw on the basic cognitive mechanisms that make the feat of literacy possible at all. These mechanisms include both essential mental abilities like identification and categorization, processes we use for literacy as well as other kinds of intellectual tasks. The linguistic capabilities humans have, abilities to use syntax and redundancy, will also continue to be important. These mechanisms allow us to work with the distinctive features of letters, words, sentences, and texts to get meaning from print in reading and put meaning into print in writing. The distinctive features make it possible for humans to reach the summit of linguistic achievement, critical literacy. The ability to analyze, synthesize and evaluate are increasingly important in dealing with the Internet. There, the additional mechanisms of bricolage and juxtaposition and the additional features of image, sound, movement and link challenge human literate capacity. Understanding the mechanisms and features of critical literacy expose this amazing human feat, whether print or electronic.

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If you think of it, literacy is really a wonder. Without thinking about it consciously for the most part, we read an amazing array of different kinds of materials at blinding speeds of several hundred words a minute. Achieving literacy is for most people simple and straightforward; once learned, it is never forgotten. Our literate capacity can be transferred to other languages, and even variations in writing system slow us down only a little. Writing takes a bit more effort, but for professional writers, similar claims can be made. Word processing by computer can barely keep up with our ability to generate text through our fingers. In some ways, literacy seems like a trick: some sleight of hand or eye, quick, clever movements that entertain us. Like magic, it seems that the more carefully we try to look, the more the exact nature of the trick eludes us.

If we define our humanity, in part, by our ability with language, a further definition is that literacy, on the printed page and on the Web, is the summit of human linguistic ability. Humans develop this amazing ability by relying on key processing mechanisms that operate on the distinctive features in language. There are distinctive features for letters, words, sentences and texts that are similar to the well-established phonological distinctive features. These processing mechanisms and features make it possible for human beings to be critically literate, to pull off this clever trick. Critical

literacy is more crucial now than ever because of the pervasive use of the World Wide Web. Reading the Web in the framework of cognitive processing mechanisms and the distinctive features with which they work can unmask the trickery of our interaction with the screen. A distinctive feature theory supports the claim that reading on the Web relies on and extends the key critical literacy abilities found in the processing of conventional printed texts.

Critical literacy, simply defined as the ability to analyze, synthesize and evaluate ideas in written language, either through perception (i.e. reading) or production (i.e. writing), hinges on basic mental processing mechanisms. These mechanisms consist of seven major abilities: a group of five general cognitive abilities, including identification or recognition, categorization, discrimination, prediction and limited short-term memory; and two major linguistic abilities, the use of syntax, and the use of psycholinguistic redundancy. All processing mechanisms are used by readers and writers as they work with the distinctive features of written language to achieve critical literacy; these and other similar processes make critical literacy possible on the Web, for the purposes of both perception and production.

Cognitive Processing Mechanisms

Because reading and writing are so pervasive and so successful, it seems reasonable to think that there must be some underlying mechanisms that make these feats possible. In particular, there must be some ways that the human mind is able to perceive and produce written forms. The commonalities are such that they go across languages and writing systems, making reading and writing possible, practical, do-able, whether the writing is logographic (like Chinese), syllabic (like Japanese), or alphabetic (like English). The fundamental processes underlying literacy are the same. Thus, to expose the trick of literacy, it is necessary to find, first, the mental mechanisms that make it possible for us to perceive and produce writing.

The first of these capacities is the human ability to recognize and/or identify letters, words and other written forms, such as punctuation. Recognition, in psycholinguistic terms, includes both remembering, i.e. "conscious recollection of seeing the item previously" (Knowlton, 1998, p. 254), and knowing, i.e. "recognition in the absence of such recollections" (Knowlton, 1998, p. 254). These general abilities apply not only to letters and words but also to meanings in written language processing. Identification makes it possible for us to look at A and a and *A* and label all of them as letter 'A'. Identification refers specifically to the ability to name the letters, words or other written forms.

It may not seem that identification or recognition is important to literacy. One of the great debates in the teaching of reading and writing concerns whether it is necessary for readers and writers to identify, that is, to label, letters and words at all; this issue plays out in arguments over phonics vs. "whole language" approaches to teaching reading, for example. Although Frank Smith, author of one of the definitive textbooks on the nature of the reading process, now in its fifth edition (1994), argues that letter and word identification are not necessary to reading, he does concede that when a reader cannot get meaning directly, there is the possibility of mediated letter or word identification, sometimes using phonics or other strategies (Smith, 1994, p. 151-166). Thus, identification does play a role, albeit limited, in literacy.

A second tool is the ability to categorize a range of possible shapes as belonging to the same group. Categorization is not the same as identification, which specifically refers to labeling ability. Having categorization ability as Pinker (1997, p.127) has described it, that is, an ability to sort items into groups and note common rules or patterns that all members follow, has implications for reading and writing discussed by Frank Smith. Smith points out that identifying letters or words is not that hard, as it entails only labeling. Putting items into a category is more complex since it entails knowing the features of the category. He makes the distinction between these two abilities clear as follows:

> Two aspects of letter identification can be distinguished. The first aspect is the establishment of categories themselves and especially the allocation of category names to them, such as "A," "B," "C." The second aspect of letter identification is the allocation of visual configurations to various cognitive categories—the discrimination of various configurations as different, as not functionally equivalent. The great part of perceptual learning involves finding out what exactly are the distinctive features by which various configurations should be categorized as different from each other, and what are the sets of features that are criterial for particular categories. (Smith, 1994, p. 113)

Identification, he goes on to say, is not necessary in order to be able to categorize or discriminate among categories. By using the sets of features, both processes are possible. He further suggests that the exact feature list is not essential to either identification or categorization, suggesting, I think, that the features may well be intuitions. In the following discussion, I will argue that the features may be intuitive, but that we can also state them explicitly in many cases. For now, the point here is that the ability to name (i.e., identify or recognize) and the ability to group like items together (i.e. to categorize) are basic tools of human thinking ability that make critical literacy possible.

The two processing abilities discussed so far make it possible for us to sort meaningful from meaningless differences when reading (Goodman, 1993). Thus, we know that 'A' and 'a' are both "a". We can put these symbols, though they do not look alike, in a single category and label it. A similar kind of activity makes it possible to read words and sentences by extension. While we do not need to do these things for every aspect of reading and writing, these are, again, the basic mechanisms by which the literacy rabbit comes out of the hat.

A third processing ability is discrimination. Discrimination does not require either identification or categorization, but is a separate kind of ability. It is not necessary to be able to identify (i.e. label) two items in order to discriminate between them. It is also not necessary to categorize two items in order to discriminate between them. Discrimination is the ability to perceive two items as the same as or different from each other. This ability is important in a number of different kinds of cognitive processing, including literacy.

The idea that two letters might be the same or different from each other may not seem terribly significant. All of these cognitive abilities, taken one by one, do not seem as though they are very important. However, each capacity plays a role in the literacy abilities people have. When we use discrimination beyond letters to distinguish words or ideas, the significance of the ability to judge similarity and difference becomes more

clearly relevant to literacy, and especially to critical literacy. In reading two editorials on the same topic for instance, perhaps in different newspapers, the ability to judge the positions of the writers may be very important.

A fourth cognitive ability is the ability to predict. Prediction is a powerful mechanism because it allows us to create expectations. We predict based on our prior knowledge of the world and to some extent, our knowledge of language. Prediction relies chiefly on our knowledge of the world and how it works. Psycholinguists describe this ability in part with the concept of a schema. We have schemas for many different kinds of experiences in the world. Mention a child's birthday party, and many predictions immediately come to mind: cake, ice cream, presents, pin-the-tail-on-the-donkey, singing "Happy Birthday," and so on. Mention lunch at McDonald's, and some menu features (Big Macs, fries) along with the general plan of ordering at a counter, picking up and paying for the food, and related matters will come up.

In written language, there are similar schemas: "Once upon a time" calls up a schema of boy meets girl, boy gets girl, boy loses girl, boy gets girl again, and "they lived happily ever after" with a possible dragon or troll thrown in for good measure. Another one emerges from predictable text structure suggested in headings like these: Review of the Literature, Methods, Results, Discussion, Conclusion. Mostly, though, prediction draws on our knowledge of the world, its conventions, and how it works rather than specifically our knowledge of language and how it works. Linguistic knowledge is captured by the last two types of basic cognitive processing abilities, to be discussed below.

A fifth general cognitive processing ability that plays a key role in critical literacy is the limitation on the content of short-term memory. This limit is well-established at the "magical number seven" give or take two items, as reported by George Miller in a landmark study almost fifty years ago (1956). Miller's research showed clearly that humans can hold about seven unrelated items in short-term memory before they are lost. His finding is firmly established in the research on human information processing.

I usually think of short-term memory as the time between when I put the phone book back in the front closet and get to the phone to key in a number I've looked up in the book. Many things come in batches of seven because of this limit: phone numbers, days of the week, dwarfs, among others. And even with the advent of area codes on many phone numbers in our increasingly wired world, I'd suggest that the area codes most often needed are processed as a unit, making eight items to hold in short-term memory for telephone purposes. This generalized limit on our memory capacity in the short-term must constrain literacy in fundamental ways. When we explore the range of distinctive features at the various levels of literacy, we will find that the array of possible distinctive features at each level of literacy falls in the five to nine item range.

Human beings have these five major abilities that make literacy possible: identification, categorization and discrimination along with prediction ability and short-term memory limitation. All of these processing mechanisms play a role in literacy as they make it possible for human beings to utilize the distinctive features of written language at various levels for comprehension or production. The mechanisms discussed thus far are general processing abilities. In addition, we have two kinds of linguistic ability, again fairly basic in nature, that make critical literacy possible.

The first of these linguistic processing abilities is the general cluster of syntactic ability. Human linguistic ability with respect to syntax entails a number of interrelated phenomena: knowledge of the rules for sentences that allows us to judge strings of words to be sentences and assess a string's grammaticality and acceptability; productive use of a small set of these rules that allows us to create an infinite number of possible sentences; recognition of the arbitrary relationship of symbols and meanings that allows us to adapt language to any need that might arise; disconnection of language from context that allows us to discuss matters unrelated to the immediate context. Each of these syntactic abilities, usually discussed early in basic texts in linguistics and psycholinguistics (Fromkin & Rodman, 1998, p. 26-27; Bernstein Ratner, Berko Gleason & Narasimhan, 1998, p. 5-6) is tied to literacy in easily recognizable ways.

We use our knowledge of the rules of language for instance when we read poetry, where the rules may be broken for artistic purposes. We use productivity when we generate new texts in written form. We use the arbitrary connection of symbol and meaning when we make up new words, such as for new products or new phenomena in the world. We use the absence of context to read or write about people and events happening around the corner or around the world or in imaginary worlds.

In addition to syntax, there is a second linguistic ability, the capacity to process a text by drawing on the inherent redundancy of language. Redundancy is usually thought of as a negative characteristic of language, simple repetition. But psycholinguistically, redundancy constitutes an essential feature of language because it is the feature that insures that the message sent by one person is the same as the message received by another. Redundancy operates largely below our conscious awareness like the other cognitive processing mechanisms, but in its absence, communication is difficult, if not impossible.

The use of the fundamental redundancy of language is in some ways more complex than the preceding six basic tools because it affects a number of different aspects of written language. Redundancy, the information overlap built into language that insures that the message sent is the message received, pervades written language from the configurations of letters to the overall structure of a text. It plays a role in our ability to recognize various aspects of written language, supporting both recognition that is based on remembering and recognition that is based on knowing (Knowlton, 1998, p. 260-261). As Horning has suggested (1993), without redundancy, the connection of readers and writers through a text would be much more difficult. The ability to tap into various kinds of psycholinguistic redundancy is a seventh key processing ability of human beings that plays a key role in critical literacy.

Redundancy helps make sure that the message sent is the message received. Though repetition can do this, and hence, is the simplest form of redundancy, the more complex kinds of redundancy are so pervasive, we hardly notice them in reading or writing. For writers, the old "tell 'em what you're going to tell 'em, tell 'em and tell 'em what you told 'em" is but one example of textual redundancy. Introducing a specialized word or term, defining it and given example all provide the kind of overlap that insures message transmission. There are many such examples of redundancy in the words, phrases, sentences and discourse structures of written language.

Literacy hinges on these key processing mechanisms. Consider this: on average, good readers are able to move through ordinary text at amazing speeds of more than two

hundred words per minute. A really juicy "beach book" can be scooped up at more than four or five hundred words a minute, though more complex texts slow down even the best readers. How are these speeds achieved? My argument is that we rely on the basic processing mechanisms described here: identification/recognition, categorization, discrimination, prediction and short-term memory, albeit limited.   We also rely on the two key linguistic abilities, the capacity for syntax and all that it entails, and the use of the inherent psycholinguistic redundancy of language. These processing abilities interact with the distinctive features of written language at four levels to make critical literacy possible. By extension, critical literacy or "hyperreading" on the Web relies on similar mechanisms and features.

Print Literacy: A Distinctive Feature View
      Originally, in linguistic theory, distinctive features were proposed as characteristics of the sounds of a language that help speakers distinguish meaningful differences among them. Voicing or vocal cord vibration is one such feature in English, the distinguishing feature that separates /b/ from /p/ and allows speakers to determine whether 'pat' or 'bat' has been said. A more technical explanation is offered in an introductory linguistics text:

> When a feature distinguishes one phoneme from another, it is a **distinctive feature** (or a phonemic feature). When two words are exactly alike phonetically except for one feature, the phonetic difference is **distinctive** since this difference alone accounts for the contrast or difference in meaning. (Fromkin & Rodman, 1998, p. 262)

Distinctive features are important in the spoken form of the language because they help insure that speakers understand one another.
      Although the phonological distinctive features have been thoroughly specified and are generally accepted as a means of describing human language sounds, other kinds of distinctive features are not so readily apparent. Indeed, Smith suggests that it may be impossible to know what the distinctive features of letters actually are (1994, p. 117). However, more recent research suggests that we do know a great deal about the distinctive features of written language and will propose some for each level on the path to critical literacy. In doing so, I will rely on Smith's generic definition of what a distinctive feature is:

> …it is a property of visual information that can be used to differentiate some visual configurations from others. By definition, a distinctive feature must be common to more than one object or event, otherwise it could not be used to put more than one into the same category. But, on the other hand, if the feature were present in all objects or events, then we could not use it to segregate them into different categories; it would not be "distinctive." In other words, a feature, if detected, permits the elimination of some of the alternative categories in which a stimulus might be allocated. (Smith, 1994, p. 109-110)

Though he intended for this description to apply chiefly to letter identification in reading, Smith's description works well not only for rudimentary orthographic literacy, but also for the basic, intermediate and advanced levels of literacy.

Rudimentary distinctive features: Letters

Sadoski and Paivio (2001) address the issue of distinctive features in their discussion of the processing of written text in terms of individual letters and words. Drawing on research on visual perception, they suggest that the brain has specific receptors for geometric shapes. When used in reading, then,

> print features include lines, angles, intersections, curvature, openness and so on, as well as the spatial orientation of features such as left, right, up, or down (e.g., *d, b, p, q*). …Through neurological connections, activated visual feature detectors activate visual logogens of letters, common spelling patterns, (e.g., onsets, rimes, affixes), words, or even short phrases learned as visual units. Sadoski & Paivio, 2001, p. 118)

Sadoski and Paivio (2001) account for literacy through their "dual coding theory" (2001, p. 42-66), which incorporates both verbal and nonverbal elements called logogens and imagens. The two coding systems work differently and can function independent of one another, parallel to one another or in relationship and connection to one another. They claim that in dual coding

> all cognition including perception, memory, meaning, and knowledge must be accounted for by the operations of the representations within and between the two codes, and such an accounting can explain a great variety of literacy activities. (Sadoski & Paivio, 2001, p. 66)

For the present discussion, Sadoski and Paivio's findings are useful in supporting the basic claim I am making about distinctive features.

A good example of how the distinctive features help with the written form would be a text that is visually difficult to read: say one that is written in handwriting that is illegible, or printing that is unclear such as in a smeared page of the newspaper. If readers can make out a few distinctive features of letters and words, it is probably possible to read the text in spite of the interference due to the lack of clarity. Partly, of course, the ability to read depends on knowledge of the context of the particular text, prior knowledge of the language and content of the passage and other factors. However, I am suggesting that distinctive features of not only the letters but also the words and sentences make the feat of literacy possible, even under difficult conditions.

Basic distinctive features: Words

Features of words might be roots, prefixes and suffixes, overall syllable structure, length, and sequential constraints. Speakers of English, for instance, know that 'q' will be followed by 'u' in English words, and that initial letter sequences in English words cannot be 'vl' or 'ng.' These are to some extent sequential phonological constraints, but not exclusively so. Words have structure beyond letter sequences: roots, along with prefixes and suffixes, as well as, in some languages, infixes and circumfixes, all provide the basic forms of words. Notice that there are five major elements in this list of word structures, at the low end of the five to nine constraint on short-term memory.

Words fall into the broad categories of the parts of speech that constitute distinctive features: nouns, verbs, adjectives, adverbs, prepositions, conjunctions, pronouns and interjections. The part of speech of a word depends to some extent on how it is being used (and sometimes how it is being pronounced) but most words fall into one or another of the categories. The list of major parts of speech is a list of eight such categories, falling in the short-term memory limit of five to nine items.

Words also have meaning, and if the proposals concerning semantic features are correct, there are distinctive features in the area of meaning as well as in the area of grammatical function. Although scholars in semantics disagree about whether semantic feature theory is the best way to capture meaning, the general idea that word meaning can be analyzed in terms of features has gotten attention in psycholinguistics for many years (Reeves, Hirsh-Pasek & Golinkoff, p. 185-191).

It's clear that readers and writers make use of these various features of words and forms of sentences in a number of different ways in literate activities. These rubrics serve as the general categories used for pedagogical purposes, and more importantly, readers clearly rely on them to get meaning. When readers encounter new words, they seldom race to the dictionary or even turn in a textbook to the glossary for a definition. Instead, they rely on the writer to provide clues to the meaning within the text, one of which is the part of speech of the word.

Part of speech is the first kind of information readers will be able to identify, simply by looking at the syntactic structure in which the word occurs. Here's an example: "The arnspanch crept through the forest in search of food. The monkeys, however, were safely nested in the treetops." (Reynolds, 1995, p. 31). This passage is presented in a text on reading strategies for college students, and is intended to help them see how they can use context to get meaning. One of the key questions the author asks is what part of speech the mystery word "arnspanch" might be, as a way to help readers get meaning.

Word structure, part of speech, sentence structure, and semantic features, are all types of distinctive features at the basic level that make literacy possible. These features rely particularly on our ability to identify or recognize and to categorize. These processes provide a clear description of how the processing mechanisms interact with the distinctive features to make literacy possible.

The two linguistic processing mechanisms, syntax and redundancy, also play an important role in our abilities with words and meanings, since they allow readers to assess the grammatical structure of sentences and use an assortment of overlapping syntactic cues to judge part of speech, affixing and related matters. Reading and writing are magical in some ways, but can also be understood through the processing mechanisms and distinctive features that allow us to pull off trick of literacy.

Intermediate distinctive features: Sentences and documents

At the intermediate level of literacy, we recognize more distinctive features to help to categorize language and make reading and writing possible. Features of word sequences entail the various types of phrases (noun phrases, adjective phrases and the like) and the main types of sentences, simple, compound, complex, declarative, interrogative, exclamatory, active, and passive. This list of eight types of sentences falls into the five to nine memory limit, supporting my claim that the various distinctive features are constrained by basic processing mechanisms. At each level of language or discourse, I am suggesting that readers and writers make use of the distinctive features to perceive and produce text.

The distinctive feature idea also works for punctuation. For English and many other alphabetic languages, the marks of punctuation for major sentence units such as sentences, phrases and clauses are once again essentially a short list: period, comma,

colon, semi-colon, question mark, exclamation point. While there are other marks of punctuation, such as dashes, quotation marks and parentheses and so on, the first list includes those used to mark sentence, clause and phrase boundaries and so are the most widely-used marks. The list is again a short set of six items, within the memory limit. Marks of punctuation not only clarify text structure, they are also important keys to meaning. One has only to think of the centuries of argument and discussion over the original text of the Bible, written without punctuation, to realize the importance of punctuation to the clarification of meaning and hence to literate processes (to see a page of the text as printed by Gutenberg, try this link: www.npr.org/programs/atc/features/2002/feb/gutenberg/020219.gutenberg.html). Although Baron (2000, p. 196) comments that our approaches to punctuation are generally schizophrenic in nature, mixing rhetorical functions (i.e. for reading text aloud appropriately) and grammatical functions (i.e. marking phrases, clauses and so on), it seems clear that the limited set of major marks of punctuation work at least in part to mark grammatical structure.

Beyond these features of structure, I propose that at this third, intermediate level, there are features of text type for documents and prose. The features here might be, for documents, such arrays as tables, charts, graphs, diagrams, forms, and maps, and for prose, the various types of text, including creative forms, newspaper articles or editorials, textbook-type materials or basic legal texts like warranty statements. Because the creative genres require sophisticated, advanced production and interpretation strategies, they belong to the highest level of distinctive features. Here, at the intermediate level, the categories are more generalized and perhaps more visually obvious. For both reading and writing purposes, language users must recognize these as distinctive forms, though again, not necessarily in a conscious way.

A description of the types and levels of both document and prose literacy appears in the United States government's adult literacy survey (Kirsch, Jungeblut, Jenkins & Kolstad, 1993), still considered a landmark study (and available online at http://nces.ed.gov/naal/design/about92.asp). The survey examined a representative sample of the American population, looking for skills at five levels of document and prose literacy. In this broad survey, the tasks in document literacy include locating pieces of information in a chart or graph, map reading, finding information in a table or map, creating a graph, and writing a summary of information from a table, or similar tasks (Kirsch, et al., 1993, p. 10). The tasks in prose literacy entail reading short articles to find information, reading instructions from appliances purchased, comparing metaphors used in a poem, interpreting a phrase from a newspaper article, and writing a letter on a billing error, among others (Kirsch, et al., 1993, p. 10). Some of these fall into the uppermost category in my scheme (comparing metaphors in poetry, e.g.), and are at the highest level in the adult literacy scale as well.

This intermediate level of distinctive features in written language provides a set of broad categories on which readers rely for literacy. The kinds of phrases, clauses and sentences make it possible for literate individuals to put meaning into print and get meaning from print. They are general categories frequently taught in English classes, commonly marked by punctuation and other visual forms such as charts and graphs. Even children engaging in emergent literacy activities know something about what text is supposed to look like: non-literate children produce capital and lower-case scribbles and

word spaces, using marks of punctuation on their "stories" long before letters and words appear (Teale & Sulzby, 1986). To pull off the feat of literacy, children begin with knowledge of the shape of text; literate adults know this and much more about the shape of chunks of text, phrases, clauses, sentences and the visual symbols that separate and connect them, processing these forms using the cognitive and linguistic mechanisms discussed previously (for a description of the essential features of emergent literacy, see http://www.bankstreet.edu/americareads/early.html).

Advanced distinctive features: Rhetorical modes and genres

The modes of discourse enumerated by psychologist and rhetorician Alexander Bain will sound familiar to nearly any teacher of composition, since they persist, in one form or another, in many contemporary texts for the teaching of writing. Bain's major categories are description, narration, and exposition, including within these categories such familiar terms as definition, contrast, exemplification, classification and process ("delineation of complex objects by the stages of their construction") (Bain, 1887, pp. xvi-xviii). Notice again that this is a fairly short list, falling easily within the five to nine item range specified by the "magical number seven" processing limit for short-term memory.

The idea of the modes plays out in at least one comprehensive theory of writing proposed by Grabe and Kaplan (1996). They offer a taxonomy of academic writing skills, knowledge bases and processes, including the array of possible academic writing tasks. They distinguish narrative fiction and non-fiction from reports/(expository) essays and from argumentative essays. Among reports, they list the following: description, definition, exemplification, classification, comparison/contrast, cause/effect, problem/solution and analysis/synthesis (note that there are eight types here). In argumentative essays, they list logical stances, ethical appeal, emotional appeal, empirical stance, appeal to authority and counter-arguments (Grabe & Kaplan, 1996, p. 218). This list again is a short six items. The modes and forms of argument are the most advanced forms of discourse for readers and writers. Perceiving them is a fundamental skill in critical reading, and is again the subject of instruction in advanced reading texts (Reynolds, 1995) and producing them is a key feature of advanced writing, as noted in Grabe and Kaplan's theory of writing (pp. 341-376) and in many, many composition textbooks.

In addition to the modes, discourse divides into the various genres: fiction, non-fiction, poetry, drama. Each of the genres has its own set of distinctive features and conventions, as do some of the other text types like news stories in journalism. These genres impose constraints of form and content in various ways. Recent research suggests that the concept of genre is being greatly expanded to go beyond the conventional literary forms to apply to all types of texts that appear in particular social contexts (Johns, 2002, p. 3). These is a growing body of research on the definition, nature and function of text genres (Swales, 1990; Bhatia, 1993). The modes and genres, broadly defined, are themselves distinctive features of text.

Applying the processing mechanisms, the most advanced level of distinctive features allow readers and writers, finally to analyze, synthesize and evaluate. These abilities are what is meant by critical literacy. They are clearly the summit of human linguistic achievement. They require the use of all the processing mechanisms discussed

here, including both such cognitive abilities as identification, categorization, discrimination, the ability to predict, and the limits of short-term memory. They also require key linguistic abilities such as the use of syntax and redundancy in language. Literacy is an amazing ability, but it is not incomprehensible. Human beings can read and write because they can use the processing mechanisms and distinctive features of text.

Reading and Hyperreading: Processing Mechanisms and Distinctive Features on the Internet

Literacy makes possible so much of the way we live. I sometimes ask students in a variety of courses to think about what life would be like if we did not have written language. At first, the typical response is "no more pencils, no more books," hooray! But then, when I ask students to spend a couple of days keeping track of their interactions with written language, from reading cereal boxes at breakfast, to the newspaper, to road signs, to schoolwork, checks, printed receipts for purchases and, of course, email, they begin to see how reading and writing is woven into the fabric of modern life. The truth of the matter is that we could not manage our lives as we know them without reading and writing. At the university, we expect and require of students that they achieve not the most rudimentary forms of literacy, but the most sophisticated form, critical literacy. This goal increasingly entails making use of critical literacy on the Internet.

Critical literacy in terms of the World Wide Web draws on cognitive processing mechanisms like those used for printed texts and a set of distinctive features likewise closely related to those used for conventional print texts, but extending beyond them. The processing mechanisms are all those ones discussed previously: identification or recognition, categorization, discrimination, prediction, memory limitation and the linguistic abilities with syntax and redundancy. The distinctive features at the four levels described above also play a role on the Internet, to the extent that Web pages and other applications use written language. But there are some additional mechanisms and features to critical literacy on the Web.

The processing mechanisms are those we've already examined in some detail, but there are two additional ones, bricolage and juxtaposition. Both of these are visual matters, because the Internet focuses attention on the visual in a way that printed text does not. As Kolers (1967) has said, reading is only "incidentally visual." The Web, by contrast is intentionally visual. As a result, one of the additional mechanisms for both production and perception is an ability to put together parts, bricolage (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 parts that are put together are a different set of distinctive features to be discussed below.

The second mechanism 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 mechanisms are supplements to those other more conventional mechanisms, adding to the list but not deleting any of the others discussed earlier (1998, p. 107).

These mechanisms operate on the distinctive features of Web pages in various ways. The features again overlap with those for printed language, since part of what we see on a Web page is writing. But the additional distinctive features of Web pages are especially images, sounds, movement and links. Burbules (1998) says that the key feature (i.e., a distinctive feature) of hypertext is the link, and that links can be characterized and classified rhetorically (p. 104). Links all work the same way, i.e. they produce a new page on the screen, but they are not alike. All require hyperreading or critical reading.   The hypertexts we find on the Web are like paper texts in some ways, but different from them in others. Jay David Bolter (2001) has made this observation, noting 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.html).

In contrast to print reading, where the text is supposed 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 says:

> 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. (Bolter, 2001, p. 45)

Hyperreading is particularly visual in nature. It also draws on a different set of distinctive features, again related and similar to those for printed text, but moving beyond 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 altered by surfing and its demands and expectations.

Burbules 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 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). (Burbules, 1998, 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.

  The distinctive features of Web pages include all of those that apply to writing, insofar as there is writing on Web pages. Other distinctive features include images, visual items of various kinds. These are often pictures, but diagrams, charts, graphs, cartoons and other visual arrays can also be found on Web pages. There can also be sound with Web pages. In one of my courses, for instance, I send students to the Web page of the American Dialect Society by using the link to the Society's website (http://www.evolpub.com/Americandialects/EngDialLnx.html) where it is possible to hear recordings of dialect samples. Some radio stations now broadcast from the Web (such as public radio station WDET in Detroit, Michigan http://www.wdetfm.org) and can put sound through computer speakers. Movement is yet another distinctive feature of Web pages. Electronic birthday cards often entail movement of figures or letters or other images on the screen as the message is delivered, sometimes also with sound, musical or otherwise for example, http://free.bluemountain.com). And, as noted already, links are the last distinctive feature of Web pages. Burbules points out that links are fundamentally rhetorical in nature; they can be categorized in terms of the figures of speech through which they function to shape readers' responses to text (1998, p. 110-117).

  Critical literacy in the new century will draw on critical literacy as we have known it from centuries past. It will continue to draw on the basic cognitive mechanisms that make the feat of literacy possible at all. These mechanisms include both essential mental abilities like identification and categorization, processes we use for literacy as well as other kinds of intellectual tasks. The linguistic capabilities humans have, abilities to use syntax and redundancy, will also continue to be important. These mechanisms allow us to work with the distinctive features of letters, words, sentences, and texts to get meaning from print in reading and put meaning into print in writing. The distinctive features make it possible for humans to reach the summit of linguistic achievement, critical literacy. The ability to analyze, synthesize and evaluate are increasingly important in dealing with the Internet. There, the additional mechanisms of bricolage and juxtaposition and the additional features of image, sound, movement and link challenge human literate capacity. Understanding the mechanisms and features of critical literacy expose this amazing human feat, whether print or electronic.

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