國民教育研究學報，第 2 期：307～362頁
民85年，國立嘉義師院國民教育研究所

Meaning Construction in Reading with Hypertext : A Sociocognitive Perspective

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Abstract

This paper explores the cognitive and social processes involved in meaning construction in reading hypertext. It starts with a theoretical discussion on the sources of meaning and assumptions about the nature of text. A discussion of the nature of hypertext and a review of research in using hypertext for reading and literacy education then follows, which provides a frame of reference for the sociocognitive model of reading hypertext proposed later in the paper. Reader characteristics and hypertext characteristics are considered and discussed in terms of their importance and implications for reading instruction with hypertext. Several theoretical conclusions are drawn in the paper. 1) Hypertext's multimedia capacity and its nonlinear, dynamic, interactive nature constitute a richer sociocultural context that facilitates construction and negotiation of meaning, involving multiple interactions between text and readers, between readers, and between student readers and reading the instructor. 2) The nonlinearity and multiplicity of hypertext may serve an experienced reader better than an inexperienced one due to higher metacognitive demand. 3) The nonlinearity and flexibility of hypertext blurs the distinction between reader and author and distorts the concept of plot which is essential for narratives. 4) Hypertext can serve as an electronic space for interaction between users, and more research should be devoted to the social aspect of using this technology for educational purposes.

Introduction

Since its first conception by Bush (1945) and the pioneer work done by Nelson in the 1960's (Janassen, 1989), the development of hypertext, a form of electronic text capable of nonlinear organization and multimedia representation, has picked up increasingly faster speed. Today, hypertext technology, or hypermedia technology as it is often interchangeably called, has moved from researchers' laboratories to shelves in stores. More and more hypermedia publications are expected to join the existing titles covering a broad range of categories-- stories, novels, desk references, arts, sciences, and so on. Another source of hypertext publication in the near future is the information superhighway (e.g., Internet, and World Wide Web) which enables us to receive and send digitized information in multimedia formats via the networked computer at home. Reading hypertext, either for information or for pleasure, will become a part of our daily experiences, just as reading newspapers, books, magazines, and watching television are to us now.

The invention of such electronic "text," to use the word in its broadest sense, has been considered by some as revolutionary and important as Gutenberg's invention of book-printing in the fifteenth century (e.g., Bolter, 1991). However, while many hypermedia engineers and cognitive scientists are devoted to designing better hypermedia programs and probing into the mental processes and consequences of learning with hypermedia (Yankelovich et al., 1989; Morrell, Marchionini, and Neuman, 1993; Search, 1993; Spiro & Jehng, 1990; McAleese, 1990), only a few reading researchers or reading educators have looked into this new form of literacy and considered its impact

on, and implications for, reading education (Balajthy, 1990; Anderson-Inman & Horney, 1993). Many questions have to be asked; some come naturally to mind. For instance, what is the nature of reading hypermedia text? How is it different from reading traditional text? What is required of the reader? How does hypertext's nonsequential organization and multimedia representation influence the way a reader interact with text and the way comprehension is fostered? How can reading teachers help their students take advantage of this new technology? These are all important questions, but at present our understandings of these topics are still very limited.

Furthermore, reading researchers and educators, with their expertise and experiences in reading theories and reading education, can make important contributions to the development of successful hypertext applications. As Pearson and Stephens observe (1992), in the past century or so reading and literacy researchers have moved from the simplistic letter- to-sound decoding paradigm to the linguistic paradigm, the psycholinguistic paradigm, the cognitive paradigm, (or the schema theory), and now to the still fledging socio-anthropological paradigm. Building on the accumulated understandings of the processes and theories of reading, recent researchers are able to integrate more and more variables into a unifying theory that gives a fuller account of reading and comprehension processes. For example, reading has been recently conceived as a complex interactive meaning construction process that involves the reader, the instructor, the text, and the context (Ruddell and Unrau, 1994), a process that is at once cognitive and social in nature. In investigating the nature and processes in reading hypertext, I also believe that it is necessary to look both at the cognitive processes of reading and the social processes occurring during the reading activity. This is especially true when we consider the

rich and complex networks of meanings and relations inherent in most hypertext systems. Such rich potential of social interaction has been largely neglected by hypertext researchers who have focused more on the cognitive aspect. The purpose of this paper is to try to present a theoretical perspective understanding the social aspect of reading hypertext.

Theoretical Perspectives on Text and Meaning

Text-Based Perspective

There has been a line of research in reading (Laberge, & Samuels, 1974; Samuels, 1994; Adams, 1994), which, explicitly or implicitly, holds that reading is basically a text-driven, bottom up process in which the reader, using his/her orthographic, phonological, and syntactic, and semantic knowledge, decodes linguistic symbols into sound and meaning. This approach is best represented by Samuels' automacity theory of reading (Laberge, & Samuels, 1974; Samuels, 1994). In his conception, reading involves decoding linguistic and episodic codes which again leads to meaning. The linguistic codes include spelling pattern code, word code, and word-group code, and these codes can be visual or phonological. Spelling codes are usually translated into phonological codes which then activate corresponding codes in the reader's semantic memory When word meaning codes in the reader's semantic memory are successfully activated, meaning is created.

The central hypothesis of Samuels' theory is that the decoding process can be either automatic (without attention) or nonautomatic. When decoding of linguistic symbols is automatic, the visual spelling and word codes are translated directly into phonological codes and then

directly into semantic codes. This is how most skilled readers process text-- effortlessly. A less skilled reader, on the other hand, tries to connect the visual codes with temporal-spatial event codes or episodic codes stored in the episodic memory, which again a ctivates relevant semantic codes. In this case, the decoding process needs extra attention and so the translation from symbol to sound and to meaning is slower or can even be unsuccessful. Samuels contends that since the resource of attention in reading is limited to some extent, a reader who has to allocate attention to the decoding process will have less attention to deal with other higher level linguistic and textual elements and therefore will perform more poorly in reading comprehension.

Adams (1994) also shares with Samuel a similar text-driven approach to reading in her proposition of the processes of reading words. Adams proposes that the print of the page constitutes the basic perceptual data of reading, that the reader's letter- and word-wise processes supply the text-based information on which comprehension depends. She suggests that word reading is built on four processors--the context processor which is responsible for selecting word meanings that are appropriate to the text, the meaning processor which provides word meanings by associating more primitive meaning elements, the orthographic processor which receives the text's information directly from the printed page, and the phonological processor which is believed to play a supportive role in the comprehension process.

The basic assumption underlying the reading theories above is that text is autonomous and is sufficient in itself for conveying meaning. The word reading theories proposed by Samuel and Adam, though able to partially explain the basic language processes, is inadequate in accounting for more complex reading activity that goes beyond the individual letters. Even at the word level, text-based reading theories

sometimes fail to explain why the same word would retrieve very different meanings, or clusters of meanings, from the memories of different readers. The weakness of the text-based perspective to text and meaning lies in its assumption that text is the only source of meaning, and that meaning is static, as something crystallized in the text. Such conception of text and meaning fails to account for the widely different backgrounds and experiences that readers may bring to the reading task.

Reader-Based Perspective

Reader-based perspective perceives the reader as the main source of meaning. Meaning does not resides in the text, though it certainly contains important clues to it. Instead, meaning depends more on the prior knowledge and concepts that the reader brings to the reading event (Anderson, 1994; Wilson and Anderson, 1986). The schema theory of knowledge and its conceptualization of comprehension in reading is a good representation of this perspective. According to Anderson (1984, 1994), "a reader comprehends a message when he is able to bring to mind a schema that gives a good account of the objects and the events described in the message." For example, the sentence, "The notes were sour because the seam split," which contains no difficult words, is incomprehensible unless one is able to activate the "bagpipe" schema to construct a meaningful understanding of the objects and events involved and their interrelations. It is argued that no text is completely explicit in meaning. The reader has to come up with a relevant schema in order to make the text meaningful. In this sense, text becomes more of a stimulus to the reader's memory from which relevant schemata are brought up to account for the meaning of the text. More important, schemata serve many important functions in the reading process, including pro-

viding ideational scaffolding for assimilating text information, allocating attention, making inferences, searching of memory, facilitating editing and summarizing, and allowing inferential reconstruction.

The schema theory of reading has made very important contributions to the field of reading research. It provides a theoretical framework for understanding and describing the nature of knowledge, memory, and reading comprehension, and has, in an important way, helped bring the higher order reading processes to the foreground of reading research. It is true that some later researchers have raised criticisms against the schema theory and some have suggested modifications, (e.g., Bransford, 1984; Sadoski & Paivioi, 1994), but the schema theory remains a competent theory that accounts for knowledge and comprehension processes. However, the reader-based approach to reading is inadequate in accounting for the influence of the social environment on reading and interpretation. To be a member of a community necessarily implies certain degree of conformity with the norms of the group. Such tendency toward conformity in a community will also exert constraints on the interpretative act. In an educational setting, such conformity will be even stronger if the instructor strives to direct the community of readers to a single ordained interpretation.

The Interactional/Transactional Perspective

The third perspective, to which this paper adheres to, takes on a social view of text and meaning. This social theory of text and reading is best exemplified by Bakhtin's concept of dialogic text (1986), Rosenblatt's transactional theory of reading (1978, 1994), and Ruddell and Unrau's model of reading as meaning negotiation (1994).

The Bakhtinian text. Although Bakhtin's theory concerns more

about the text, not the reading act itself, his conception of text as an utterance with an addressee which is embedded in a chain of utterances has important implications for reading theories. In his discussion of speech genres, Bakhtin (1986) presents his central propositions on the way all speech genres and texts should be treated--that is, as an utterance addressed to some audience. One of his core propositions is the necessity to distinguish language itself from an utterance, and hence, to distinguish meaning from sense. Any linguistic form, for example, a sentence "The sun has risen," may carry certain semantic meaning with it but it may not make any sense to the listener or the reader unless he/she understands the context in which this linguistic form is expressed by a speaker as an utterance. Language is a medium for expression. As a medium it is neutral, void of any evaluative opinions, emotions, attitudes. A word or a sentence could be used to make many different senses, some of which could be in direct conflict with each other. For example, a sentence such as "The sun has risen" may appear in an utterance, "The sun has risen. It's time to get up," or in another utterance, "The sun has risen. But it's still early," and thus leads to opposite propositions. Language does not belong to anyone, but an utterance has an owner, the speaker. Depending on who the speaker is, the intonation, and other contextual features of the utterance, one, or more than one, of the meaning-potentials of a linguistic form is realized and brought to life. In a Bakhtinian sense, all texts are utterances, not just a congregation of linguistic forms. In reading, the reader should be aware of the voice behind the printed pages, as well as the emotions, opinions, tones, and values embedded in the text.

Another core proposition presented by Bakhtin is the dialogic nature of utterances. An utterance cannot stand alone, cannot refer to just the object at hand. It is always a response to others' utterances

that preceded it. It is related to others' utterances by the theme and subject it is dealing with, by allusions, explicit or implicit, by a shared body of knowledge, and by a shared context of communication. Any utterance is "about" others' utterances and may contain others' utterances. Even when a speaker is beginning a new topic on which no previous utterances were made, i.e., as far as he knows, he is still anticipating some kind of responses that future utterances may make. Therefore, in framing his utterances, his choice of words, views, tones, and arguments is shaped by his anticipation of those possible future responses. In fact, each utterance is in itself a link in a long chain of speech communication within a more immediate intratextual context and at the same time a larger intertextual context.

In terms of the source of meaning, Bakhtin's sociointeractive view of text suggests that meaning is not encoded in the linguistic signs; it is to be sought in the contextualized utterances, in the utterances' relations to other utterances within and without the text. Meaning, therefore, is to be sought intertextually. As we will see in the discussion of reading hypertext below, Bakhtin's conception of all texts as dialogicalized utterances linked into a network of texts strongly anticipated the conception of hypertext (though he did not mean it), and is extremely helpful in understanding the characteristics of hypertext.

Reading as transaction. Rosenblatt's transactional theory of reading (1978, 1994) also provides a strong framework for understanding the social nature of reading. Informed by Peirce's triadic formulation of meaning--the sign, the object, and the interpretant--Rosenblatt contends that "meaning does not reside ready-made 'in' the text or 'in' the reader, but happens, comes into being, during the transaction between reader and text." Transaction goes far beyond the linguistic level to include the physical conditions, the personal experiences, the social

and cultural factors as embodied in the text and the reader. According to Rosenblatt, Reading is a transactional act involving a particular reader and a particular text occurring at a particular time in a particular context. Meaning is created from the transaction between the reader's inner world and the text's meaning-potentials as embodied by the linguistic signs. However, neither the reader nor the text is a static entity; rather, each is seen as constantly changing throughout the reading event where new structures and relations of the text are perceived as the reader shifts his/her attention and creates new understandings and interpretations of the text. In comparison to the text-centered and reader-centered perspectives, the transactional perspective seems to be more fluid and dynamic, and it captures the immediate cognitive and affective qualities involved in the reading event more aptly. It implies less textual authority or textual autonomy and at the same time avoids relying too much on the reader's prior knowledge for meaning.

As stated above, during the reading process the reader selectively activates different aspects and elements of his/her linguistic-experiential reservoir. But what determines the activation of prior experience? Rosenblatt suggests (1978, 1994) that the selection of attention is mainly determined by the reader's reading stance at the moment. She believes that a reader's stance can be located on an efferent-aesthetic continuum. An efferent stance directs the reader to the factual information and logical aspects of the text, which belong more to the public domain of knowledge. On the contrary, an aesthetic stance directs the reader to the experiential and affective qualities of the text, i.e., the private domain of knowledge. Rosenblatt's conception of efferent-aesthetic continuum about reader stance and the distinction of private and public knowledge is helpful in explaining the dynamic processes and varied products of reading. The transactional model of

reading predicts both consensus and variety, which seems to capture the essence of reading more aptly.

Reading as meaning negotiation. Closely related to Rosenblatt's transactional theory of reading but somewhat more expanded in scope is a comprehensive sociocognitive conceptualization of the reading process recently presented by Ruddell and Unrau (1994). Reading, as suggested by Ruddell and Unrau, is a complex interactive meaning construction process that involves the reader, the reading instructor, the text and context in a reading event. Each of these component again consists of many factors critical to the process and result of the meaning construction task. Such a comprehensive approach to reading and reading instruction is particularly valuable in that it provides a holistic model for conceiving reading research and instructional practice. This sociocognitive perspective to reading, which is interactional in nature, is elaborated below.

The reader, to begin with, brings his/her prior knowledge and beliefs to the reading task, including his/her affective conditions (motivation, attitude, stance, values, beliefs) and cognitive conditions (knowledge of language, word analysis skills, text processing strategies, metacognitive strategies, knowledge of the setting and personal and world knowledge). Each of these factors is likely to exert some influence on the reading process.

Likewise, the teacher also brings his/her own prior knowledge and beliefs to the reading event. Definitely the outcome of the reading task will be determined by the teacher's motivation, instructional stance, beliefs concerning reading education, and her knowledge of the students, reading process, literature and content areas, her teaching strategies and metacognitive strategies, as well as her personal and world knowledge.

The text and context, which is the third important component in the Ruddell and Unrau's model, also plays a critical role. The text, with its specific thematic and structural characteristics, sets up the task setting for the reading event which again is influenced by the interactional pattern and community characteristics of the larger socio-cultural context of the learning environment. Multiple processes of interaction occur at many contact points where a multitude of factors and variables act on each other as meaning is being negotiated. Meaning in this sense does not lie in the printed page, nor in the reader's head or in the teacher's authority. Instead, it lies somewhere between the reader, the teacher, and the text, which are all embedded in a particular reading context.

In the brief review above, I have tried to categorized text and reading theories according to the locus of meaning. Three major categories have been presented, namely the text-based perspective, the reader-based perspective, and the interactional/transactional perspective. The text-based perspective, as represented by the information processing approach, sees reading as a linguistic process in which perceived symbols are decoded into meaning. This perspective clearly sees meaning as encoded in the signs, i.e., the text. On the other hand, the reader-based reading theories, such as reader response approach or the schema theory, tend to locate the source of meaning more in the reader's head than in the text. A third perspective takes on a social view of the text and the reading act. According to this perspective, meaning is generated from interaction between the text and the reader.

Despite their different perspectives on meaning and reading, these three perspectives share a common assumption, namely, that text means linguistic symbols printed or handwritten on paper. This assumption has been unchallenged ever since the invention of writing

systems and particularly since Gutenberg's invention of printing. However, with the advancement of hypertext technology, the definition of text has to be redefined to accommodate the invention of electronic text. Hypertext, or hypermedia, is a drastically different technology of representing information and ideas, and can drastically reconfigure the meaning of text and the meaning of reading (Landow, 1992). In the sections that follow, I will discuss the characteristics of this new form of text and consider its implications for reading research and reading instruction.

Research on Reading Hypertext

More and more researchers are beginning to pay attention to this new form of representing information and thought. Some have been interested in the potential use of hypermedia in facilitating learning and thinking (Horn, 1989; Irish & Trigg, 1989; Jonassen, 1990; Shapiro, 1993; Reinking, et. al. 1993). Some are concerned about the system design and navigational problems (Gay & Mazur, 1991; Jonassen, 1989; Landow, 1990; Fujihara, et. al, 1992). Some have considered the impact of hypertext/hypermedia on literary studies and instruction and on the relationship between author and reader (Landow, 1992; Landow & Delany, 1990). In this section, I will focus my review on research in reading and comprehending hypertext.

The Supported Text

Some researchers have envisioned ways in which hypertext can be used to enhance reading experience and comprehension. Higgins & Boone (1990) suggest three kinds of enhancement that hypertext can provide to students. First, it can provide varied forms of information

such as pictures, animation, definitions; synonyms, and computer generated speech to supplement a student's prior knowledge and experience needed in comprehending the text. Second, hypertext, as a tool for computer assisted instruction, can provide scaffolding for learning strategies to decode unknown words and understand word and phrase relationships through word or syntactic analyses and context clues. The third kind of enhancement is to help students make inferences, summarizing, or main idea matching.

In a similar line of interest, an ElectroText Project (Anderson-Inman and Horney,1993; Anderson-Inman, Horney, Chen, & Lewin, 1994) was developed to help middle school students, including at-risk students, read and comprehend stories. Using the ElectroText Authoring System developed from Hypercard, Anderson-Inman and Horney created "supported texts"-- i.e., hypertext version of stories--for use in reading class in two eighth- grade classrooms. Resources like vocabulary definitions, background information, text glosses, graphic overviews, pictures, sounds, and self-monitoring comprehension questions were provided to assist students' understanding of the stories and their metacognitive reading strategies. Although the effects and complications of reading the ElectroText have not been reported, it is believed that the rich resources and the comprehension monitoring questions will enhance students' comprehension and foster metacognitive reading strategies.

Cognitive and Metacognitive Demands

Not all researchers, however, are enthusiastic about hypertext. Rouet (1990), for one, is concerned about the comprehensibility of hypertext and considers the allocation of limited cognitive resources during the reading process a potential problem. According to Rouet, two

levels of orientation are involved in processing a text. The global level of orientation, which is similar to the metacognitive processes discussed by Brown et al. (1986), refers to the monitoring of the match between objectives and outcomes in reading. On the other hand, the local level of orientation, which is similar to the cognitive processes in reading, refers to the process of comprehending an individual information unit and relating it to another unit. In reading a sequential text, the relations between units of information are usually more explicit as they are shown in the physical format of the text, i.e., neighboring units are usually related to each other. In reading a nonsequential text, a reader usually has to be able to understand and evaluate the semantic links correctly in order to make meaningful selections of links. The heavier cognitive load, as Rouet's research revealed, often results in a global/local orientation trade-off, and thus causes poorer comprehension, in inexperienced readers or in reading unfamiliar subject matter.

Balajthy (1990), for another, takes a similar metacognition perspective and examines the relationships between features of hypertext and comprehension, especially for poor readers. He argues that hypertext, like other computer managed interactive text, tends to give the reader more control. Such flexibility often benefits good readers but not poor readers since it allows good readers to apply their own reading and learning strategies in reading which is often lacking in poor readers. Research has shown that one of characteristics of poor readers is their inability to exert active control over the reading task or to detect comprehension failure during reading (Balajthy, 1990). The high degree of user control of hypertext, which is helpful for skilled readers, can in fact impede a poor reader's comprehension. In sum, Balajthy calls for educators to be more cautious in using hypertext in reading programs for poor readers. Hypertext designers, he suggests, have to consider

what reading research has to say about reading comprehension and metacognition.

Coherence and Comprehension

Foltz (1993) conducted a study investigating college students' comprehension and use of strategies in reading linear text (traditional text) and hypertext. It was hypothesized that the weaker coherence in hypertext would result in poorer comprehension in reading unfamiliar materials. The result of the research, however, contradicted this prediction. These expert readers used similar approach to processing linear text and hypertext, i.e., choosing a path that is coherent, despite the different formats of text. The similar approach to text processing, Foltz suggests, resulted in similar performance in comprehension. The reader's goal in reading, however, did interact with the strategies employed. Readers with a specific goal were found to visit fewer nodes and pages and used less amount of time. In general, the study concluded that the reader's strategy and comprehension was more affected by the reader's effort to seek for coherence than by the degree of coherence in a text.

Types of Hypertext Readers

Since hypermedia is a rather new invention, how younger readers would approach this new form of text is still little understood and should in itself be an interesting topic for investigation. The ElectroText Project (Anderson-Inman and Horney,1993; Anderson-Inman, Horney, Chen, & Lewin, 1994) mentioned above provides some insights into patterns of hypertext reading. Three profiles of hypertext reader are presented. The first, Book Lover, were found to typically read all the 44 pages in the story in a linear fashion and use the available

resources only sparingly. The second type of hypertext reader was called Studier, which was characterized by linear navigation through the 44 pages of text, backward navigation for reviewing and checking, and more frequent use of comprehension monitoring questions. The third type of hypertext reader was labeled Resource Junkies. Students of this type were found to be infatuated with the resources provided, particularly the computer generated speech. Resource Junkies ended up spending most of their time looking for and using the resources, often without ever reading the text of the story. Their navigation strategies, as a result of the searching for resource, were also the most varied and complex.

In another study, MacGregor and Winover (1993) investigated the influence of learner characteristics and system design on a student's hypertext navigation style. Based on the total number and type of nodes accessed and time used, they identified five types of hypertext users: Browser, Studier, Text Focuser, Video Seeker, and Interest Linker. These users show features identical to the Anderson-Inman and Horney's findings. Both Browsers and Studiers accessed the nodes in a sequential manner, whether they be text or video. Browsers tended to move quickly, paying little attention to the details, whereas Studiers usually moved slowly, spending much more time studying each node in details. Text Focusers and Video Seekers were like Book lovers and Resource Junkies found in the ElectroText Project. Interest Linkers were characterized by purposeful, nonsequential navigation guided by interest and need. They accessed nodes more selectively and would often visit one node from several linking origins, making more meaningful connections. MacGregor and Winover believe that navigation style is strongly influenced by learner characteristics and system design.

Two conclusions can be drawn from the brief research review

above. First, system design is a critical variable in developing any hypertext system. A good hypertext system, no matter how large or small, must give the reader a clear notion of the structure of the hypertext and provide the reader with convenient and friendly navigational tools so as to facilitate successful and meaningful navigation. Second, reader characteristics are also critical in considering the effects of reading hypertext. It is clear that a good reader with strong prior knowledge and skills can compensate many of the missing links or elements in a hypertext and successfully construct meaning from using the hypertext, whereas a less able cannot. Many other reader variables can contribute to the success or failure of the reading experience, e.g., motivation, goal, cognitive strategy, computer literacy, etc. The profiles of hypertext readers above provide a clear example how different readers may approach the same hypertext system in many different ways and come out with different results. Therefore, in evaluating the values of hypertext and its potential use in education, it is necessary to consider both the capacity and the design of hypertext, as well as the hypertext users' needs and characteristics. Such interaction between hypertext and reader characteristics definitely needs further research.

However, there are two aspects of reading hypertext which have not been carefully examined by hypertext researchers to date. One aspect has to do with the interaction between the multimedia capacity of hypermedia and the reading process, or, in other words, the influence of multimedia representation on meaning construction. As can be seen in the review above, although multimedia representation of information or stories have been included in some hypertext studies, the focus of analyses mainly fell on how users access the sound, graphics, and video nodes in the hypermedia system, rather than how the different media

of representation may influence the way a hypertext reader constructs meaning. Nor has the implications of such multimedia capacity for literacy education been carefully considered by hypertext researchers.

Another aspect is the social interaction involved in reading hypertext. It seems most studies of hypertext reading reviewed above have focused on the cognitive processes--what cognitive and metacognitive loads and skills are involved, how understanding of the text can be enhanced, and how coherence of hypertext influence comprehension. This lack of concern about the social processes in reading hypertext may due partly to the kind of hypertext used, i.e., that of the closed, read-only type, and partly to the persistent dominance of the text-based perspective on meaning and reading. For example, in their conception of using hypertext for enhancing comprehension, Higgins and Boone (1990), as well as Anderson-Inman and Horney (1993), treated hypertext no more than an enriched version of traditional text, i.e., as multimedia basal reading materials or multimedia story books. Given the social nature of hypertext (it creates meaning by relating nodes of information) and its capacity of allowing powerful social dynamics among users (it incorporates multiple utterances and perspectives in the same text), it is somewhat unfortunate to see that many hypertext researchers have neglected a most significant feature of hypertext.

Building a Sociocognitive Model for Reading Hypertext

Conceptual Framework

The long tradition of reading research, as mentioned above, has provided valuable insights into the various aspects of the reading and comprehension processes and the nature of text. The long tradition has

been built on the assumption that information and ideas are expressed in words on paper (Olson, 1994). However, the invention of hypertext calls for a reconsideration of the nature of text and the processes of reading. On the other hand, the fact that most researchers of hypertext so far have failed to look at the social aspect of hypertext also calls for a reconsideration of hypertext reading research from a sociocognitive perspective. A reasonable answer to these calls is to build a sociocognitive model for reading hypertext where both the cognitive and the social processes in reading hypertext are considered and examined. Such a model should be able to increase our understanding of the nature and use of this new form of text.

In my brief review of the different perspectives to meaning and text above, I have emphasized the transactional perspective first presented by Rosenblatt and later expanded by Ruddell and Unrau in their conception of the interactional nature of meaning construction in a classroom setting (1994). This transactional model of reading is also the perspective embraced in this paper. In other words, hypertext is conceived as a text, in the broadest sense of the word, consisted of multiple symbol systems in which a multitude of meaning is embodied. The reader is conceived as a social being with a unique history of linguistic, intellectual, social, emotional, and spiritual experiences. Reading is conceived as a transaction between the text and the reader from which meaning arises. It is a process which is at once cognitive and social. Cognitive processes are the fundamental processes for meaning construction, but they are shaped by social processes that occur at all levels of the processing, and before, during, and after the reading event.

Assumptions

To facilitate discussion and analysis, I will make explicit several

assumptions that underlie this model. First, it is assumed that reading is a complex process in which meaning is constructed and negotiated by participants of the reading event which is located in a complex social context. Second, readers of hypertext is assumed to be already fluent in decoding language symbols, i.e., with a reading competence above the fifth or sixth grade level. Third, it is also assumed that the reader has a basic level of computer literacy; he/she is familiar with the procedure of operating the computer, including turning on the machine, opening, editing, saving, closing files, and so on. The fourth assumption is that the reader is located in a hypertext environment where computers and hypertext applications are easily available and are incorporated in some way into the curriculum. And finally, the hypertext system conceived here is that of the open type, not the "read only" type. In other words, the hypertext system is a fluid and dynamic one where information and links can be added or changed constantly.

The Model

I consider my model of reading hypertext a sociocognitive model basically because it is intended to depict the sociocognitive processes of reading. Reading is first of all a cognitive process where the reader uses his/her knowledge and strategies to construct meaning from the text. The social part of the definition refers to the social nature of the text (any text as involving many other texts), the social nature of the reader (reader as carrying a socialization history), and the social nature of reading (interpretation as interacting with the text and with other readers). That is to say, all the important components in the model are considered to be interacting with each other in some particular context

The model (see Figure 1 below) includes three major components: Hypertext, Reader (i.e., Student), and Instructor, all of which, besides

being a context in themselves, share a sociocultural context of the reading community. The two-way arrows are meant to represent interaction between each two component. As shown in Figure 1, interaction can occur in four dimensions, namely interaction between hypertext and reader/instructor, interaction between reader and instructor, interaction between reader and reader, and, interaction between elements, or nodes, of the hypertext system. Furthermore, the rectangle that contains all the major components of the model represents the sociocultural context in which interaction

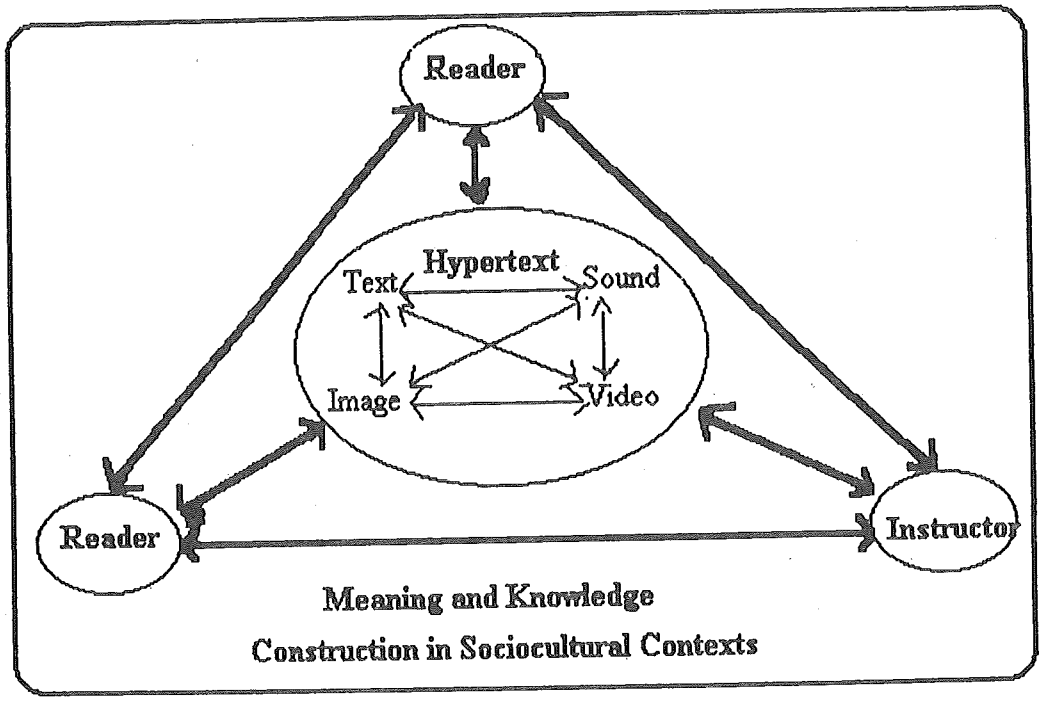

Figure 1: Model of Meaning Construction in Reading Hypertext

occurs. It is proposed that in reading hypertext, construction of meaning, though in itself a cognitive process, is shaped and affected by social processes that occur within the sociocultural context of the reading and learning community.

Figure 1 presents only an overview of the Model and focuses on the

social processes involved; it does not show the interaction in details. A more detailed and deeper analysis of one of the four dimensions of interaction is presented in Figure 2 below, which mainly analyzes the cognitive processes occurring during interaction between the reader and the hypertext, though that should not be taken as to mean that the interaction is only cognitive in nature. In the following sections, I will explain how the Model works by analyzing and discussing the various components and the cognitive and social processes involved in the interaction. It should be noted that graphic representation of deeper analyses of the other three dimensions can be presented as well, but to reduce space and repetition, these details will be discussed only verbally.

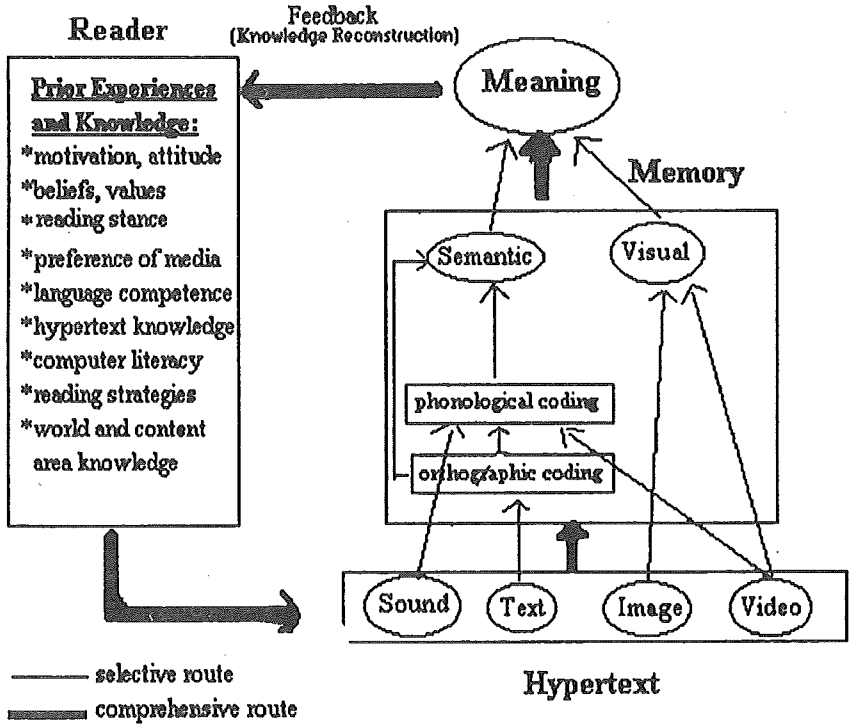

Figure 2: Interaction between Reader and Hypertext: The Reading Process

Reader Characteristics and the Reading Process

According to the interactional/transactional perspective on meaning and reading highlighted above, the reader is not a neutral interpretant of signs. Instead, the reader brings with him/her a unique set of affective and cognitive conditions (Ruddell & Unrau, 1994) fostered by his/her history of experiences. The varied prior experiences and knowledge that each reader brings to the reading task ensure different kinds of interaction with the text, either conventional text or hypertext. My discussion of the reader characteristics here (see Figure 2) is mainly based on Ruddell and Unrau's conception of the reader presented in their model. However, I will focus my discussion on the interaction between the special features of hypertext and the reader variables. Besides, some new reader variables not found in Ruddell and Unrau's model will also be added to accommodate the special features of hypertext.

Motivation and Attitude

Motivation and attitude (the first factor in the Reader component in Figure 2) toward reading has been largely left out or assumed in most reading research. Mathewson (1994) is one of the few exceptions who have considered the influence of motivation and attitude on reading. He suggests that attitude and motivation are the two important factors that determine whether or not a reader will have the "intention" to read, which again mediates the reader's reading behavior. Attitude, on the one hand, can be positive or negative and is mainly shaped by one's personal values, goals, or self concepts, as well as by others' persuasive communications. Motivations in reading, on the other hand, can be ex-

trinsic or intrinsic (Ruddell, 1992). Extrinsic motivations include difficulty of the material, teaching effectiveness, and peer expectation and approval. Intrinsic motivations involves problem resolution, prestige, aesthetic enjoyment, escape, intellectual curiosity, and understanding of self.

Some special features of hypertext are particularly strong in fostering intrinsic motivations in reader. First of all, the fresh experience of using a computer to read some kind of text is exciting in itself, although such advantage tends to fade off with time. Another advantage is the adventure-like nature of reading hypertext. Since a hypertext corpus is consisted of many connected nodes of information and the reader has to travel from one known node to another still unknown node. There is always an excitement in opening up a new screen and encountering new material every time the reader clicks on a button or a highlighted word/phrase. It is an intellectually satisfying experience to read in such a manner. A third strong internal motivation comes from its problem solving nature of reading hypertext. Unlike in a traditional text where the reader is led on through the text sequentially by the default route, a hypertext reader usually has to actively chooses where to go next according to his/her own goal. This goal-seeking process is rewarding in itself every time when the goal is achieved. The most valuable motivational advantage of hypertext, however, must lie in its multimedia presentation of text. Information and idea can be represented by sound, speech, images, animation, video, and of course printed words. For young readers, such variety of pathways to meaning is at the same time attractive and challenging.

Values and Beliefs

Personal values and beliefs about reading (the second reader

characteristic in Figure 2) are important factors that influence a reader's motivation and intention to read (Mathewson, 1994). Values and beliefs, in their broader sense, also play an important role in the meaning construction process of reading. One's general values and beliefs, as shaped by one's sociocultural background, are part of a reader's experiential-affective entity that is responsible for constructing the private aspects of meaning out of the reading event (Rosenblatt, 1994). In other words, they exert influence on the initialization of reading (whether or not one would engage oneself in a reading event), the process of transaction (how one interacts with the text), as well as the product of transaction (what one gets from interacting with the text). In reading hypertext, the reader's values and beliefs play a similarly important role as in reading traditional text. For instance, a student with a strong belief in the importance of learning to use the computer will be more willing to engage in reading hypertext, will perhaps pay more attention to the tools and functions of the computer than the content of the text itself, and will get to know more about the computer and the hypertext system itself than the concepts, ideas, or feelings embodied by the text. We can expect to meet readers who are very enthusiastic about electronic text as well as readers who find reading on a computer screen a most unpleasant experience.

Reading Stance

Reading stance (the third reader factor in the reader component in Figure 2) is critical in shaping the strategies being used in processing the text and the goal set for reading. For example, as Rosenblatt (1994) suggests, a reader with an efferent stance will seek to extract information from the text and retain it. Reading with this stance involves

much reasoning, analysis and structuring. An efferent stance is more suitable for expository writings though it may also used mistakenly in reading literary works. On the contrary, an aesthetic reader "pays attention to the qualities of the feelings, ideas, situations, scenes, personalities and emotions that are called forth" in the transaction. The aesthetic stance turns reading into a "lived- through" literary experience. Moreover, Rosenblatt warns that such dichotomy should not be taken to mean that reading stance is an either-or case. Rather a reader's stance is more likely to fall on the middle part of an efferent/ aesthetic continuum and can be only labeled as predominantly efferent or predominantly aesthetic. Only in rare cases would one take a purely efferent or aesthetic stance.

In reading hypertext, reading stance becomes a more complicated matter, especially for young readers. In Rosenblatt's conception, the efferent stance is mainly meant for expository writing while the aesthetic stance for literacy works, though it does not have to be strictly so. Rosenblatt suggests that an experienced reader can pick up clues from text more readily and adopt appropriate stance. In reading traditional text, it is easier to identify the type of a text since a traditional text is more homogeneous in style and theme, and its genre is usually marked either by form or by usage of language. However, a hypertext corpus usually contains a great amount of disparate, loosely connected chunks of information, so it is more likely for a reader to encounter greatly different forms and content of "text" in just a short reading. For example, imagine a reader is reading Salinger's "The Laughing Man" in a hypermedia story corpus. At one moment he/she may be following the story line, aesthetically experiencing the mysteries, adventures, excitements and sorrows as the two parallel story lines are unfolded in two worlds. Then suppose there are nodes introducing the parks in New

York mentioned in the story in the hypertext system, and the young reader decides to read the description about the parks. How would the reading be affected by the insertion, or interruption, of such expository passages in the main story line? Besides the problem of a disturbed sense of plot, adjustment of reading stance is certainly an important issue here. In reading hypertext, as the reader goes from node to node, encountering widely different genres of texts, he/she needs to constantly adjust his/her reading stance. It is true that shifting of stance is also required in reading traditional texts, as suggested by Rosenblatt, but it seems a more difficult task in reading hypertext, especially for inexperienced readers.

Preference of Media

With hypermedia, similar ideas or information can be represented with either text, sound, image, or video, or they can be represented in some or all of the media. The relations between a text node and a sound node on the same topic can be compensatory or redundant, but normally a hypertext reader does not have to read any particular node or all of the related nodes to be able to get the needed information. In other words, choices are usually allowed and presumed. A reader's preference of media (the fourth factor in the reader component in Figure 2), therefore, will have important influence on the way he/she reads the hypermedia document. A reader with strong background and interest in reading conventional text may still access those textual nodes than other kinds of nodes, whereas a reader who enjoys watching television more than reading books may favor those sound and video nodes. In another possibility, a student who likes painting and drawing may visit more picture nodes than other kinds of nodes. Researchers have found that a hypertext reader's cognitive style is an important variable

that influences reading patterns (MacGregor & Winover, 1993). It can be expected that a young reader's prior experience with, and preference of, media will also have important influence on his/her reading pattern in reading hypertext.

Language Competence

Most hypermedia production today assumes that the reader is able to use the language rather fluently, although this does not have to be so. As a technology, hypertext can be used to design any kind of application for any level of readers. The degrees of sophistication of a hypertext corpus can vary greatly, so can the sizes and scopes, and therefore the linguistic demands may also vary greatly. What role would a reader's language competence (the fifth factor in the reader component in Figure 2) play in dealing with hypertext? Several interesting points are in sight. First, in reading textual nodes in the hypertext, the language processes are basically the same as in reading a book. For example, if the reader reads ten consecutive screens, without any digression, to finish a short story or an essay in the hypertext document, we do not expect the reading process to be much different from reading a short story in a book.

Another more frequently seen situation is that the reader jumps from node to node in a nonsequential manner. In this case, the language processes will be different. The reader's success in jumping to the right node depends much on the reader's semantic knowledge of the language, that is to say, the reader's ability to correctly tell what the node labels mean is essential for successful traveling in the hyperspace. Relations between nodes are usually defined in semantic terms. Lexical and semantic developments are therefore more important than other language developments. Facilitation of meaningful read-

ing, on the other hand, can be provided by the hypertext corpus. Some hypertext may use icons and maps in representing the relations among nodes. These are helpful devices for less experienced readers. Some hypertext corpi may provide reference materials (e.g., dictionaries and encyclopedia) and other supportive materials (word analysis, pronunciation, etc.) and can facilitate various aspects of language development (Anderson-Inman and Horney,1993; Anderson-Inman, Horney, Chen, & Lewin, 1994).

Knowledge of Hypertext

For a successful reading of any hypertext document, the reader needs to have some knowledge of hypertext (the sixth factor in the reader component in Figure 2), i.e., some basic understanding of how a hypertext works. He/She should know that on every screen there are usually buttons that can be clicked on to go to some designated node, that highlighted or boldfaced words and phrases usually mean that there is additional information available for these terms. He should also know that maps are usually provided in the hypertext to guide movement in the hyperdocument. And finally the reader needs to know that meaning in hypertext does not only exist in a single node; meaning can also be spelled out by the relations between nodes.

Computer Literacy

Since hypertext exists only in its electronic form, it is obvious that some basic level of competence of using computer is necessary for hypertext to become "readable" at all. Computer literacy (the seventh factor in the reader component in Figure 2), for this purpose, should include the following knowledge and abilities:

1) knowing how to operate a computer, how to turn the computer

and the monitor on and off, how to insert or eject a disk, and how to communicate with the computer through the keyboard and the mouse.

2) knowing how a computer works, including the functions of the drives, the disks, and how computer files are managed.

3) knowing how to open up a program and close it.

Reading Strategies

Use of reading strategy (the eighth factor in the reader component in Figure 2) may be understood at two levels: the cognitive level and the metacognitive level. Cognition involves understanding and remembering while metacognition involves thinking about one's own perceiving and understanding (Flavell, 1981). Garner's explanation (1987) may be helpful for delineating the relationship between the two. In reading, verbal rehearsal is a cognitive strategy, but the reader might employ a metacognitive strategy of jotting down the critical dates, checking those he/she knows, and referring to the text to check predictions. Thus the cognitive strategy of verbal rehearsal is used to note cognitive progress while the metacognitive strategy of checking to see what is already known monitors cognitive progress. Research has shown that both cognitive strategies and metacognitive strategies are essential for comprehension in reading traditional text (Brown, 1986; Flavell, 1979). In reading hypertext, we can expect both cognitive and metacognitive strategies to be as important as in reading traditional text.

World and Content Area Knowledge

A hypertext corpus usually provides more needed information than a traditional book can provide. From this point of view, hypertext requires less prior knowledge of the reader than does traditional text.

Needed information can usually be brought up from the hypertext corpus itself. But a reader with stronger world and content area knowledge (the ninth and final factor in the reader component in Figure 2) will have the advantage of seeing more connections and making more successful links. For example, suppose a student wants to find out some facts about the Crusades in the Middle Ages in a hypermedia encyclopedia system. If the student knows that he/she should look for the information in the history section, particularly in the Middle Ages section, or European history section, or Christianity section, then he/she will have more access routes to the needed information than a student without such knowledge. For a student reader without this background knowledge, the only way to get the information may be to use the index or word search method which is usually provided by more friendly hypermedia systems.

Hypertext Characteristics and the Reading Process

The section above focuses on the reader variables which are critical in the process of reading hypertext. The affective and cognitive variables included in the reader component reflect the sociocognitive perspective to reading to which this paper subscribes. In this section, I will discuss the major characteristics of hypertext and how these characteristics may influence the processes and product of reading (see Figure 2). The word that most aptly describes the qualities of hypertext is perhaps "multiplicity:" the multiple modes of representation, the multiple pathways to multiple meanings, and the multiplicity of the sociocultural context. These different dimensions of multiplicity and their implications for reading are discussed respectively below.

The Multiple Modes of Representation

To appreciate the significance of the revolutionary nature of hypertext, a brief look at the development of communication technology may be helpful. One of the most important characteristics that distinguish human beings from other creatures is our capacity to use symbols to express ideas. At the very beginning there was speech, the patterned sound that carries meaning. Then there were pictures, the first "text" that our ancestors wrote on rocks. These rudimentary drawings were important invention that marked the capacity to use symbols other than oral speech to represent ideas and information, a more permanent form of representation. Then came ideograms, which was a step further than writing with pictures. Then came the alphabet, which, instead of mapping onto ideas, were mapped onto human speech. The invention of the alphabet is considered the most important development in human civilization (Goody & Watt, 1988). And finally there came the motion pictures, the technology that combined oral speech, pictures, music, and sometimes written text into one form.

As a multimedia technology for presentation, hypertext is not a new invention. It has been long foreshadowed by motion pictures and television. But it is the advancement in modern computer technology that helped bring the multimedia presentation from the movie factory to home, and from the theater to our desks. As a new form of communication, hypertext is not designed to replace the traditional text. Instead, it is designed to revive the ancient forms of writing which had been somewhat suppressed by the alphabet. Hypertext incorporates all of the past communication technologies into one new form. It is this capacity to combine all of the modes for communication in the human history that makes hypertext a revolutionary invention. It is the most

versatile literacy technology (Bolter, 1991).

More specifically, hypertext provides multiple modes for representing ideas, information, and feelings, namely, through traditional written symbols (alphabetic or nonalphabetic symbols), sound (music, human speech, or even noise), image (pictures, animation, graphics), and video (combination of all of the above). The multiple forms of representation do not serve motivational purposes only; there are also critical implications for reading and learning. For example, according to Sadoski's Dual Coded Theory (1994), both mental imagery and language are important components in the comprehending processes of reading. Given hypertext's multimedia capacity, it can be expected that the available images and video will have great impact on the nature and process of meaning construction in reading hypertext. Eisner (1993; 1994), for another, also makes a strong case on the necessity for developing curriculum which provides students with opportunities in exploring the physical and imaginative worlds through all the human senses. His main tenet holds that different forms of representation will lead to different forms of understanding, and eventually to an enriched and expanded cognitive capacity.

As shown in Figure 2, a reader bringing with him/her prior experiences and knowledge to the hypertext system has several forms of representations to choose. The reader may take the comprehensive route (represented by the thicker lines with arrows in Figure 2), by which I mean that the reader takes roughly equal interest in visiting the textual, audio, visual, and video nodes in the system. Or the reader may take the selective route (represented by the thinner lines with arrows) by visiting one type of nodes more frequently than others. Each type of nodes appeal to different faculties of the human mind. Textual nodes rely heavily on the written symbols and utilize the orthographic

and phonological codes and appeal to the semantic memory for decoding and comprehension. Textual nodes are more abstract and more difficult since it requires higher literacy competence (in the traditional sense of the word). A reader visiting an audio node can bypass the orthographic codes and directly access the phonological codes, i.e., when the sound presents human speech. Thus, audio nodes provide an important alternative access to meaning for readers who have difficulty decoding the writing symbols. Image nodes, which include pictures, drawings, animation, access the visual part of the reader's memory which then leads to meaning. Video nodes, which present information in multimedia form, access both the phonological and visual codings of the memory.

The Multiple Pathways to Multiple Meanings

The second dimension of hypertext multiplicity lies in its nonlinearity. A hypertext document is consisted of a web of interconnected nodes, each of which contains a unit of information. There is no supposed order or sequence for reading through the hypertext. A reader can start where he/she likes and choose where to go at every node as his/her goal or interest directs. So it is likely that ten readers of the same hypertext document could come out with ten different sequences of reading through the hypertext system and thus produce ten different versions of texts. All of them are legitimate. Similarly, a reader who re-reads the hypertext many times may have many different sequences of reading through the hypertext and may have many different interpretations of it. Hypertext, in the post-modernist sense, is the most unauthoritarian kind of text in which the author does not dictate any single version of meaning. If multiple perspectives cultivate reflection and critical thinking in the reader, hypertext then

is the right kind of text to facilitate this process (Landow, 1992).

It is necessary to note that multiple interpretations of text are predicted by reader response theories in reading traditional text. In light of the transactional perspective of reading (Rosenblatt, 1978, 1994), multiple interpretations are a general condition since each reader brings a unique experiential-affective world to interacting with the text. So even for the same reader, reading at different times would also result in different interpretations. However, the transactional theory of reading also predicts that variations of interpretation are limited to the degree where consensus of the "interpretive community" lies. In reading traditional text, variation of interpretation comes mainly from the reader. In reading hypertext, variation of meaning comes both from the text and the reader. The multiplicity of hypertext, then, will lead to more varied interpretations.

Multiplicity of Sociocultural Context

If each piece of writing represents the projection of the author's sociocultural entity at a certain point of his/her life, then hypertext, which is by definition a conglomeration of texts, can be seen as a text consisting of many interconnected sociocultural entities. Thus the hypertext system represented in Figure 1 is in itself a sociocultural context, while the reading community, including the readers, the instructors, and the hypertext form an even larger sociocultural context. Due to its much greater capacity (for example, a CD-ROM can hold all of the information of a 23-volume encyclopedia), a hypertext system is usually co-authored by multiple authors, the number of which can range from several to dozens, depending on the nature and size of the hypertext system. In any case, a hypertext system constitutes a much richer sociocultural context in which meaning is negotiated. What kind

of interaction can be seen in such a complicated sociocultural context? How may such a rich sociocultural context influence the process of meaning construction? These questions are discussed below.

Social Processes in Reading Hypertext

As has been suggested above, reading is more than a cognitive process where the reader utilizes his/her cognitive concepts and linguistic knowledge to decode or comprehend text. Rather, reading is assumed to be a sociocognitive process, i.e., it is a cognitive process in that it involves employing mental faculties for understanding text and at the same time it is a social process in that it involves several dimensions of interaction influencing the process of meaning construction. In this paper, discussion of the sociocognitive processes of reading hypertext is focused more on the social part than on the cognitive part. This approach is taken partly because the socioconstructive perspectives to reading has been found to be a more powerful paradigm for describing and explaining the complex and dynamic reading process (Weaver, 1985; Pearson & Stephens, 1992) and partly because hypertext in itself is a medium that highly facilitates social interaction. In this section, I will examine four dimensions of interaction mentioned. These include interactions between texts, between readers, between reader and text, and between readers and instructors (see Figure 1).

Interaction between Texts

According to Bakhtin's conception of text, every utterance is in itself a link in a chain of utterances which make up the text. Every utterance is a response to previous utterances related to this topic, and will

be responded to by future utterances. So is a text. In reading or writing, we are constantly relating one utterances to other utterances, and relating one text to other texts. Meaning making goes beyond decoding the linguistic signs; it involves active intertextual linking, weaving individual ideas into a network of related ideas. Such intertextual linking has been commonly found to be essential for higher level comprehension in reading (Hartman, 1994; Beach, Appleman, and Dorsey, 1994). Here the claim that a text, especially essayist text (Olson, 1988), is autonomous, and can stand alone isolated from any context is seriously challenged. It is more true that even in reading a supposedly complete and independent text a reader still has to relate what is being read at the present moment to what has been read and known in the past. As a matter of fact, the more experienced a reader is, the more intertextual links he/she makes (Beach et. al, 1994).

Hypertext is an out-growth of this associative nature of human thinking. In his original conception of hypertext, Nelson (1992) already implied that hypertext is a better text for reading and learning. His reasoning is that readers have different ways of organizing and processing information and ideas. By allowing each reader to use or create his/her own organization of units of ideas, a hypertext document provides a more productive reading and learning environment. Intertextual link-making therefore is not only a practice of the reader, it is an inherent part of hypertext. We can predict that hypertext readers will have more opportunity to practice link-making in constructing higher level understanding of the text.

In a "closed" type of hypertext (i.e., read only), the relations between texts (or nodes of information) are fixed; no new relations can be added, nor old relations be changed. The sociocultural context is thus static. This is not the ideal type of hypertext. In an "open" type of hypertext (i.

e., writable type), the sociocultural makeup is more dynamic. New elements can be added constantly, so can old elements be changed. Relations between texts are constantly changing.

Interaction between Hypertext and Reader

It is obvious that nature and process of interaction between hypertext and reader has much to do with the characteristics of reader and the characteristics of hypertext. In the sections above discussing reader characteristics and special features of hypertext, I have considered some theoretical implications for interaction between hypertext and reader. As has been mentioned, successful reading of hypertext depends in part on the reader's belief in reading, motivation to read, adoption of appropriate stance, and knowledge of computer and the hypertext system, and in part on the design of the hypertext system. Given the complexity of the variables involved, it does not sound very practical to try to delineate in details all the possible situations to be found in the reader/hypertext interaction. Here I would like to sum up some general key ideas concerning reader/ hypertext interaction, particularly in practical situations.

First, it is generally true that interacting with a hypertext system is more demanding metacognitively. This is so because hypertext, by definition, provides more alternatives for the reader to choose, and making a decision, especially a right decision, is a highly demanding task. Therefore, even though a system may provide varied forms of resources to the reader and reduce the cognitive demand, these resources can become distractions to less skilled readers. For example, the researchers of the ElectroText Project(Anderson-Inman and Horney, 1993; Anderson -Inman, Horney, Chen, & Lewin, 1994) found that some students have not made the best use of the resources available, either by not using

them or by over using them. This is clearly a metacognitive problem.

Second, hypertext works by connections and associations. This is believed to be a benefit (for example, Nelson, 1992; Landow, 1992), for the reader can choose to follow those links that are relevant and meaningful to him/her, or even to create new links. But there is a down side to it. How about if the reader cannot find any meaningful links to follow, or if the reader cannot understand the relevance of a link between two nodes created by others. Such difficulty can also arise in reading a conventional text. But in a conventional text, there are usually rhetorical devices (transitional phrases, for example) that give the reader hints about the relationship between two units of text. In hypertext, relationship is usually less transparent if the reader cannot figure out the significance in the first place. However, a post-modernist may argue that the reader can ascribe any significance to the relationship as he/she thinks it fits without bothering the original link-maker's intention. Thus, we can say that interacting with a hypertext system involves greater degree of interpretative freedom because hypertext is less authoritarian and because there are more alternative perspectives to take. What kind of reader will benefit most from such characteristics? This remains largely an open question.

Interaction between Readers

I have defined hypertext above as representing a multitude of sociocultural entities. Expanding this analogy to the extratextual level, we can also define the sociocultural context of hypertext as including the whole reader community, in which each reader carries with himself/herself a social history and a cultural identity (see Figure 1). In a classroom environment where interaction between readers and

teachers is encouraged, the sociocultural context becomes more important for the reading task. Interaction between each individual reader's social and cultural identities can take place in the prereading activities during which the goal of reading is set and prior knowledge activated, both of which will exert some influence on each individual's interaction with the hypertext system. Post-reading activities are another arena where each individual's sociocultural identity and personal interpretation of the hypertext are brought into contact. And due to the more varied scope of ideas and interpretation of meaning resulted from reading hypertext, the postreading interaction should be richer and more complex.

But the most exciting aspect of this dimension of interaction lies in the fact that hypertext allows readers to interact with each other during reading and within the system itself. In reading a traditional text, inter-reader interaction occurs only when they are not engaging in the reading process, and occurs only in the form of discussion outside the text. But in reading an open-type of hypertext, the hypertext system can in itself be a space where readers interact. Text-reader interaction and reader-reader interaction actually occur simultaneously. This is so because in an open type of hypertext readers can add their own nodes and links to the system, and comment on each other's opinions or perspectives. Thus, as time goes by and the hypertext system grows larger, readers can expect to encounter a whole history of one line of discussion, including claims and counterclaims and various perspectives to one particular topic. Here, hypertext in fact becomes a living example of Bakhtin's interrelated chain of utterances. Intertextuality, which has to be implicitly sought across texts in traditional text technology, is now brought to light within one corpus of texts.

Interaction between Reader and Instructor

The fourth and final dimension of social interaction occurring in reading hypertext concerns the instructor and the student readers, which is represented by the double headed arrow between the reader component and the instructor component in Figure 1. In an instructional setting, the instructor usually is the most powerful reader whose interpretation of text weighs much greater than that of students'. The teacher also has the privilege of setting the goal of reading and defining the rules for participation, i.e., if he/she chooses to do so. As a result, we should not suppose we can change reading instruction practice in the classroom in a day by bringing in a revolutionary technology such as hypertext. Instead, it is often the social relations and cultural traditions which determine the use and effect of literacy technology (Street, 1986; Kulick, & Stroud, 1993). Therefore, it is very important for the instructor to take an instructional stance that makes best use of the new technology. In this case, I would propose that the teacher takes the role of a facilitator than that of a director when using hypertext to support reading instruction. As a facilitator, the instructor should set up a hypertext system that invites students to read and to express. He/She will allow students to bring in different perspectives and interpretations to the interpretative community for meaning negotiation.

Characteristics of hypertext, on the other hand, do have some constraints on the teacher-student interaction in a reading classroom. For example, a pedagogical strategy such as the Directed Reading-Thinking Activity (DR-TA; Stauffer, 1976) may not be feasible in a reading classroom using hypertext. The central idea of the DR-TA is to develop the habit of making predictions and checking for verification

while reading. In practice, the teacher has to suspend students' reading at certain stop points and ask students to make predictions about future development of the story. There is obvious difficulty to do so in reading hypertext since students do not follow the same paths through the hypertext. And even more seriously, there does not seem to be a plot line for students to predict, since hypertext is nonsequential.

Meaning Construction in Reading Hypertext

The immediate goal of reading is to make sense of the text, including, as Rosenblatt (1994) puts it, the public meaning that is generally recognized by most people and the private sense generated from the transaction between the world of the reader (his/her personal experiences and consciousness) and the world of the text (the information, themes, messages, and author's voice). But the ultimate goal of reading is to reconstruct one's knowledge, one's inner text, one's self. Hypertext does not only serve as a textual world with which the reader interacts out, it also serves as a metaphor for the transactional process and for the reconstruction of knowledge and self.

A hypertext document can be read by the same reader in many different ways (see Figure 2 above). Every sequence of the nodes visited consists of one conglomeration of relations among nodes and thus represents one possible interpretation of the hypertext. An expository hypertext may allow smaller room for variation in interpretation, for the information contained in each node denotes more definite meaning and suggests more efferent stance in reading. This is especially true when the hypertext document is relatively small in size, for example consisting of only 20 or 30 nodes. As the size becomes larger and larger and the composition becomes more and more varied, room for variation

in interpretation also becomes larger. A literary hypertext, on the other hand, will almost "demand" multiple interpretations from the same reader. Meaning-making is additive and dynamic. As the reader visits more nodes and in more different sequences, he/she will come closer to a more comprehensive understanding of the many-sided truth of the hypertext. Meaning construction in this sense is a negotiation process with one's self. Just as meaning in hypertext is often defined by the relations between nodes, so is the reader's understanding of the text's truths defined by the relations between each individual transaction with the text. There is no such thing as the meaning of the text; there will only be a history of interpretations.

A hypertext corpus is usually meant to be read by a group of people, sometimes jointly in its physical sense. Meaning negotiation becomes a more complicated yet more productive process. Multiple points of view are brought into the discussion; no one can be declared to be more legitimate than others. The result of the negotiation is a social meaning of the text that is more comprehensive than would otherwise be understood by one single reader. It may also result in more reflective and inquiry thinking in the reader (Reilly, Hull, & Greenleaf, 1993). When meaning of the text is negotiated in a sociocultural context that involves the hypertext, student readers, and the teacher, the social meaning is aptly represented by the nature of hypertext--each reader in the reading community is like a node in the hypertext and meaning is defined by the relations between nodes.

Conclusions

Several important conclusions concerning reading hypertext can be drawn from the above discussion:

First, with its multimedia capacity and its problem-solving nature in its organization, hypertext can provide readers with strong internal motivations, although the disparate kinds of texts incorporated in a hypertext corpus may require more skillful shifting of one's stance in reading.

Second, the nonlinearity and multiplicity of hypertext may serve an experienced reader better than an inexperienced one. Traveling meaningfully from node to node in the hyperspace requires a clear goal and sufficient world knowledge as well as metacognitive strategies. The reader needs to always keep in mind what he/she wants to know and what has been known in order to make meaningful choices. Constant monitoring of reading process and comprehension is a must. Thus higher reader control in reading hypertext has both promises and challenges.

Third, in an open-type of hypertext, the distinction between author and reader becomes very blurred. A hypertext corpus consists of many nodes of text created by different authors. There is no single text and no single author. Both text and meaning are always in flux. Textual meaning resides both in each individual node of text and in the relations among nodes. Intertextual linking becomes an actual act. Comprehension and interpretation is the result of transaction between a reader-writer's inner text (prior knowledge and experience) and the hypertext.

Fourth, in reading hypertext, the sociocultural context of the reading event has to be understood differently. Apart from the values and beliefs brought forth by students and teachers in pre- and post-reading activities, a large part of the sociocultural context is embodied in hypertext's multiplicity of authorship and organization, which can be understood as a complex network of social relations and cultural enti-

ties.

Finally, it is not enough just to consider the cognitive processes and their implications in reading hypertext, as most studies of hypertext reading have done (see review above). To treat hypertext as an isolated, multimedia text betrays the nature of hypertext. The whole idea of hypertext is constant and explicit linking, relating, and restructuring. Hypertext is in itself a living example of the inquiry process and knowledge construction, which is more a social process than a cognitive one.

In his presidential address in the 1993 AERA Annual Meeting, Eisner (1993) called for new forms of representation and understanding in schools. He argued that students should have the opportunity to use different forms of representation to express their meaning and selves and the opportunity of reading and decoding meaning from different forms of representation, so that they can develop multiple modes of thinking and understanding. Verbal representation is only one of the several major symbol systems used by humans, but it has long dominated our schools, often to the exclusion of other forms. By allowing this, we unfortunately, are impoverishing children's minds. From Eisner's point of view, though he did not mention hypertext in particular, we can say that hypertext, or hypermedia, integrates the various forms of representation. It is a medium where media meet, where meaning is embedded in different forms of representation and where different modes of understanding is practiced. Hypertext is indeed an appropriate form of expression for a multicultural society where multiple values and cultural forms are cherished.

Implications

Given the recency of its invention and its revolutionary features,

hypertext presents many meaningful research and practical implications. For theoretical research, one obvious and important topic that deserves further research is to find out how multimedia representation of information may influence motivation and comprehension and how the explicit intertextual linking may assist students in constructing meaning and developing the habit of connecting ideas into knowledge system.

Another interesting line worth pursuing is to find out if the metacognitive monitor and control practiced frequently and explicitly during reading hypertext would foster a student reader's metacognitive awareness and skills and transfer them to reading traditional text. Researchers have found that metacognition is critical for higher order comprehension and can be taught explicitly through instructional practice such as reciprocal teaching (Palincsar & Brown 1984). Since reading hypertext requires active decision making every time the reader wants to go to another node, the reader needs to frequently reflect on the goal of reading (what information is being sought), and to monitor and evaluate his/her comprehension so far. Such awareness and practice of the goal setting, monitoring and evaluation may have the potential of improving a reader's metacognitive reading strategies in either traditional text or hypertext.

A third important theoretical issue that arises from the discussion above has to do with the sense of plot in reading a hypertext story or novel. Since Aristotle's time, plot line has been considered the most essential part of all narratives, especially stories and novels. But in a genuine hypertext narrative, such as the kind advocated by Landow (1990; 1992), there is not a central, sequential plot line. With linearity taken away, could a story still be a story? How could the author compose a story at all without linearity? And without the standard pattern o

plot (i.e., from exposition to complication to climax then to resolution), how can a reader understand and appreciate a narrative work? Does plot have to be abolished? Or does it have to be redefined? Many questions have to be answered concerning the structure and plot line of a nonlinear hypertext novel.

The sociocognitive perspective taken in this paper also provides helpful insights into the use of hypertext for instructional purposes. First, the multimedia capacity of hypertext should be exploited to explore the possibility of enhancing learning in the classroom, especially for those students with difficulty processing verbal information. Variety in representational forms that allow different mental processes should be encouraged, for, as Eisner suggests, schooling has long relied on the written word for representing experience and thought, a practice which has impoverished the quality of school children's sensual and mental experiences. How hypertext or hypermedia technology can be employed to implement the multiple literacies education is an important topic for educators to consider.

Second, given the rich resources and great degree of freedom provided by hypertext, the reading teacher's role has to be reconsidered as to what extent and in what way the instructor can facilitate meaning construction. Since whole class reading of a singular text is not likely to happen in reading hypertext, how reading curriculum should be designed and conducted is another urgent topic for reading researchers and instructors alike.

Third, hypertext is a powerful learning tool and it should not benefit only college students for whom most hypertext systems have been intended so far. More hypertext or hypermedia applications should be developed for younger readers. In doing so, hypertext designers need to take findings from reading research on metacognition and comprehen-

sion into consideration in producing hypertext applications for young or poor readers. It is also necessary to develop hypertext applications that can easily provide an open type hypertext system to users for creating rich social interaction.

Fourth and finally, there are important similarities between hypertext and human mind in their organizational principles and their multiple modes of representation. Knowledge can be defined as a mental practice of relating relevant ideas into a system. Making connections of ideas and concepts is best done through making intertextual linking and through social interaction with others. The process of linking ideas into a system is best exemplified in the making of a hypertext system. It should be interesting to explore if interacting with hypermedia systems can aid a learner's conception of the inquiry processes and the knowledge construction processes.

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從社會認知的觀點看閱讀超文體中的意義建構

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摘　要

本文主要的目的是從社會認知的觀點來探討學生閱讀超文體(Hypertext)時所涉及的社會的與認知的過程。首先，本文討論了幾種解識文意來源與文章性質的理論，其中特別強調了社會互動論的看法。其次，本文討論超文體的性質，並從文獻中歸納出幾種研究或使用超文體的看法與趨勢。最後，根據社會認知的閱讀理論，本文提出一個閱讀超文體的模式，探討了讀者特色與超文體特色的重要性，以及這些特色在閱讀或使用超文體時所代表的意義。本文的結論包括，(一)超文體的多媒體功能與其非線性、動態、及互動的特色頗能幫助學生經由互動來建構意義；(二)超文體的非線性與多元性需要較高的後設認知能力，因此對閱讀能力強的讀者較有利，語文較差的學生可能比較容易覺得困惑；(三)超文體的非線性與彈性模糊了作者與讀者間的差別，也破壞了情節的本質，對於故事的定義與閱讀過程形成很大的衝擊；(四)超文體可以當作師生之間或學生之間互動的媒體，來達到教育的目地。