Digital reading theory and its relationship to academic reading practices
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Abstract
As students and scholars increase their use of digital texts, digital reading theorists consider how electronic text affects reading practices, learning, and scholarship. This essay examines the development of digital reading theory and its relationship to academic reading practice. Hypertext theory and the phenomenology of reading are evaluated as methods of understanding the digital reading process and as starting points for the development of new online reading tools. Empirical studies of academic reading and conceptions of appropriate reading tools are considered alongside theoretical developments to determine the impact of digital reading on scholarly practices.

Keywords: digital reading, hypertext, phenomenology of reading, theory

Introduction
Digital reading can be studied from several different perspectives; the fields of cognitive psychology, education, information studies, and literary studies have all contributed to different aspects of current knowledge of digital reading. Hypertext theory has emerged as the most prominent theory of digital reading today. The phenomenology of reading can also be used to model digital reading, and empirical studies of reading behaviour serve to complement areas of theory. However, digital reading theory is still an emerging area of study that continues to seek a theoretical framework and accepted body of knowledge (Miall & Dobson, 2001).

Academic reading consists of the reading done by students in the process of learning about a discipline and by faculty when doing research and teaching. Both reading theory and practice point to an increasingly social, interactive use of digital texts. The thought processes that take place during academic reading, such as questioning new concepts, synthesizing findings, reworking ideas, and responding to authors, are beginning to find an outward expression in the online environment through digital reading tools. While these processes are not new to academic reading, researchers and designers are beginning to consider how to facilitate critical reading in the digital environment, opening new opportunities to readers.

Development of Hypertext Theory
The term hypertext, first coined in the 1960s by Theodor H. Nelson, can be defined as “text composed of blocks of words (or images) linked electronically by multiple paths, chains, or trails in an open-ended, perpetually unfinished textuality,” (Landow, 1997, p.3). This definition is drawn from Roland Barthes’ description of an ideal text, where the text has many networks that interact to create a text without beginning or end (Landow, 1997). Foucault similarly describes a text as a network with links, expressed through a book’s references to other texts (Landow, 1997). As such, hypertext theory is based in the theories of postmodernism and poststructuralism (Carusi, 2006) but also grows out of the world of the printed text and often exists in comparison to print forms. More recently, DeStefano and LeFevre (2007) define hypertext broadly as “a collection of documents containing links that allow readers to move from
one chunk of text to another” (p. 1616).

Vannevar Bush’s 1945 essay was similarly instrumental in developing today’s concept of hypertext, where Bush introduced the idea of a memex (Zambare, 2005). This device was envisioned to store all kinds of books and documents while also being able to link items (Bush, 1945). This same concept can be seen in today’s digital libraries.

Currently, literary scholars are interested in the potential and theory of hypertext. Authors such as Jay David Bolter, George P. Landow, and Richard Lanham, among others, have been influential in the development of the field of hypertext theory (Miall & Dobson, 2001; Zambare, 2005).

**Characteristics of Hypertext**

Hypertext can take many different forms, providing different degrees of context and choice to readers (Carusi, 2006). However, hypertext is characterized by several main features. First, hypertext is described as non-linear (Carusi, 2006). Because of this, readers are seen as having the ability to create the text as they read, depending on the choices made when reading (Carusi, 2006). Hypertext is said to bring freedom to readers, creating new terms such as *wreader* and *secondary author* (Carusi, 2006). Because hypertext is joined by links, each reader is able to create a unique path through the text, therefore having a role in the text’s authorship (Carusi, 2006). Each reader can then create a unique text according to the links followed.

Hypertext consists of two components: links and lexias (Carusi, 2006). A lexia, a reading unit or section of text, can be of varying length and composition (Carusi, 2006). Lexias are joined by links. It is through these links that lexias gain meaning and form the text as a whole (Carusi, 2006). However, this whole is changeable depending on the reader’s choices and can be formed again with each reading.

**Theoretical Debates: Freedom and Cognitive Processes**

Hypertext’s format can bring greater freedom to readers when compared to printed books, which are arranged in a preordained order that readers must follow (Carusi, 2006). However, not all scholars agree that hypertext does in fact bring such freedom to users. Traditional text does not necessarily constrain readers. Critics argue that there can also be many paths through a printed text, to be formed by the reader during the process of understanding the text. Hypertext itself is made up of prearranged lexias and link choices that may limit reading choices (Carusi, 2006). Although readers of print texts may follow similar reading processes to those used in hypertext when connecting concepts, hypertext offers a physical manifestation of this reading process.

A second debate focuses on the cognitive processes taking place during reading. Hypertext has been put forward as a better reflection of the associativeness of cognition and the reading process (White, 2007). However, some theorists, such as Bolter, argue that this associativeness can also be carried out through print-based reading, that it is not exclusively the domain of hypertext (White, 2007). Similarly, Dillon argues that there is no evidence within cognitive psychology that hypertext supports associative thought processes (as cited in White, 2007, para. 16). Charney again argues that there is insufficient evidence to conclude that hypertext reflects the associative processes of reading, cognition, and memory (as cited in Carusi, 2006, p. 170).

**Effects on Reading and Readers**

As readers adjust to the digital medium, certain new factors are introduced to the reading process. First, the digital text is less material than text on a page, but can act in different ways than print text (Gervais, 2007). Words on the screen can have hyperlinks and can be changed through computer functions (Gervais, 2007). It is not yet clear whether hyperlinked words are read in the same way as print-based words (Gervais, 2007). The non-linearity of hypertext may also affect the reading process. Readers no longer have the
The entirety of texts before them and must learn to navigate invisible sections of text (Gervais, 2007).

When reading digital text, simply making one’s way through the text often requires more thought and practice than it does when reading print texts. Gervais (2007) explains that every act of reading consists of three parts: manipulation, comprehension, and interpretation. The manipulation of traditional print texts is often overlooked in the act of reading, but this aspect of the reading process is growing in importance with digital reading (Gervais, 2007). If a text cannot be manipulated, readers will have difficulty in understanding and interpreting the text (Gervais, 2007). Readers must continue to learn to manipulate texts on screen as they adapt to the digital reading environment (Gervais, 2007).

The digitization of texts also means that there are ever-greater numbers of texts available in digital format. This changes the reader’s cultural reading context. Readers have access to overflowing information, so that the need for selection and speed becomes more central to the reading process (Gervais, 2007). Readers must learn to intelligently select needed texts from among many (Gervais, 2007). However, accelerated reading can reduce comprehension to more superficial levels (Gervais, 2007). Individual texts tend to have less importance to readers, are read quickly, and are discarded or lost in the overflow of digital information (Gervais, 2007).

Text digitization has important effects in the academic environment. Patterson (2000) argues that readers interact with electronic text in ways that is not possible with print text, that hypertext allows readers to have a more authorial role and to participate more in the text. This can lead to new educational practices for teachers and students, who can use hypertext in new, participative ways in the classroom (Patterson, 2000). Students can become coauthors through hypertext, and instructors can encourage students to contribute their own writing in response to hypertexts read (Patterson, 2000). Reading then becomes an interactive process. However, in higher education, a problem arises through the multiple texts that can be derived through hypertext reading, creating difficulties for teaching and study. If students and instructors can all create different texts through reading, they have little common ground for discussion and instruction (Carusi, 2006).

According to Carusi (2006, p. 171), the central claim of hypertext theory is that “hypertext constitutes a challenge to existing reading practices, and that even our experiences of reading will eventually be changed by it.” Hypertext may have the ability to change the roles of readers, the attention given to texts, and the form of texts themselves (Carusi, 2006). Some theorists worry that students may become readers who lack depth of thought and analysis due to the nature of hypertext, while others suggest that hypertext can bring about new forms of scholarship that have yet to be discovered (Carusi, 2006). These elements are beginning to be studied, but researchers have yet to develop firm conclusions about the changes brought about by hypertext to academic reading and learning.

Phenomenology of Reading
The phenomenology of reading is most often used to describe the process of reading traditional, linear text, but it can also be a challenge to hypertext theory in describing digital reading. Its goal is to describe the experience of reading (Carusi, 2006). Carusi (2006) outlines nine characteristics of reading as portrayed through the phenomenology of reading, developed by Wolfgang Iser (1978). In this case, reading is seen as a conscious activity and an act of communication. The text is not perceived all at once by the reader, so that the reader focuses only on one part of the text at any time (Carusi, 2006).

The reader forms expectations while reading, which are either met or not, causing syntheses to be reinforced or modified (Carusi, 2006). A blank or gap is formed when the reader’s expectations are not met, causing the reader to look for connections and modify expectations (Carusi,
As such, the phenomenology of reading can be compared to hypertext theory, where the reader forms connections between lexias through links. However, in hypertext, the lexias and links are pre-formed for readers, while in the phenomenology of reading it is the reader who makes his or her own connections within the text (Carusi, 2006). Even so, the experience of reading to be gained through hypertext can also be gained through the reading of linear text, according to the phenomenology of reading (Carusi, 2006).

Applying Theory: Studies and the Design of Reading Spaces

Several empirical studies examine different aspects of digital reading with the goal of better understanding the reading process. This knowledge can be put toward the design of digital reading tools and interfaces.

Miall and Dobson (2001) conducted a study evaluating the use of hypertext for literary reading. Through two studies with 130 readers, the authors examined the differences between linear and hypertext forms of electronic text, using short stories. Overall, Miall and Dobson (2001) found that hypertext was not an effective tool for literary reading. Hypertext readers took longer in reading each node presented, often felt confused and reported feeling that they had missed part of the text (Miall & Dobson, 2001). Many hypertext readers had difficulty following the story given.

Furthermore, hypertext readers and linear readers generated different kinds of comments about the text. Hypertext readers commented more frequently on difficulties in navigating the text but also reported feeling more control through the choice of links (Miall & Dobson, 2001). While linear readers showed greater engagement with the story, on a more personal level, hypertext readers were distanced from the text and made fewer comments about the literary aspects of the story (Miall & Dobson, 2001). This suggests that hypertext can limit a reader’s involvement with the content of a text.

De Stefano and LeFevre (2007) conducted a detailed literature review to examine the relationship between cognitive load and hypertext reading. They found that the links in hypertext add decision-making processes and interruptions to the reading process. These may make reading more enriching or create increased complexity for comprehension (DeStefano and LeFevre, 2007). The authors also found that when hypertexts included new features, readers’ comprehension was decreased when compared to linear texts or hypertexts without the added features. However, hypertexts with hierarchical structures and organizational aids often resulted in better comprehension. Furthermore, in both cases, novice readers were more highly affected by these changes in structure than were those readers with prior knowledge of the structures (DeStefano and LeFevre, 2007). As such, the manipulation of texts must be considered when designing reading interfaces. Finally, they did not find evidence to support the claim that hypertext generates a more enriching reading experience.

In addition, DeStefano and LeFevre (2007) put forward several suggestions for the design of hypertexts. They explain that, in educational settings, it is important to “establish principles of good hypertext design for learning that are consistent with our understanding of human cognition but without neglecting issues of motivation and interest,” (DeStefano & LeFevre, 2007, p. 1636). They further recommend that cognitive processes should be combined with a model of hypertext learning that would include aspects such as prior knowledge, working memory capacity, and the ability to impose structure on information (DeStefano & LeFevre, 2007).

Salmeron, Kintsch, and Canas (2006) conducted two studies to identify the reading strategies chosen by hypertext readers. They discovered two strategies: the coherence strategy (selecting text related to the previous section read) and the interest strategy (choosing the most interesting text over less interesting sections). Through the two studies, the authors found that the strategy
chosen affects the reader’s comprehension of the text, depending on the reader’s prior knowledge. The coherence strategy best facilitated learning for readers with low prior-knowledge, while both the coherence strategy and the interest strategy promoted comprehension for readers with intermediate knowledge (Salmeron et al., 2006). This research can be compared to the claim of hypertext theory that hypertext can facilitate learning more efficiently than linear text (Salmeron et al., 2006). While this claim has not yet been supported by research, there may be certain situations where hypertext can be beneficial, especially when readers with prior knowledge actively choose the order of text to be read (Salmeron et al., 2006). Even so, the study results show that these readers will benefit equally from linear and hypertext versions of the text (Salmeron et al., 2006).

Finally, Quayyum (2008) conducted a study to describe students’ reading practices when preparing electronic journal articles for class discussion. By examining the markings made by two groups of users, those doing individual annotations and those sharing their markings with other members of the group, Qayyum discovered a range of markings present and several differences between the groups. Highlighting and underlining were found to be the two main forms of marking the electronic journal articles (Qayyum, 2008). Interface designers should facilitate the use of these two features and should provide options for colours and sizes of lines, so that readers sharing documents can distinguish their markings from those of other users (Qayyum, 2008). Finally, the author concludes that both technical and social aspects of human interaction with electronic documents must be considered when designing marking and reading systems (Qayyum, 2008).

Due to the variety of findings and recommendations present in these studies, it can be difficult to draw out conclusive principles for the development of reading theory or the design of reading tools. Even so, these studies and others are working towards the design of effective interfaces for reading electronic texts. As digital materials are increasing in number, libraries and other institutions continue to collect and promote these materials without understanding how they are being used (Coyle, 2008). Researchers have yet to discover what technologies will make it more desirable for readers to use electronic texts and what methods can be used to best link the ideas and relationships between these texts (Coyle, 2008).

Both hypertext theory and the phenomenology of reading can be used to design digital reading spaces for academic readers. Carusi (2006) argues that the phenomenology of reading best represents the academic reading process. In applying the phenomenology of reading to digital reading in higher education, the advantages of hypertext can also be incorporated into the design of reading tools (Carusi, 2006). As the phenomenology of reading suggests there is always interaction between the parts and wholes of texts, these characteristics can be incorporated with hypertext’s ability to allow readers to form links between texts in creating reading tools for students (Carusi, 2006). Students can form their own lexias and links in a text, connecting ideas while commenting on the principles used in these decisions (Carusi, 2006).

Developments in reading tools for academic e-books are moving toward a more interactive medium for reading online. One research group, the Institute for the Future of the Book, affiliated with the University of Southern California, has started to develop tools for collaborative online academic reading, writing, and review. The Institute anticipates a future for books where “the social life of readers and authors … will exist around and inside of books” (Albanese, 2006, para. 5) and “books will literally have discussions inside of them, both live chats and asynchronous exchanges through comments and social annotation. You will be able to see who else out there is reading that book and be able to open up a dialog with them” (Albanese, 2006, para. 6). Reading and writing tools developed by the
Institute, such as CommentPress and Sophie, are based on the idea that the process of questioning that goes on during academic reading can be expressed online during the reading process and that readers and authors can interact with each other within a book (Young, 2006).

Conclusion

Although hypertext reading is increasingly becoming a topic of study, little work has been done specifically on the academic reading of electronic books and journals and the processes used in reading these texts. Some of the claims of hypertext theory are as yet unexamined by empirical studies or unsupported by research. Furthermore, theorists must move beyond hypertext theory to examine other aspects of digital text. Does digital text change the nature of reading? Is student learning affected by increased use of hypertext, e-books, and e-journals? What are the roles of the author and the reader in the digital context? These questions and others are beginning to be examined but have yet to be answered adequately. As designers and theorists focus on interactive online reading processes, new tools and paradigms are created for academic reading, facilitating many of the processes that have traditionally taken place in print form while simultaneously creating new forms of digital expression.

Works Cited


**Additional Works of Interest**


