

Hypertext Literacy: Are We Teaching Students to Read and Write Hypertext?

Brad Atchison

Brad Atchison is a doctoral student specializing in educational technology at Kansas State University. Brad is currently working as an occupational therapist in special education in USD 383. His work experiences include teaching in the Department of Speech Communication at the University of Alaska in Anchorage and working in a pediatric hospital in Boulder, Colorado. Brad's primary interests of study and research include using assistive technology as an educational support for students with disabilities and supporting teachers with their use of educational technology. He has studied in Scotland, Alaska, and Colorado and someday hopes to live and work overseas. Brad can be reached at brada@manhattan.k12.ks.us.

Abstract

Hypertext has become a prominent and much heralded component of educational technology at all academic levels. Given its growing popularity, the author argues that educators must take a proactive approach to teaching students how to effectively use hypertext for academic writing and reading. The essay highlights new concepts related to literacy, compares and contrasts hypertext and traditional paper documents, and reviews research that compares reading hypertext and traditional text documents. In conclusion, the author reviews several methods that have been developed for supporting reading academic hypertext.

Introduction

Technology, as it is used as an academic tool, has dramatically affected the way that students read and write. Although most researchers and educators would agree with this pronouncement, some would also agree that the way that educators study and practice the pedagogy of reading and writing has not experienced such dramatic revision or change. Dramatic changes in educational technology demand reassessment of related pedagogy. The same skills that enable students to be competent readers and writers in traditional modes will be transferred to some degree to reading and writing with technology, but will not necessarily insure student competencies as readers and writers working in a new medium. Ray (1999) cautions that it would be a mistake to assume that educational technology is a transparent tool that makes no unique demands on students as readers and writers. Ray advises:

As school districts rush to embrace multimedia technologies, they must be wise enough to exercise the same critical evaluation of multimedia authoring tools that they apply to the adoption of a textbook series or a particular pedagogical approach to reading instruction. (p. 79-80)

Educational technology used in schools should be evaluated for quality before adoption and the impact of using this technology should also be assessed and reassessed as it impacts the way students learn and express knowledge. The primary focus of this essay is to affirm that educators

and researchers must take a proactive approach to teaching students how to effectively use technology in academic settings, even for the seemingly transferable skills of writing and reading. The first section of this paper highlights a concept of literacy that includes the influence of the interrelated, but distinct skills of “writing” and “reading” with technology. The second section compares and contrasts reading hypertext documents with reading traditional paper documents. The third section reviews research that examines the ease and effectiveness of reading hypertext versus reading traditional text. In conclusion, the paper focuses on ideas that some researchers have offered for supporting improved teaching and student performance concerning reading academic hypertext.

The Concept of Literacy

Some scholars have drawn a clear distinction between the terms “hypertext” and “hypermedia” (hypertext referring exclusively to text documents and hypermedia referring to documents that contain a mix of text and media). As has been the case in other academic writing (Jonassen, 1989; Joyce, 1988), the terms will be used interchangeably in this paper. The rationale behind this lack of distinction is that frequently educational media (even traditional textbooks) are combinations of text, images and graphical representations of information. When we refer to educational texts, we are rarely referring exclusively to printed text. Furthermore, non-text media is commonplace in most educational settings, but rarely exists independent of some connection to traditional printed text. Finally, students consume academic information through a variety of media on a daily basis.

In addition to having the potential to include a variety of media, hypertext possesses structural and navigational qualities outlined in the following description:

Hypertext writers and readers depend on a computer-based organizational scheme that allows them to move from one section of text (termed a “node,” often the size of a paragraph) to related sections of text quickly and easily. Such a text consists of a network, or web of multiply connected text segments. Hypertext writers set multiple connections between nodes of a text, and readers choose which links to follow, which nodes to read, and which nodes to skip. (Johnson-Eilola, 1994, p. 197)

Although some researchers envision true hypertext as including a feature that enables the reader to edit the content of a hypertext document (Nelson, 1993), this relatively uncommon feature of hypertext will not be explored in this paper. It should be noted, however, that when hypertext documents encourage reader contributions through authoring and editing, teaching the unique skills related to this mode of expressive reading and writing should be added to related curriculum.

In a traditional academic sense, literacy refers to a broad range of skills that enable a person to communicate through reading and writing. The definition of literacy, however, has changed dramatically through the years (Bransford, Brown, & Cocking, 2000; Karchmer, 2001). What was once considered to be functional literacy is no longer adequate. Many contemporary definitions of literacy extend beyond the traditional abilities of reading and writing to include aspects of using media and technology to produce and consume information. Researchers and

educators would, however, be foolish to consider the most modern vision of literacy as anything more than a temporary socially accepted concept. Valmont (1999) uses the term “virtual reality literacy” to describe a literacy that encompasses the effective exchange of information through electronic avenues. Valmont predicts that, “Tomorrow, virtual reality literacy may require entirely new strategies for dealing with literacy” (1999, p. 76). It follows that a constantly changing view of literacy should be accompanied by constantly evolving method for teaching literacy skills.

The traditional concept of literacy does offer us the invaluable notion that a person must be able to effectively produce and consume information to be considered literate. A considerable amount of research reviewed for this essay on the subject has heralded hypertext as a superior tool of academic expression, providing less insight into the unique affordances of “reading” hypertext. Some proponents of hypertext appear to consider the benefits of reading hypertext as a given. Others herald hypertext as superior to traditional reading because hypertext more closely mirrors innate cognitive structures such as memory. Other authors assert the superiority of hypertext by presenting case examples that illustrate students that have demonstrated superior knowledge and retention through using hypertext as a means of authoring (Erickson, 1997; Landow, 1992; Lehrer, 1993; Lehrer, Erickson & Connell, 1994; Meyers & Beach, 2001). Although it is easy to grant these assertions related to the value of hypertext, additional review and research of this subject is warranted. Failure to adequately explore and measure the benefits of reading hypertext documents is especially troublesome given the commonly held view of hypertext authoring as a valued activity in constructivist and collaborative learning (Erickson, 1997; Lehrer, 1993; Lehrer, Erickson & Connell, 1994; Wolf, 2002).

Each of the articles listed above emphasizes peer review and revision as a central part of the collaborative writing process. However, none of the articles discusses specific training or guidance that students should receive to be effective consumers and critics of hypertext documents. Research may support the claim that hypermedia is a superior tool of expression, but expecting students who have not been trained how to consume and navigate hypertext to offer effective critique of design and content of hypertext documents is inappropriate. Expecting “partially literate” students to effectively critique the hypertext of peers’ is similar to expecting the Wright brothers to offer an effective critique of shuttlecraft technology. The negation of this argument is to assert that reading and writing are skills that do not require individual development. Certainly authoring and reading hypertext are complimentary skills, but a significant body of researchers recognizes that reading hypertext deserves consideration as an essential component of academic or technology literacy (Barab, Young, & Wang, 1999; Baylor, 2001; Coiro, 2003; Karchmer, 2001; Schmar-Dobler, 2003; Sutherland-Smith, 2002).

Hypertext and Traditional Text

Johnson-Eilola’s (1994) description of hypertext emphasizes two primary differences between hypertext and traditional text documents. First, hypertext materials are nodes of material that are linked to related nodes of material. This quality affords the reader a certain amount of control over how they navigate a document. Second, nodes of information are frequently connected and arranged in a manner that supports non-linear progression through a body of information. Depending upon design, a hypertext document can be extremely broad and deep in terms of

information. In addition, document design can provide a relatively strict organization for the reader, or a degree of navigational freedom that approaches random access. In addition to scholars who see the flexibility and dynamic nature of hypertext as an asset to the learner, there are scholars who recognize how hypertext documents can complicate the reading process, especially for less-than-accomplished students.

Spiro, Feltovich, Jackson, and Coulson (1991) offer hypertext as an effective educational tool because it affords more flexibility to both author and learner in organizing information and expressing knowledge, thus supporting greater flexibility with problem solving. Bransford, Brown and Cocking (2000) describe such proactive educational ability as metacognitive skill. They assert, "The ability to monitor one's approach to problem solving—to be metacognitive—is an important aspect of the expert's competence" (p. 50). Later in the same text Bransford et al. (2000) point out that metacognition is a developmental skill, the presence of which varies according to the unique ability and developmental stages of the learner. Bransford et al. state:

The evidence suggests that, like other forms of learning, metacognition develops gradually and is as dependent on knowledge as experience. It is difficult to engage in self-regulation and reflection in areas that one does not understand. (p. 98)

The metacognitive skills required to effectively navigate and read hypertext may not be something that some students possess because they have not yet developed these skills, due to cognitive deficits or typical factors related to individual growth and development.

Although considered to be an advocate for hypertext, Jonassen (1989) warned educators years ago that this medium is not without its problems. Simply stated, Jonassen has recognized that the hypertext designs can present poor structure or limited structure that hinders a reader's ability to navigate and understand a document. Karchmer (2001) has recognized a difference between graphics and text integration between written and electronic texts. In addition, she has recognized that the different paths that students follow through a hypertext can result in different conceptions of a document. Schmar-Dobler (2003) has recognized "the sheer volume of text" available through hypertext documents, especially those connected to the Internet. In addition, Schmar-Dobler has recognized the dynamic links and multimedia features of hypertext as having the dual potential of guiding a reader through a document, or distracting from the reading. Sutherland-Smith (2002) argues that hypertext and Internet technology demands that classroom teachers respond with additional approaches to teaching and practicing reading. Sutherland-Smith asserts that even students recognize the difference between web text or hypertext and traditional printed texts. Based on quantitative research results, Baylor (2001) claims that navigation through hypertext raises a variety of issues for the student. He states:

A common phenomenon on the Web is for a participant to become sidetracked by other links and become disoriented when seeking a particular location. From the participant's perspective, did s/he make the right choice or will s/he have to backtrack? Did s/he temporarily ignore the original intent because s/he has a high need for novelty and stimulation? What insights about the content did s/he gain? What is his/ her spatial-synthetic representation of the website? (p. 228)

Wegner and Payne (1996) conducted a quantitative study exploring the different processes that support comprehension and retention of information presented to the reader through hypertext documents. Specifically the “load” of hypertext documents can be far greater than that of traditional text documents and the task of “topic sequencing” is more demanding in hypertext reading.

Research on hypertext reading suggests some complications for the learner that should be considered by educators using this mode of reading and writing. Research by Mezak and Hoic-Bozic (2003) suggests that when using hypertext with students with disabilities, the educator must model appropriate and adapted navigation strategies to support effective reading. Wu, Houben, and De Bra (1999) conducted a research and made a statement: “The rich link structure of the hypermedia application cannot only cause users to get lost in the hyperspace, but can also lead to comprehension problems because users read information in an order not foreseen by the author” (p. 1).

Davidson-Shivers, Shorter and Jordan (1999) conducted an empirical research that led to the conclusion that hypertext that is organized in a linear and hierarchical manner can help younger readers with comprehension and retention. In an empirical study that focused on comprehension and retention of hypertext reading, Hailey and Hailey (1998) came to similar conclusions. Although they were working with adults, these authors found that “A-level” students benefited equally from reading traditional text and hypertext materials, but “B-level” students demonstrated better retention and comprehension with traditionally structured text resources. A quantitative study by Higgins, K., Boone and Lovitt (1996) found that while children with learning disabilities gained more from reading hypertext documents than traditional printed text alone, optimal comprehension and retention resulted from a reading mix of hypertext and traditional text. Finally, Dee-Lucas and Larkin (1999) conducted a research indicating that students who work with hypertext increased their study efficiency over work completed with traditional printed text sources, but in the process frequently experienced a decrease in breadth of learning.

Hypertext and Traditional Text Reading

The aim of this review and analysis is not to assert that hypertext is flawed as an educational tool. The potential of hypertext as an educational asset cannot be denied, but for this tool to reach its potential, researchers and educators must respond to the unique nature of hypertext and train students how to use this mode learning effectively. Fortunately researchers are already developing methods for fostering the effective use of hypertext in education. The description that Valmont (1999) offers of the skill set needed by students to be effective consumers of information on the Internet parallels the skill set that students should possess to effectively consume hypertext. Valmont lists decisions regarding link navigation, acceptance and rejection of information, determining task relevance of information, and developing methods for processing and managing the sheer volume of linked material, as reading skills worth teaching. Karchmer (2001) emphasizes the need for teacher training, not only on the use of technology, but methods of using “new technologies of literacy” as effective educational tools. She also emphasizes the need to train students how to write and read with hypertext. Sutherland-Smith

(2002) suggests that “weaker students” benefit from a limited number of links in hypertext documents and more structure. Thuring, Hannemann, and Haake (1995) state:

If we want to increase the readability of a hyperdocument we must assist readers in the construction of their mental models by strengthening factors that support this process and by weakening those that impede it. (p. 69)

The authors offer eight guidelines that they assert can enhance a student’s ability to design and read hypertext more efficiently:

1. display typed hyperlinks
2. indicate equivalencies
3. preserve context
4. present higher-order information units
5. present clear structure
6. present orientation cues
7. present clear navigational facilities
8. include user-interface adjustment

Schmar-Dobler (2003) acknowledges that some of the same strategies used for reading printed texts also apply to reading hypertext, but additional skills unique to hyperreading must be developed. These include:

1. Skills related to skimming and scanning to manage the sheer volume of text.
2. Reading with guiding questions in mind to avoid getting sidetracked or lost in linked material.
3. Effective navigation of linked materials.

Coiro (2003) encourages student collaboration and immediate feedback as means for checking comprehension and modifying design with hypertext documents. She also offers a stern directive. She said: “Teachers need to be aware of these new cognitive challenges posed by Internet environments before we unnecessarily confuse our competent readers or overwhelm our struggling ones.” (Cognitive Capabilities section, para. 3).

Chen and McGrath (2003) conducted hybrid research project that found hypertext authoring to be a positive influence in a middle school classroom, but concluded their article by posing several cautious questions concerning the use of hypertext as an educational tool. They ask:

Is this process likely to equip students with mental skills essential for cognitive flexibility? ... Or is it detrimental to students’ learning, or does it perhaps depend on whether the learner is a novice or more advanced learner? (p. 58)

Conclusion

This review and analysis of literature supports several simple statements. The empirical success of hypertext as an educational tool is mixed. Hypertext documents have the flexibility to meet

the unique interest and reading needs of students. Hypertext as an educational tool possesses qualities that link it to and separate it from traditional modes of reading and writing. Hypertext can complicate or simplify the reading process depending upon a student's unique abilities and needs and the quality of the document. And finally, more empirical research should be conducted to explore the effectiveness of hypertext as a tool of both writing and reading, and to develop more strategies for improving teacher understanding and students' ability related to effective reading and writing with hypertext. As does any educational tool, hypertext offers educators and students a set of affordances and not all of them fit naturally with the educational needs of all students. Like any educational tool, the value of hypertext depends largely on the way that educators prepare themselves and their students to use the tool and how hypertext is integrated into curriculum.

References

- Barab, S., Young, M., & Wange, J. (1999). The effects of navigational and generative activities in hypertext learning on problem solving and comprehension. *International Journal of Instructional Media*, 26(3), 283-299.
- Baylor, A. (2001). Perceived disorientation and incidental learning in a web based environment: internal and external factors. *Journal of Educational Multimedia and Hypermedia*, 10(3), 227-251. Retrieved September 12, 2004, from <http://dl.aace.org/6496>
- Bransford, J., Brown, A., & Cocking, R. (Eds.) (2000). *How people learn: brain, mind, experience, and school*. Washington, D.C.: National Academy Press.
- Chen, P., & McGrath, D. (2003). Knowledge construction and knowledge representation in high school students' design of hypermedia documents. *Journal of Multimedia and Hypermedia*, 12(1), 33-61.
- Coiro, J. (2003). Reading comprehension on the Internet: Expanding our understanding of reading comprehension to encompass new literacies. [Exploring Literacy on the Internet]. *The Reading Teacher*, 56(6). International Reading Association Inc. Retrieved September 12, 2004, from http://www.readingonline.org/electronic/rt/2-03_Column/
- Davidson-Shivers, G., Shorter, L., & Jordan, K. (1999). Learning strategies and navigation decisions of children using a hypermedia lesson. *Journal of Educational Multimedia and Hypermedia*, 8(2), 175-188.
- Dee-Lucas, D., & Huston, L. J.. (1999). Hypertext segmentation and goal compatibility: effects on study strategies and learning. *Journal of Education Multimedia and Hypermedia*, 8(3), 279-313. Retrieved September 12, 2004, from <http://dl.aace.org/9047>
- Erickson, J. (1997). Building a community of designers: Restructuring learning through student hypermedia design. *Journal of Research in Rural Education*, 13(1), 5-27.

- Hailey Jr., D., & Hailey, C. (1998). Hypermedia, multimedia, and reader cognition: An empirical study. *Technical Communication: Journal for the Society of Technical Communication*, 45(3). Retrieved September 12, 2004, from <http://imrl.usu.edu/publications/stcarticle.htm>
- Higgins, K., Boone, R., & Lovitt, T. (1996). Hypertext support for remedial students and students with learning disabilities. *Journal of Learning Disabilities*, 29(4), 402-412.
- Johnson-Eilola, J. (1994). Reading and writing in hypertext: Vertigo and euphoria. In C. Selfe & S. Illigoss (Eds.), *Literacy and computers: the complications of teaching and learning with technology* (pp. 195-219). New York: Modern Language Association of America.
- Jonassen, D. (1989). *Hypertext/hypermedia*. Englewood Cliffs, NJ: Educational Technology Publications.
- Joyce, M. (1988). Siren shapes: exploratory and constructive hypertexts. *Academic Computing*, 10(14), 37-42.
- Karchmer, R. (2001). The journey ahead: Thirteen teachers report how the Internet influences literacy and literacy instruction in their K-12 classrooms. *Reading Research Quarterly*, 36(4), 442-466.
- Landow, G. (1992). Bootstrapping hypertext: Student-created documents, Intermedia, and the social construction of knowledge. In E. Barrett (Ed.). *Sociomedia: multimedia, hypermedia, and the social construction of knowledge* (pp. 195-217). Cambridge, MA: MIT Press.
- Lehrer, R. (1993). Authors of knowledge: Patterns of hypermedia design. In Lajoie & Derry (Eds.). *Computers as cognitive tools*. (pp. 197-227). Mahweh, NJ: Erlbaum.
- Lehrer, R., Erickson, J. & Connell, T. (1994). Learning by designing hypermedia documents. *Computers in the Schools*, 10 (1/2), 227-254.
- Mezak, J. & Hoic-Bozic, N. (2003). An approach to modeling adaptive hypermedia for children with disabilities. *Proceeding of the 3rd IEEE International Conference on Advanced Learning Technologies*. IEEE Computer Society.
- Myers, J. and Beach, R. (2001). Hypermedia authoring as critical literacy. *Journal of Adolescent and Adult Literacy*, 44(6), 538-546.
- Nelson, T. (1993). *Literary Machines*. Self -published. Swarthmore, PA.
- Ray, L. (1999). Multimedia authoring tools: Challenges to effective use. In J. Blanchard (Ed.), *Educational computing in the schools: technology community and literacy* (pp. 79-88). New York: The Haworth Press.

- Schmar-Dobler, E. (2003). Reading on the Internet: The link between literacy and technology. *Journal of Adolescent and Adult Literacy*, 47(1). Retrieved September, 12, 2004, from http://www.readingonline.org/newliteracies/jaal/9-03_column/
- Spiro, R., Feltovich, P., Jackson, M. , & Coulson, R. (1991). Cognitive flexibility, constructivism and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology* 31(5), 24-33.
- Sutherland-Smith, W. (2002). Weaving the literacy Web: Changes in reading from page to screen. *The Reading Teacher*, 55(7), 662-669.
- Thuring, M., Hannenmann, J, & Haake, J. (1995). Hypermedia and cognition: Designing for comprehension. *Communications of the ACM*, 38(8), 57-66.
- Valmont, William (1999). Technology: Impact on literacy development. In J. Blanchard (Ed.), *Educational computing in the schools: technology community and literacy* (pp. 73-77). New York: The Haworth Press.
- Wenger, M. & Payne, D. (1996) Comprehension and retention of nonlinear text: Considerations of working memory and material-appropriate processing. *American Journal of Psychology*, 109(1), 93-130.
- Wolf, K. (2002). Sleepy links, collaborative grading and trails: Shaping hypertext structures by usage processes. In R. Bromme & E. Stahl (Eds.). *Writing hypertext and learning: conceptual and empirical approaches* (pp. 79-97). New York: Pergamon.
- Wu, H., Houben, G., & De Bra, P. (1999). *Authoring support for adaptive hypermedia Applications*. Retrieved 9-12-04, from <http://www.wis.win.tue.nl/~houben/respub/edmedia99.pdf>