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ABSTRACT

Comprehension of expository text can be assisted using hypermedia support--text plus images and speech. This kind of presentation environment, called Responsive Text, compensates for deficiencies in basic reading skills by using speech support to aid decoding, hypertext and images to provide background and vocabulary support, and interactive questions to encourage comprehension monitoring. This paper presents a brief overview of ways in which Responsive Text has been used with adults in workplace training materials and with middle school students in social studies and science texts. Reproductions of computer screens illustrate the discussion. (Contains 11 references.) (Author/BEW)

Paper (M2-202A)

Using Hypermedia toSupport Understanding of Expository Text: Examples from the Workplace and Classroom

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Abstract

This paper examines how comprehension of expository text can assisted by using hypermedia support—text, images, and speech. This kind of presentation environment, what we call Responsive Text, can compensate for a reader's basic skills deficiencies by using speech support to aid decoding, hypertext/hypermedia to provide background and vocabulary support, and interactive questions to encourage comprehension monitoring. The paper will describe how a Responsive Text environment has been used for both adults, using workplace training materials, and middle school students, using social studies and science texts.

Body

Text as been the mode of choice for conveying information since the invention of movable type. Unfortunately the printed page has little to offer those with reading difficulties. This is especially true with expository text where comprehension demands are usually higher than narrative text. A typical work-related training manual, for example, contains dense text covering complex procedures. Such instructional texts also convey information using charts, graphs, tables, and calculations that demand competencies beyond those considered as "literacy".

While one can "dumb down" such text by rewriting it to a lower grade level, this often has the unintended consequence of making the text harder (Anderson, Hiebert, Scott, & Wilkinson, 1985). A more thoughtful approach is to make the text

"considerate" (Armbruster & Anderson, 1981) by using predictable structure, shorter sentences, and less demanding vocabulary. Studies consistently indicate that comprehension is improved when text is rewritten to be more considerate of reader's needs.

There is a limit, though, to how considerate static text can be. Because paper-based text cannot respond to each reader's particular needs it must be written and revised based on the needs of a single "ideal" reader. We are exploring new ways of thinking about text, based on the use of hypertext and hypermedia, that address some of the problems with text as a training medium.

Responsive Text and Workplace Training

Hypertext and hypermedia are usually thought of as an *extensive* medium, the surface text provides a starting point and links lead the reader away to browse among many diverse topics. But one could also design a hypertext/hypermedia document as an *intensive* medium with links providing supplemental information to help the user read and understand the original text. We have designed such an intensive hypertext/hypermedia model and used it with children and adults. We call our approach.

Responsive Text

The responsive text model is based on what we know about the needs of readers. Good readers bring many skills to the reading task and for those with less proficiency, hypermedia support can compensate for their shortcomings. In particular, responsive text offers support in four areas of reading difficulty: decoding, background knowledge, inferencing, and comprehension monitoring. To illustrate how these supports can be implemented we will use sample screens from a responsive text material on handling hazadous materials, part of a lesson designed for use in a Workplace Literacy Demonstration Project funded by the Federal Department of Education

Decoding

At the most basic level, reading proficiency requires decoding visual representations of words into a phonological representation (Gough & Hillinger, 1980). While poor readers may be able to decode words, their lack of fluency makes the process is difficult and diverts attention from higher level comprehension processes.

To assist decoding, responsive text provides spoken representations of words. Turning on the speech mode, by clicking the speaker icon, underlines the words that can be spoken (see Figure 1). With affixed words only the base word is encoded. Thus, when clicking on ***examining***, ***examine*** is spoken and the uninflected version is displayed in a small window adjacent to the selected word. Having a spoken version of a printed word readily available allows the reader to focus on higher-level comprehension processing. Beyond immediate support, Reitsma (1988) has found this method of providing readers with independent access to spoken and visual representations of words is an effective way to teach decoding.

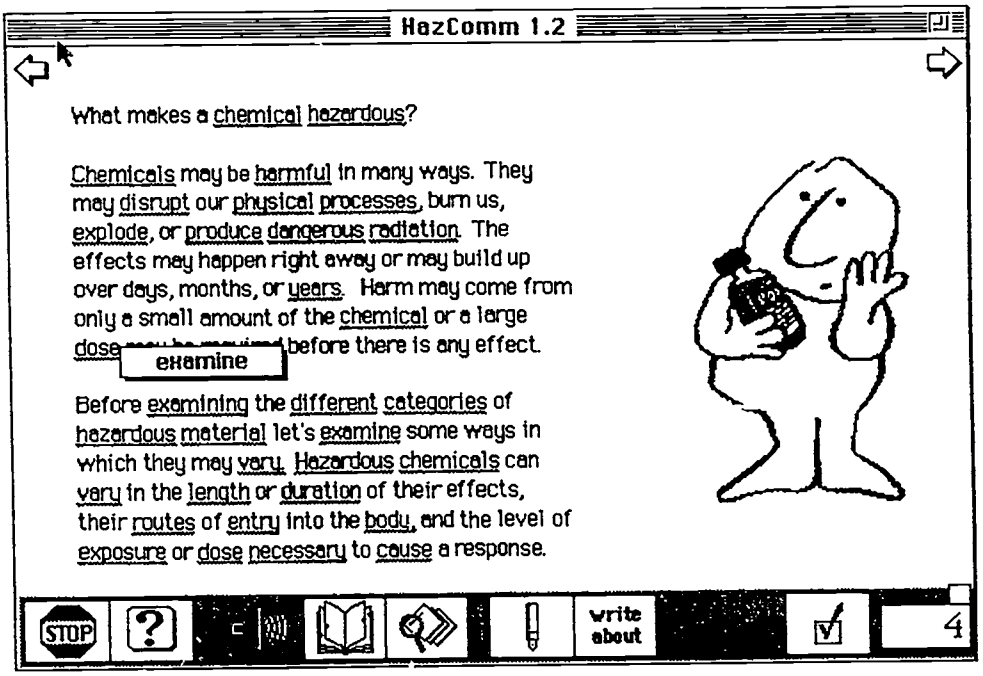

Figure 1. Decoding Support in Responsive Text

Background Knowledge

As Chall (1983) notes, reading beyond the earliest stages requires background knowledge. This knowedge of vocabulary, phrases, and idioms—all gained through reading—is necessary for later reading stages. Poor readers often lack the necessary background knowledge to understand a passage.

In responsive text this support is enabled by turning on background knowledge (an icon adjacent to the speech support button). With background *on*, words having definitions are displayed in bold and selecting the word causes a brief definition to be displayed (Figure 2).

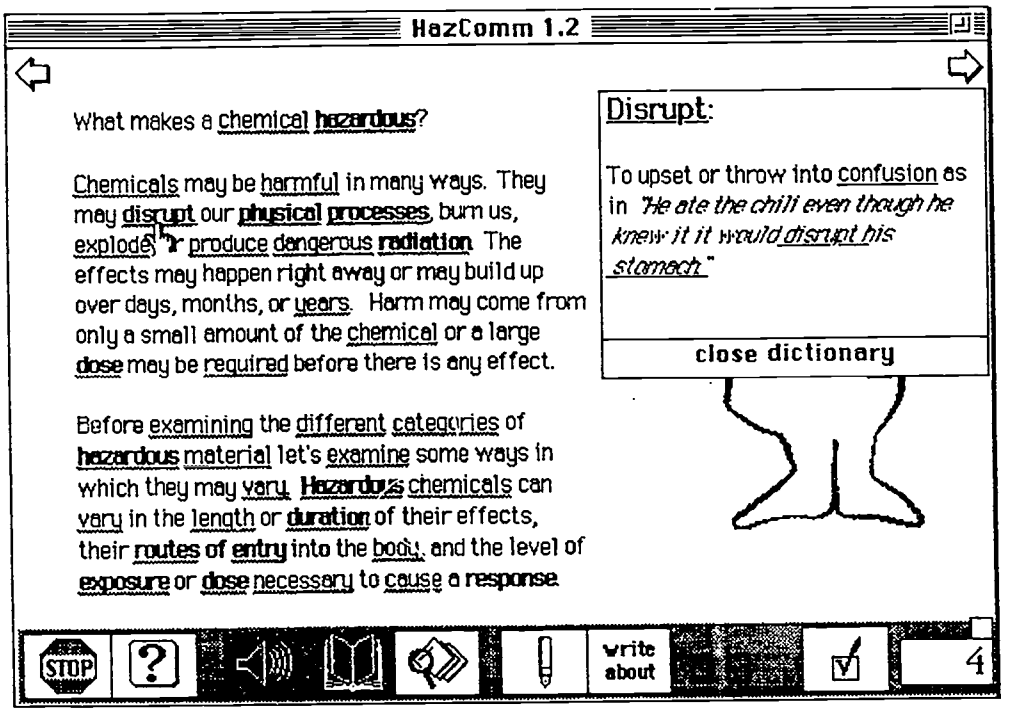

Figure 2. Background Knowledge Support in Responsive Text

While a short definition is sufficient for many of the words, some words or ceoncepts requires a more extensive definition. When such an item is selected a *more about...* icon that appears. Clicking this button leads to more extensive background information. With the links provided in hypermedia, there is no practical limit to how detailed this background information can be.

Inferential Capacity

Reading requires filling in information not explicitly stated (Collins, Brown, & Larkin, 1980). Poor readers may have difficulty explicating relationships or noting causal sequences. There may also be confusion over the relative importance of ideas, or just too many new words and concepts. In responsive text, passage-level assistance is available through the closeup option. Selecting the closeup option (the magnifying glass icon) reveals the portions of the text that have closeup information available.

Providing passage-level support is more complex than linking definitions and speech to individual words and closeups utilize the full pallette of hypermedia tools. Some learners can make better use visual information and, for them, passages can often be explained with a diagram, animation, or even a video clip. In other cases the text itself can be changed with implicit relationships made explicit and critical words emphasized. Because the learner selects the type of assistance he or she finds most useful, a variety of aids can be added to suit an individual's learning style.

Comprehension monitoring

As readers, we frequently check or monitor what we think we are reading against the information in the text. Baker & Brown (1984) have noted that poor readers often have difficulty monitoring their comprehension of a passage. In responsive text, checkup questions, available at the reader's option, allow the reader to check their passage understanding. Checkup questions can take a variety of forms. In Figure 3 the reader must move parantheses around a sentence containing relevant material. Using the computer's power allows checkup questions to become quite sophisticated—moving switches, testing temperatures, measuring distances— can all be simulated in software. Figure 4 shows how a checkup can check both the factual knowledge of flashpoints and the basic skill of reading a table. Checkup questions are not used for evaluation and no record of performance is maintained. This encourages the reader to try the checkup question repeatedly, going back to earlier parts of the text as needed.

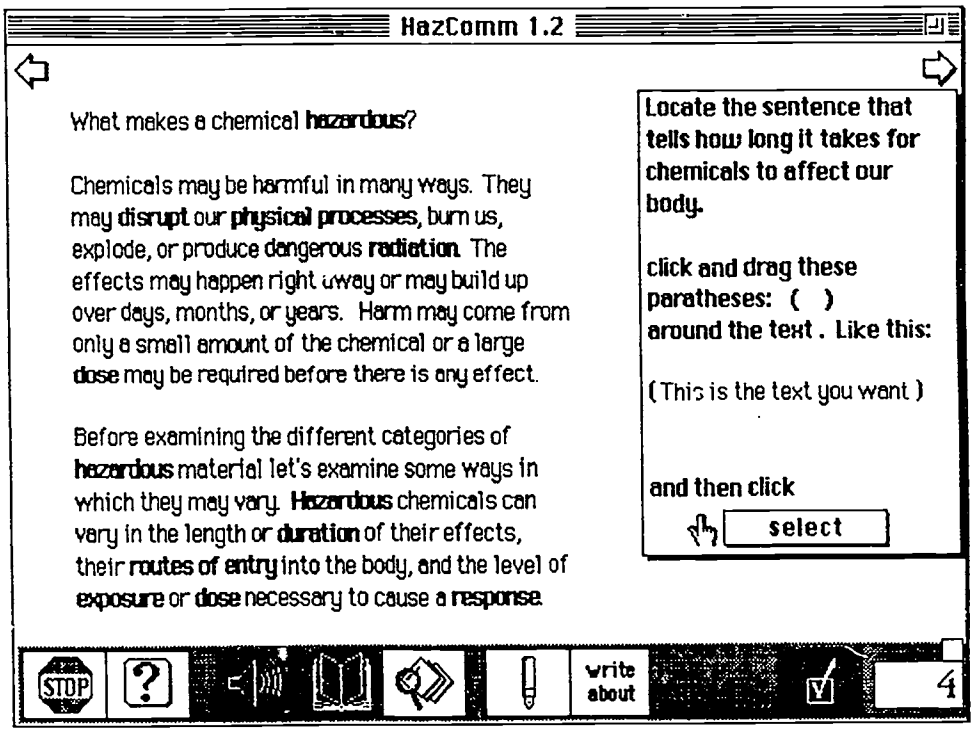

Figure 3. Identifiying Information in the Passage

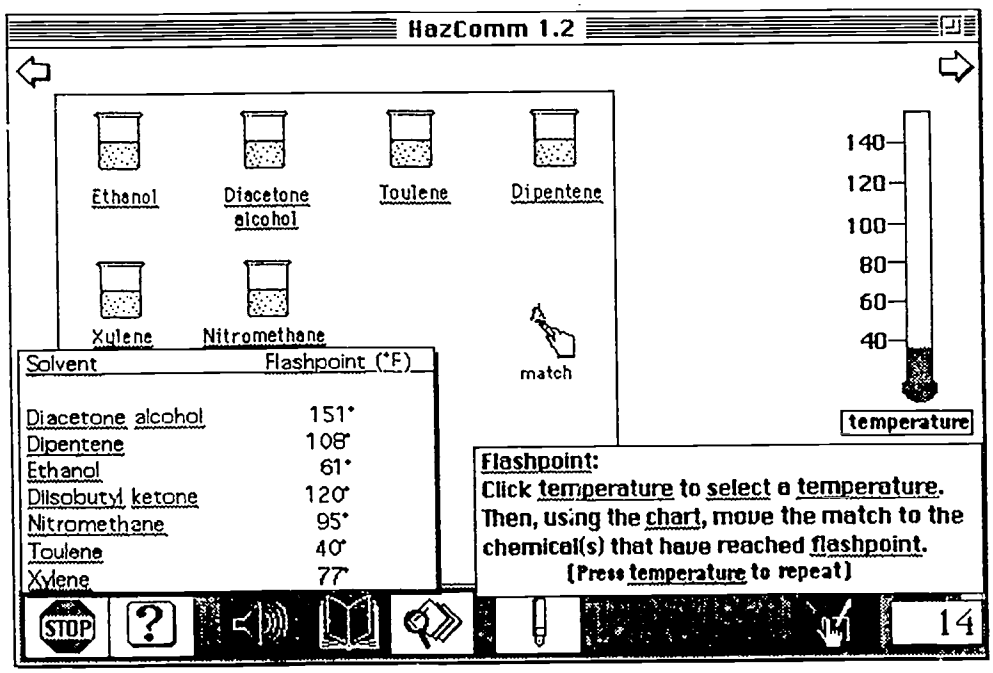

Figure 4. Checkup on Flashpoint and Reading Charts

Responsive Text and Content Area Instruction

Responsive text can also be used for younger readers. Chall and Squire (1991), have noted that, for K-12 students, content area texts have been traditionally recognized a difficult to comprehend so we designed another series of responsive text around middle school science and social studies. A sample screen from a lesson on the Pacific Islands is shown in Figure 5. Where the workplace material had to run on Macintsoh SE, the middle school material was able to take advantage of the more powerful Macintosh II platform.

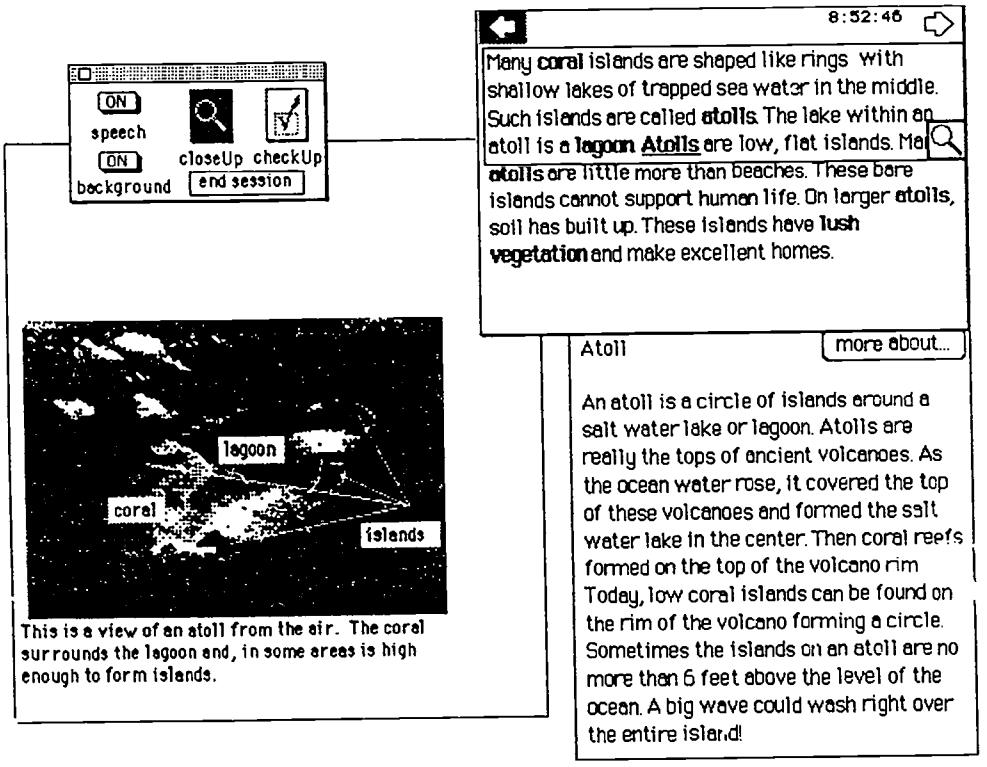

Figure 5. Sample Social Studies Responsive Text

The middle school material was used in a controlled study of the potential instructional advantages of responsive text over less interactive formats. Leu, Gallo, & Hillinger, (1993) found that students reading the material in responsive text comprehended more than students seeing the material in its original textbook versions or in less interactive computer verisons.

Conclusions

We have been developing and using responsive text materials for almost four years and a number of important points have emerged.

Presenting training material in responsive text blurs the line normally drawn between job skills (e.g., knowing how to handle a hazardous material) and basic skills (knowing how to read instructions). Although we began by designing workplace literacy training that used job-relevant materials, we have evolved in our thinking and now we try to develop job trainings, usable by anyone, that is "basic skills sensitive".

Responsive text allows us to integrate diverse skills into a lesson. While the early versions of responsive text (cf. Hillinger, 1992) focused on literacy, We found that reading expository materials, on the worksite or in the classroom, required a mix of skills including an understanding of charts, interpreting graphs, and even some basic math. Our most recent responsive text materials now include support in reading charts, interpreting graphs, and basic math.

The addition of hypermedia support turns text into a rich information experience. While enhancing the information spectrum should increase the learning potential our research indicates that the learner must also learn how to best exploit

these new resources. The rich array of support possible within the multidimensional information landscape makes it likely that the strategic knowledge of how to use hypermedia may be even more important than in traditional static text environments.

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