Enhancing Screen Reading Strategies

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ABSTRACT

In an earlier pilot study, we found that advanced English for Academic Purposes (EAP) students who were not experienced computer readers could neither scan nor skim texts effectively on screen. In the present study, we hypothesized that if students were taught to use facilitating strategies, they would scan better from screen than from paper and also skim and close-read as well as they do on paper. Throughout the semester, students in the experimental group were taught to use available on-line tools, and at the end of the semester a reading comprehension test was administered to the students in the experimental and the control groups. The results showed that in all question types, students reading from screen performed as well as those reading from paper, confirming two of the three hypotheses.

KEYWORDS

Foreign Language Reading, Reading Strategies, Strategy Training, Scanning, Skimming

INTRODUCTION

Many people today require immediate access to information at any time and any place. Since information on demand is becoming a common concept, digital reading is a natural development. Moreover, the profession is witnessing increased availability of academic and professional texts (both books and articles) on the Internet. Digital libraries are becoming increasingly accessible, and publishers are offering loan facilities for their books through the Internet which allow registered users to “take out” digital books and access them on their own “personal bookshelf.” As a result of these developments, reading from screens is becoming commonplace for
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students and professionals. Bronner (1998) reports that at Virginia Commonwealth University sociology students use a textbook that exists only online and that at Kent State University students learn from portable electronic books containing course texts.

The vision of a small portable electronic book to replace paper books dates back to Kay's vision of a dynabook (Kay & Goldberg, 1977 cited in Nielsen, 1995). Several attempts to make electronic books were made in the past but were unsuccessful because the character quality was inferior to that on paper. In addition, research showed that people reading from larger screens read faster than those reading from smaller screens (Shneiderman, 1987; Reisel & Shneiderman, 1987). However, as screen resolution improved, reading from small screens became easier and better. Character quality improved as well, and today small electronic books are a reality. Three such books are now commercially available. These books range in size from 4 x 7 inches to 10 x 12, weigh from 1.25 pounds to 3.5 pounds, and come equipped with reader annotation features (Silberman, 1998). In addition, readers can highlight, underline, search, and cross-reference text. Many volumes can be downloaded directly into these digital devices, which is an important advantage because a single electronic book containing multiple volumes is much lighter than the same number of volumes on paper.

Although more and more reading is taking place on screen, certain problems are still associated with reading in this mode. Electronic books can be taken on the bus or to the beach, but digital texts lack the “unique tactile qualities of paper” (Dillon, 1992). When comparing paper books and electronic books, Stephen Manes (1999) mentions other disadvantages of electronic books: they require batteries, can break if dropped, are costly, and probably difficult to lend or sell. On the other hand, he also points to some of their advantages: they are readable in the dark, easily searchable, have a bookmark facility, and can read the text aloud. Noam (1999) points to an additional advantage of digital texts, the ability of the reader to adjust the font size.

Interquest and a team of University of Virginia researchers (1997) conducted an extensive study on the influence of the new digital technologies on reading. One of their conclusions was that teaching and learning will move in the direction of digital modes. They also predict that books will not disappear but that they will cease to hold “the center of the cultural stage.” According to Noam (1998) “books are yesterday’s technology—bulky, environmentally suspect, impermanent, expensive, hard to find, forever out of print, slow to produce, slow to write and slow to read, and a strain on the eye.” Noam foresees that paper books will become a secondary resource in academia and that the main academic resources will be available through the electronic media because of ease of access, storage, and cross-referencing. He adds that books were merely the “receptacle”
or medium for transmitting knowledge. Now, a new and creative medium is available.

The process of text comprehension involves the reader in a complex, dynamic, ongoing interaction with the text (Goodman, 1967; Rumelhart, 1977). This interaction often involves some kind of text manipulation such as highlighting or annotating. Reading on the screen offers powerful means of manipulating information. Text manipulation, whether on screen or on paper, “externalizes the otherwise invisible reader interaction” (Cobb & Stevens, 1996). Text manipulation amounts to a graphic, recorded expression of readers’ interaction with the text, an interaction that aids their construction of meaning by capturing their fleeting thoughts and ideas. Brown, Palincsar, and Armbruster (1984) list several comprehension-fostering activities, one of which is the allocation of readers’ attention in order to maintain concentration on main points rather than minor details. Text manipulation may well help readers concentrate on main points and overcome the limitations of human working memory.

Most research comparing reading in the two media has focused on the time variable and has shown that subjects take longer reading a text from the screen than reading the same text from paper (Askwall, 1985; Muter, Lautremouille, Treurniet, & Beam, 1982; Smith & Savory, 1989; Gould, Alfaro, Barnes, Finn, Grischkowsky, & Minuto, 1987; Dillon, 1992). Some studies have looked at reading comprehension as well as speed and found no significant differences between reading from the screen and reading from paper (McKnight, Dillon, & Richardson, 1990; Muter & Maurutto, 1991). On the other hand, O’Hara and Sellen (1997) compared reading and writing in both media and concluded that whereas writing on line offered clear advantages, reading on paper was far easier.

Since university students are increasingly reading from the screen, the aim of our project was to train them to read more effectively in this mode. The new technologies (high-resolution screens, digital libraries, electronic books, etc.) are available, but readers need to learn to overcome old habits while, at the same time, exploiting the new possibilities offered in innovative ways. In a pilot study conducted to determine the applicability of students’ reading skills and strategies when reading from the screen, we found that inexperienced computer users could neither scan nor skim texts effectively on the screen. They were, however, able to read for details as well as students reading from paper (Kol & Schcolnik, 1997). Based on the results of the pilot study, we decided to teach students strategies designed to facilitate their screen reading: using the Find feature, the highlighter, and a hyperlinked outline of the text. We hypothesized that after learning to use the new strategies, students reading from the screen would
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  1) scan better than those reading from paper;
  2) skim as well as those reading from paper; and
  3) close-read as well as those reading from paper.

THE PROJECT

Method

DEFINITION OF TERMS

We had to redefine the terms scanning and skimming to suit screen reading since traditional definitions applied to reading from paper. Traditionally, scanning is defined as quickly looking over a text to locate specific pieces of information (Feuerstein & Schcolnik, 1995). We defined screen scanning as quickly searching for specific pieces of information by using the Find feature of the word processor.

In both paper and screen reading, the purpose of skimming is to perceive text organization and search out the main ideas. However, the procedures for skimming vary from paper to screen. Skimming from paper involves quickly looking over the whole text, selecting and discarding information, and quickly reading and highlighting selected parts (Feuerstein & Schcolnik, 1995). We defined screen skimming as reading the hyperlinked outline provided, clicking the outline to access specific sections of the text, quickly reading and highlighting those sections, and scrolling to read the highlighted sections to get the main ideas (see Figure 1).

Figure 1
Hyperlinked Outline

<table>
<thead>
<tr>
<th>Outline</th>
</tr>
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<tbody>
<tr>
<td>A. Introduction</td>
</tr>
<tr>
<td>B. What to graft:</td>
</tr>
<tr>
<td>Cells on the Grow</td>
</tr>
<tr>
<td>C. The new home:</td>
</tr>
<tr>
<td>Conditions for Survival</td>
</tr>
<tr>
<td>D. What grafts do:</td>
</tr>
<tr>
<td>Wiring or plumbing?</td>
</tr>
<tr>
<td>E. Rejection</td>
</tr>
<tr>
<td>F. New directions:</td>
</tr>
<tr>
<td>Future of Brain Grafts</td>
</tr>
</tbody>
</table>
The hyperlinked outline thus represents a navigational aid that takes readers to specific sections of the text. By looking at the hyperlinked outline, students can easily see the main content points and the organization of the text. By clicking on the outline, they can quickly access different sections of the text. Using the hyperlinked outline has clear advantages over scrolling. It affords a global view of the text, saves human memory and time, and is easier on readers’ eyes.

It was not necessary to redefine terms for close reading since, regardless of the medium, close reading means reading a defined and relatively short piece of discourse intensively to comprehend ideas, logical relationships, and/or fine points.

Subjects

The subjects were 47 EAP students in two classes of an advanced course of English for the Exact Sciences at Tel Aviv University. Placement in this course was based on a high mark on the national psychometric test. Students placed at this level have a good working command of English, and the course prepares them to read long academic texts independently. The subjects included 31 men and 16 women, ages 21 to 28, all with some experience in computer programming but little experience reading texts from the screen.

Instrument

A reading comprehension test (made up of an unabridged text and questions) was prepared for the purpose of the experiment (Ferry, 1989). A four page text on brain research was taken from a popular science magazine and presented in two different modes: one on paper and the other on screen. The texts in both modes of presentation had the same font (Times New Roman), background color (white), and color of letters (black). The layout of the texts, however, was different. The screen mode consisted of the hyperlinked outline above—created with the “Insert hyperlink” feature of the word processor. Clicking the items on the outline took students directly to the relevant section of the text (6 sections). The paper mode text had a different layout consisting of three columns and illustrations with captions.

The test questions over the text were presented on paper for both modes and included a total of 22 questions of three different types: nine scanning, nine skimming, and four close reading. (See the comprehension test in the appendix to this article.) Some of the questions were closed (e.g. multiple choice), while others were open (e.g., short answer).
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The scanning questions required the students to check whether certain questions were answered in the text (e.g., "What is a brain graft? Can grafted cells grow axons?"). Skimming questions required students to skim the whole text or a section of the text for main ideas. For example, one question asked students to complete a summary statement with key words, "________ are used to treat brain ________ in humans, although the ________ of this treatment has not yet been proven." Another question required them to check items from a list that answered, for example, "What conditions can increase the chances of the survival of a brain graft?" The close reading questions directed the students to individual paragraphs in the article to locate specific information, for example, "According to the conclusion, what two problems would the use of skin cells for brain grafts solve?"

The skimming and close reading questions were standard reading comprehension questions. In order to answer the skimming questions, students needed to read the introduction and conclusion of the article as well as first sentences in paragraphs, while, at the same time, noticing key words. In order to answer the close reading questions, students had to concentrate on reading a small section of the text (one or two paragraphs) and pay attention to details.

Reflecting upon the results of the pilot study (Kol & Schcolnik, 1997), we saw that in order to answer common types of scanning questions students needed to read closely and comprehend in addition to locating the information. In order to eliminate the need for close reading from the scanning questions, we developed a new type of scanning question that only requires knowing whether a question is answered in the text. Students did not have to answer the question itself. This new question type was given to a few reading comprehension teachers for validation.

Placement of the questions in the test followed the sequence accepted in our department in which skimming questions are placed first and close reading questions last. This sequence is based on the assumption that by prereading an article and getting an overview of the text students are better able to deal with the text in depth (Feuerstein & Schcolnik, 1995).

Procedure

Of the two advanced EAP classes participating in the study, one class was designated as the experimental group (N = 23) and the other as the control group (N = 24). Students in the experimental group were told that the research investigated reading comprehension.

The experimental group had four sessions of computer training prior to the test in order to learn the facilitating strategies for screen reading. To help students scan on screen, we trained them to use the Find feature of
the word processor as a means of locating key words in the text and obviating the need to scroll. To help students skim on screen, we trained them to use the highlighter of the word processor and the hyperlinked outline. In the last training session, the students took a practice test on the same topic and in the same format as that used for the experiment itself. The purpose of the practice test was to give students background knowledge on brain research, timed practice using the screen strategies, and exposure to the same question types they would encounter.

The control group did not get any special training, but they did complete the same practice test with the same text on paper as the students in the experimental group did on screen. In this way, all participants were exposed to the same background knowledge and the same question types.

The test was conducted during a regular class session at the end of the course. Students were told that if they did well on the test, the grade would be included in their course average. The experimental group read a long text from the screen, and the control group read the same text from paper. The time allotted for the test was 90 minutes for both groups because that is the length of a regular class session. All participants completed the test in the allotted time.

Results

Table 1 shows the results of the t-test for the question types. It shows the mean scores of the two groups, experimental (screen reading) and control (paper reading) on the different types of reading comprehension questions: scanning, skimming, and close reading.

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
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</thead>
<tbody>
<tr>
<td>Scanning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exp. Group</td>
<td>82.22</td>
<td>20.05</td>
<td>.98</td>
</tr>
<tr>
<td>Con. Group</td>
<td>86.71</td>
<td>9.16</td>
<td></td>
</tr>
<tr>
<td>Skimming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exp. Group</td>
<td>92.83</td>
<td>7.85</td>
<td>.97</td>
</tr>
<tr>
<td>Con. Group</td>
<td>94.94</td>
<td>7.24</td>
<td></td>
</tr>
<tr>
<td>Close Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exp. Group</td>
<td>94.57</td>
<td>14.99</td>
<td>.60</td>
</tr>
<tr>
<td>Con. Group</td>
<td>96.88</td>
<td>11.21</td>
<td></td>
</tr>
</tbody>
</table>
As can be seen in the mean scores for scanning between the two groups, the hypothesis that students reading from the screen would scan better than those reading from paper was not confirmed. No significant difference emerged from the analysis between reading from paper and reading from the screen. Table 1 also shows that students reading from screen and students reading from paper performed equally well in both skimming and close reading questions, confirming our other two hypotheses.

Discussion

In general, the test results were very high in both modes. We feel that the high scores can be explained by

1) the high reading level of students in the Exact Sciences, particularly at the end of the course;
2) the high level of motivation to succeed since students knew that a good grade on the test would count;
3) the background knowledge on the subject of the brain provided by the practice test; and
4) the familiarity with test format and question types.

Students reading from screen and students reading from paper performed equally well in all types of questions on the reading comprehension test. These results differ from those in our pilot project whose results indicated that skimming was better from paper. It is difficult to generalize from the results of such a small number of students. However, the results of the current study seem to indicate that students can probably read as well on screen as they do on paper, provided students who read on screen are taught the necessary strategies. In this study, we explored only a few facilitating strategies; future research may uncover additional ones.

We had hypothesized that students reading from screen would scan better than those reading from paper because scanning involves locating specific information quickly, and we felt that the Find feature in word processing software would facilitate this activity. The results did not confirm this hypothesis. A possible explanation for the results here is the problem of multiple appearances of the search word in the text. Scanning a long text for a key word can be a tedious and frustrating process because the Find function does not take readers directly to the desired location but, rather, stops at every instance of the word in the text. Moreover, at every stop, readers must check to see if that location is the desired instance of the word. On the other hand, while scanning on paper, readers go directly to that section of the text in which they expect to find the relevant information and thereby avoid unnecessary stops. The positive value of the
Find feature may well be neutralized by the multiple stops in irrelevant sections of the text.

Our results suggest that the Find function is not a magic solution for screen scanning. Yet, scanning seems to be a very important activity when using the Web, as reported by participants in the Interquest study (1997). In the future, training schemes could teach students to combine the use of the hyperlinked outline (to access the desired section) and the subsequent use of Find to minimize the number of irrelevant stops. Future research could check the amount of time spent scanning in the two modes.

Nielsen (1997) suggested ways of enhancing the scanability of Web pages. He recommended, among others, the use of highlighted keywords and meaningful subheadings. Based on our findings, we would recommend that any electronic text include a hyperlinked outline as a navigational aid. In addition, readers should have tools that include a search facility and a digital highlighter. However, if, as Nielsen (1996) suggests, web texts appear as small, coherent pieces to avoid scrolling, perhaps scanning, as conceived today, will disappear. It is also possible that our definition of screen scanning has to be refined.

According to the Interquest forecast (1997), “There will be dramatic changes in how we interact with non-paper devices and how we learn to use new media.” Moreover, “every 5-year-old today is likely to be using the Web routinely before finishing primary school.” If this claim is proven to be accurate, the young generation will not need to be taught special strategies for effective screen reading when reaching adulthood. However, in this period of transition, we cannot assume that students can in fact effectively read from the computer screen, and educators need to focus on the issues created by the emerging technologies.
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APPENDIX

Remaking the Brain: Test (version for students reading the text on screen)

A. Use the hypertext outline to help you navigate to the conclusion easily.

1. Read the introduction (pars. 1-3) and the conclusion (pars. 35-37). What is the main idea in this article? Complete the summary with key words.

_________ _________ are used to treat brain _______, although the _________ of this treatment has not yet been proven.

2. What conditions can increase the chances of the survival of a brain graft? (Mark ALL correct answers.)

____ placing the graft directly below the cortex
____ dissociating the cells to be used
____ using tissue from an adult rat for grafting
____ implanting the graft in one of the ventricles
____ having quick access to oxygen

B. Use the Find feature to locate specific information.

3. Does the text answer these questions? Check the questions that are answered in the text and write the paragraph number. (Do not answer them!)

What is a brain graft? Par. ______
What is a neurotransmitter? Par. ______
What is a fetus? Par. ______
Is room temperature a condition for the survival of brain grafts? Par. ______
What is the best age of tissue for grafting in rats? Par. ______
Can grafted cells grow axons? Par. ______
What does the death of cells in the substantia nigra cause? Par. ______
Are efforts being made to transplant a whole brain? Par. ______
At what age do old rats become forgetful? Par. ______
C. Answer the following questions.

4. Why are “these diseases possible candidates for treatment with grafts” (par. 5, line 2)? Choose one answer.
   _____ because they affect muscle coordination
   _____ because they are hereditary
   _____ because they damage only one area of the brain
   _____ because they cause memory failure in the elderly

5. According to the section on Rejection, what is done to ensure that brain grafts in rats are not rejected? (Choose one answer.)
   1. Skin grafts are used.
   2. The rats are given drugs.
   3. The brain tissue is treated.
   4. The genes of the rats are changed.

6. According to the conclusion, what two problems would the use of skin cells for brain grafts solve?
   1)
   2)
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REFERENCES


AUTHORS’ BIODATA

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