

RESEARCH ON COMPUTERS IN READING

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Until recently, describing the "state of the art" in research on computer use in reading instruction was a task analagous to describing the effect of the printing press on reading instruction. Like the printing press, the computer causes print to be displayed so that it may be read. Also like the printing press, the computer can display pictures before or after text or simultaneously with the display of text. Like the printing press, the computer can display novels, textbooks, crossword puzzles, word searches, posters, maps, graphs, and charts.

The difference are these: (1) The computer can flash pictures or text or cause them to change size and shape or to move on the screen. (2) The computer can withhold printed messages so that they appear only under conditions specified by the program designer. (3) The computer can display messages simultaneously on its own screen and on the screen of another computer or group of computers at many locations. (4) The computer can instantly change its messages to reflect changed opinions or information. (5) The computer can transmit spoken messages as well as printed ones. (6) The computer can recognize a few spoken messages.

The research investigations in which the computer's differences with the printing press have been exploited are few. I'll discuss with you only ten of these. Each will be a separate sub-topic in my presentation:

1. Increasing Comprehensibility of Text by Decreasing Readability

L'Allier (1980) used a computer program which could revise passage structure of expository text so as to lower the readability estimate. Subjects read text from the screen, responding to questions periodically. When response time and/or comprehension errors so indicated, the text was modified so as to decrease its readability level. High school subjects reading the adaptive text scored higher than those reading the original version or the totally revised non-adaptive version. Poor readers reading the adaptive version scored significantly higher than high ability readers who read the non-adaptive original passage version.

2. Pronouncing Unfamiliar Words

McConkie (1984) has reported a preliminary evaluation of a program for adult illiterates. Text is presented on the video display screen. When the student encounters an unfamiliar

word, shining a light pencil at it causes the machine to pronounce the word, using that pronunciation which is appropriate to its context. Observations indicated that words requested once were again requested with decreasing frequency — that students did not develop a dependency upon the computer.

3. Providing Access to Text-Processing Aids

Reinking (1983) asked good and poorer readers to read three difficult passages and three easy passages in one of four treatment conditions. In one condition readers could ask for (1) words to be defined as appropriate to the context, (2) a less technical version of the passage, (3) background knowledge, (4) a pictorial illustration of the most important concepts, relationship, or skill, or (5) a display of the structuring of the main ideas in the passage. In the second condition, readers read passages from the computer with no text manipulations available. In the third, readers were required to view all the textual manipulations, and in the fourth, readers read printed pages (the usual).

The results were difficult to read because of an interaction between treatment condition and passage difficulty. However, a tentative conclusion was that readers having access to text manipulations did not comprehend better than those who did not. The results also suggested that (1) it takes some time for intermediate grade children to become facile with using interactive text, and (2) interactive text seems more useful with difficult passages. The study supported an earlier one by Blohm (1982) in which college readers who could request glosses (paraphrases) recalled more ideas from experimental passages than did those without access to glosses.

4. Providing Workbook Pages on the Computer

Prince (1984) compared the effects of three types of practice on synonym learning by upper elementary subjects. One group practiced using an arcade game computer program. A second practiced using a standard drill and practice (programmed text) computer program. A third practiced using workbook activities created by a computer program and printed out on paper. She found no significant differences in synonym pairs learned, even though she gave the maximum possible teacher assistance to the "workbook pages" group and even though she used the "arcade" program to present words for initial learning when it had been designed only for drill and practice on words previously taught by a teacher. The computer-presented programs equalled the results of a good teacher working closely with students who were completing workbook pages.

5. Presenting Beginning Writing and Spelling Skills by Computer

Murphy and Appel (1984) reported their evaluation of the IBM Writing to Read Project's second year. Of the 10,513 children and the several hundred teachers, who participated at more than 60 school sites, those in 23 schools undertaking a second year and in 12 schools in their first year of participation were selected for evaluation. Superintendents named other schools in their districts to serve as controls. The major conclusions were that the program worked — children learned to read with Writing to Read and they wrote better than the

children in comparison schools.

Kindergarten children did better in reading than controls, but first graders did not differ in reading performance. They spelled as well as control students and teachers and parents were positive about the program. However, teachers did report spending more time on reading and writing instruction when their children were involved with Writing to Read. Furthermore, Writing to Read children scored at the 81st percentile on the pretest while control children scored only at the 67th. These and the time differences mandate that the results be viewed with caution.

6. Providing a Microcomputer Authoring System

Powers (n.d.) directed a comprehensive microcomputer-assisted reading-in-the-content areas curriculum for teachers and students in grade 7-12. Selected as exemplary, READ:S was named an NDN Lighthouse demonstration site in June, 1983. In this project, English teachers test for and work toward the development of "priority reading skills" while content area teachers create microcomputer lessons involving application of these vocabulary, comprehension, and study skills to the text passages used in their instruction. The READ:S project provides teachers with CAI authoring programs which enable teachers to create instructional programs, some of which involve phrase-reading and some of which involve timed reading. The program resulted in marked gains (20 + %ile points) in standardized reading scores.

7. Serving as an alternative to reducing class size, tutoring, or lengthening the school day

Levin, Glass, and Meister (1984) used meta-analysis to compare the cost-effectiveness of four interventions on the reading and mathematics achievement of elementary students in the Los Angeles Unified School District. By converting standard scores to effect size estimates, and by making many assumptions (such as that 80% of the extra time in a longer school day would be used for instruction, that only a third of the elementary school day is devoted to reading, and that present day CAI, with color and better software, is no different than the standard colorless drill and practice of the seventies), the authors concluded that tutoring approaches were the most cost-effective, that reducing class size and increasing the length of the school day were the least effective, and that computer-assisted instruction ranked between the most and the least effective.

8. Comparing electronic communication to face-to-face

Kiesler, Sigel, and McGuire (1984) explored the impact of computer communication (electronic mail or teleconferencing) on group interaction and decisions. By comparing records of group meetings which were (1) face-to-face, (2) electronic and anonymous, or (3) electronic between known group members, they found marked effects on communication efficiency, participation, interpersonal behavior, and decision making. They found less inhibition, with more name-calling and swearing, when the conference was electronic. They also found the electronic conference to entail more disorder and a longer time to be needed for decision-making, perhaps because group participation was more equal. When a computer program designed to allow only one person to "talk"

at a time was employed, the participants disliked it. The authors interpreted their results to mean that computer conferencing depersonalizes the communication and lessens the dominance of those who would otherwise lead. This was equally true when the conference topic was addressed with electronic mail between conferees instead of teleconferencing.

9. Generating microcomputer cloze tests for content teachers

Starshine (1984) found microcomputer-generated 10% random deletion cloze tests to be valid and moderately reliable tests when passages were taken from fourth and sixth grade social studies texts. Furthermore she found that an adequate level of reliability could be achieved with as few as 19 items.

10. Determining text considered during cloze passage completion

Fortier (1984) allowed college students to request words one-at-a-time to provide the context with which to attempt to complete cloze blanks. He found differences in good and poor readers' ability to use following context, but no differences in the information they attempt to process from that text preceding the missing word.

SUMMARY AND IMPLICATIONS

We are finding ways to use the computer to fill the difficulty gap between the reader and his text. Soon a text passage will be presented by computers equipped to help with any task from reading the text aloud, to simplifying it, to explaining every word and sentence in simple terms or even with pictures. We are gaining evidence that in school programs within which the computer's role is clearly laid out, the reading scores of pupils can be improved significantly. And we are beginning to learn that text presented on the screen by computer as a replacement for conversation, discussion, or even workbook and textbook pages may engender very different responses from humans than the same text presented as printed pages, face-to-face speech, or voice-to-voice telecommunications.

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