

Engaging the Text: Strategy Instruction in a Computer-Supported Reading Environment for Struggling Readers

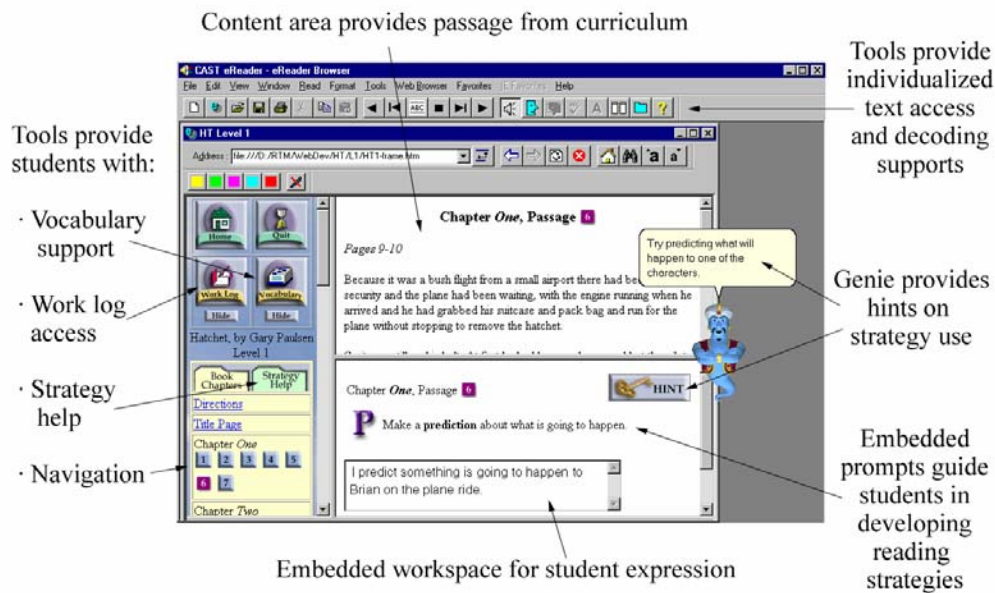
Bridget Dalton, Bart Pisha, Maya Eagleton, Peggy Coyne, & Susan Deysher
CAST, Inc. www.cast.org

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Introduction

There is a wealth of research over the last 25 years demonstrating the positive impact of reading strategy instruction on students' comprehension (NRP, 2000; Palincsar & Brown, 1984; Pressley, 2001; Swanson, 1999). Unfortunately, there is a wide gap between research and practice, with very little strategy instruction (versus comprehension assessment) taking place in today's classrooms (Pressley, 1998). This is a case where technology has the potential to bridge the research-practice gap. Using digital text and computer tools and software, it is now possible to develop computer-supported reading environments that can extend the capacity of the teacher while building students' skills and strategies. There is a growing body of research demonstrating the value of computer-supported reading and studying environments (Anderson Inman & Horney, 1998; Cognition and Technology Group, 1993; Kamil, Intrator, & Kim, 2000; Leu, 2000; MacArthur & Haynes, 1995; McKenna, 1998; Reinking & Labbo, 1999). However, we still know relatively little about how to implement research-based instructional practices in computer-supported environments, and still less about the potential of such combinations to improve students' comprehension of either electronic or printed text.

The purpose of this study was to compare the effect of computer-supported versus traditional strategy instruction on the reading comprehension of middle school students who were identified as "struggling readers". We developed a CD-ROM research prototype entitled "Thinking Reader" that embedded decoding, strategy, vocabulary and self-assessment supports into digital versions of high quality, age-appropriate novels.



The key pedagogical features of the Thinking Reader draw on the following areas of reading research and practice:

- *Strategy instruction*, including reciprocal teaching strategies and visualization/mental imagery.

- *Aesthetic response to reading*, focusing on eliciting a personal response from the reader.
- *Self-monitoring and self-evaluation*, including engaging students in self-reflection and goal-setting.
- *Embedded assessment*, in which teaching and assessing are part of a continual system, contrasted with the more standard approach where comprehension is tested infrequently.
- *Hypertext*, with which students can benefit from supports such as vocabulary definitions when needed.

Universal Design for Learning (UDL)

UDL provides the conceptual foundation for Thinking Reader, and meshes well with reading research findings. UDL calls for flexibility in support of learner differences in recognition, strategy, or affect:

- *Recognition networks* make it possible to recognize patterns, concepts, and relationships.
- *Strategic networks* make it possible to generate patterns and develop strategies for action and problem solving.
- *Affective networks* fuel motivation and guide a person's ability to establish priorities, focus attention, and choose action.

To adjust for learner differences in these networks, materials and instruction need to *provide multiple, flexible options of presentation, expression, and engagement*. Until recently, it was not practical to think about developing flexible curricula and tools because of the labor intensiveness and high cost of such an effort. Fortunately, advances in technology and the increasing availability of digital text have made it possible to seriously pursue the development of UDL tools, texts, and curricula to support students.

Research Study

The study was carried out over three years using a combined quantitative and qualitative methodological approach. In years one and two the technology-based instructional approach was developed and piloted in several classrooms. Year three was a quasi-experimental study, with the goals of providing students access to the general education curriculum, and developing students who were able to read for understanding – who were engaged, strategic, and self-aware as learners. The questions studied were:

1. What is the effect of computer vs. traditional strategy instruction on middle school struggling readers' comprehension?
2. What are students' views on strategy instruction and computer-supported reading (usefulness, impact, suggestions for improvement)?
3. What are teachers' views on strategy instruction and computer-supported reading (usefulness, impact, suggestions for improvement) and how did they integrate Thinking Reader into their instructional program?

Fourteen middle school teachers from four schools in the Boston and North Shore area of Massachusetts participated in this study. Three teachers taught in inclusion classrooms, and eleven teachers taught in resource room settings. 102 middle school students, consisting of 64 Computer-supported and 39 Traditional, participated in the study. All of the students performed at the 25th percentile or lower on the Gates-MacGinitie Reading Achievement Test administered

prior to the intervention. We used a modified random sampling approach, attempting to balance classrooms based on student demographics and computer availability.

Half the teachers used a computer-supported strategy instructional program for struggling readers to complement their strategy instruction taking place off computers, while the other half taught strategies without the computer supplement. All students were introduced to strategy instruction using recommended procedures over a 3-week period prior to the intervention.

Each class read three age-appropriate novels, such as Hatchet and So Far From the Bamboo Grove, over a six month period. Students on computers read digitized versions of the novels with embedded strategy prompts. As students read (or had read aloud via the text to speech tool), they were prompted periodically to “stop and think” and apply one of several strategies (predict, question, clarify, summarize, visualize, personal connection). Students’ responses were recorded online in individual work logs, and these logs formed the basis of regular student-teacher conferences. Students’ efforts to use comprehension strategies were scaffolded by the computer software. Both students and teachers could access strategy hints and review their responses in an online work log at any time. Students read on computers for two to three sessions each per week, for an average of approximately 90 minutes of computer-supported reading time, supplemented by off-computer sessions. Students in the Traditional non-computer classrooms spent the same amount of time reading and applying the strategies, guided by their teacher and with peers.

The Gates-MacGinitie Reading Test was administered pre and post-treatment to assess reading growth. Students were administered a post-questionnaire to obtain their views and preferences with regard to strategy instruction, and for the computer-supported students, their views on the various computer supports. Selected students and all teachers were interviewed at the completion of the study to obtain their views on their respective programs and to explore how they used the program and what effect they thought it had on learning and motivation. We also collected student demographic data, as well as ongoing performance data such as students’ interactive work logs and assessment conference records, weekly classroom observations (both informal and structured), and field notes.

Results and Discussion

On average, students reading the computer-supported novels gained approximately .53 grade equivalents while students in the traditional group gained approximately .2 grade equivalents, and this difference was found to be statistically significant at $p < .05$. We believe that several key factors may account for the greater gains achieved by students in the computer-supported group:

1. The text to speech feature with synchronized highlighting allowed students to read age-appropriate text that was well above their decoding level, but which was at their interest level.
2. The embedded strategy prompts required frequent interactions with the text and involved students in writing their thoughts and feelings throughout their reading of the novel.
3. The opportunities to exercise choice and control were greater in the computer-supported environment.
4. The electronic work log was a visible reminder to students of their efforts, and was concrete evidence that they were learning to read more strategically. The capacity to review their responses from months of work helped them to evaluate and perceive their own progress.

These results contribute to a small, but growing knowledge base on hypertext and computer-supported learning environments, and particularly, the potential of digital text to support struggling readers' comprehension of age-appropriate novels and use of reading strategies. This study shows the potential of digital text to meaningfully support struggling readers so that they are able to read for understanding, to monitor their understanding and apply a variety of reading strategies, and to build their confidence as readers. Because the computer can "read" digital text to them, bypassing decoding and fluency problems, students are free to allocate more cognitive resources to understanding the text and developing effective reading strategies. The embedded strategy prompts, with supports to scaffold their thinking and strategic processing, provide additional evidence of the potential of digital text to ensure all students access to the general curriculum and meaningful engagement in the learning process.

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