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Given that "in some inner-city public schools, more than 50 percent of the students leave before graduating" (Bialo and Sivin, 1989a, p. 35), educators are constantly searching for intervention programs and resources to reverse this trend (Moskowitz, 1989; Ryan and Brewer, 1990; Vescial, 1989). Because the computer has been lauded for its ability to assume different software-driven roles, it is especially well-suited to the needs of at-risk students (Bialo and Sivin, 1989a, 1989b; Knights, 1988; Brooks, 1989; Knights, 1988).

Notwithstanding technology's capability to provide at-risk students with varied multi-sensory opportunities to read and write about their own concerns and issues, many educators resort to using basic skills software to remediate these students' reading and writing deficiencies (Bialo and Sivin, 1989a, 1989b). While this latter type of software addresses specific curricular objectives, its content typically is not written to address the needs and interests of this special population. Research is needed to determine whether reading software, written specifically for this population, affects students' attitudes and achievement.

This study was designed to examine the effects of "real-life" reading software versus skill-based reading software. One purpose was to determine whether software makes a difference in students' attitudes toward their work with computers and themselves as readers and writers. Another purpose was to determine whether software affected students' achievement in reading and writing.

Methodology

Subjects and procedures. Seventy-three eighth grade students (86 percent Afro-American, 14 percent Hispanic) from an inner-city school in Paterson, New Jersey, participated in this yearlong study which was funded in part by the New Jersey Department of Higher Education. These students were part of a special project that qualifies them for support services (e.g., tutoring; educational, recreational and enrichment activities; preparation for college entrance examinations) to help them succeed in school. If these students get into college, they will be awarded a full tuition scholarship to a New Jersey state college or any one of 40 or more other participating colleges.

Before the 1989-90 academic year, students were grouped by their teachers according to their *California Achievement Test* (CAT) scores into three sections: above average, average, and below average. Students within each section then were randomly assigned to either the experimental or control groups, thereby forming six groups. Groups varied in size from 11 to 18 students. Because of absenteeism and student work schedules, group size varied from week to week.

Once a week, during students' regularly scheduled reading time, I met with the six student groups in the Apple computer lab for approximately 40 minutes, alternating

between experimental and control groups within each section. During the rest of the week at reading time, all students worked with the district's basal series. The basal activities did not resemble students' software reading experiences.

In the computer lab, the experimental group worked with 14 stories from *Reading Realities* (Teacher Support Software, 1989), a software package that uses a Directed Reading-Thinking Activity framework (Stauffer, 1975) for stories built around three themes: real-life issues such as cheating, stealing, addiction, and pregnancy, jury series (real court cases with students acting as jurors), and careers such as lawyer, secretary, hairdresser, pilot. Students read 12 stories from the real-life issues theme and one story from each of the other two themes. The control group worked with 10 reading skill-based software packages from Minnesota Educational Computing Consortium as well as test preparation software for the reading portion of the High Schools Proficiency Test (HSPT), New Jersey's statewide test for high school graduation. Control students spent 85 percent of their time with the MECC software and 15 percent of their time with the HSPT software. Each group had 20 instructional sessions in the computer lab.

All students had folders in which to record their reactions to each computer session. To keep the sessions similar for both groups, I used the same daily procedures: 1) students recorded computer assignment in folder; any new procedures were explained; 2) students engaged in computer activity while I walked around to troubleshoot computer and/or procedural problems; and 3) students reacted to the session in their folders. Any individual discussions and reading/writing assistance occurred spontaneously for

both groups. I also kept a journal to record observations and students' comments during each session.

Instruments. To determine differences in students' attitudes and interests toward reading and writing with computers as well as their perceptions of themselves as readers and writers, a 22-item pre-post teacher-designed survey was used. All students completed this survey anonymously by circling one of five numbers for each item, with "5" meaning "all the time" and "1" meaning "never" (see Appendix). To control for students' response accuracy, sixty percent of the statements were positive (e.g., "I read material on the computer that is interesting," "I'm getting better as a reader") and forty percent of the statements were negative (e.g., "I don't read material on the computer that is interesting," "I'm not getting better as a reader"). Since Cronbach's coefficient alpha was .92 for the pretest and .97 for the posttest, the survey was treated as a unitary factor.

To determine differences in students' reading achievement, alternate forms of the *Gates-MacGinitie Reading Tests* (Gates-MacGinitie), Levels 7-9, were used. Both multiple-choice subtests, the 45-item vocabulary and the 48-item comprehension section, were administered.

To determine differences in students' writing ability, Part 1 of the writing section of the HSPT, in which students have to write an essay on a stated topic, was administered. Two different essay topics, used in previous statewide assessments and available to all students in New Jersey as practice exercises, were used. Two readers – teachers from a different New Jersey district trained in registered holistic scoring – rated students' essays for organization/content, usage, sentence construction, and mechanics.

Scores for both essays could range from "1" ("inadequate command" of written language) to "6" ("strong command" of written language). All assessment measures were administered in September, 1989 and June, 1990.

Results

Results for the three assessment instruments were subjected to separate analyses of variance (ANOVA). There was a significant main effect for group for the attitudinal survey ($F(1,72) = 26.67$, $p < .001$), indicating that the experimental group felt significantly better than the control group about their work with the computer and themselves as readers and writers.

There were no significant differences attributable to group for the posttest vocabulary and comprehension scores of the *Gates-MacGinitie* (vocabulary $F(1,72) = 0$, n.s.); comprehension ($F(1,72) = 2.98$, n.s.), indicating that the experimental group did not do significantly better than the control group with identifying synonymous words or understanding passages of prose and simple verse respectively. However, analysis of total reading scores for the CAT (administered schoolwide in May, 1990) indicated that, when the vocabulary and comprehension scores of the *Gates-MacGinitie* served as covariates (to adjust for reading scores prior to entering into program), there was a two-way interaction between section and group ($F(2,71) = 5.90$, $p < .01$), with the below average group doing significantly better.

There were no significant differences attributable to group for the posttest writing samples of the HSPT ($F(1,72) = .43$, n.s.), indicating that the experimental students did not have a stronger command of written language than the control students.

Discussion and implications

Significant attitudinal differences indicated that the content of the software can make a difference in students' work with technology. Inasmuch as the experimental group was reading stories about their own real-life experiences, they could and did relate personally to the content. For example, as one student read the story entitled "Deserted" about a father who is estranged from his wife and turns to alcohol, he told me how his own dad had just gone through the same experience. Another student told me about her pregnant friend whose boyfriend left her the way the boy left the girl in the "Pregnancy" story.

The experimental group also had options for manipulating how they read (e.g., speech, control for reading rate, type of reading mode such as word-by-word, phrases, or whole screen), which also may have contributed to their positive attitudes. Interestingly, by the midpoint of the year, the above average students use of these options was different from the below average students manner of use. Because the above average students were more confident with their reading, they no longer used the speech option. They also chose to read in the whole screen mode so they could monitor their reading rate. In contrast, the below average students continued to use the speech option throughout the year and read in the word-by-word phrase reading mode so that the computer was reading aloud more slowly to them.

On the other hand, the control group was reading content which eluded them much of the time (e.g., information about Albert Einstein's work or facets of Julius Caesar's life). Students often could not even pronounce words that were critical for understanding a passage or

sentence, let alone bring any prior knowledge to their reading. Yet the readability level of the control software was similar to the experimental software, since both were developed for students reading between the second and sixth grade levels.

Informal observations and students' journal recordings revealed that the computer became much more invisible for the experimental group than the control group, with the experimental group relating to the content of the stories rather than the technology *per se*. Experimental students would write in their journals, "I was upset because the mother shouldn't have left the kids," while control students would write, "the computer was good today."

Although students' reading achievement scores were not significantly different, possibly because of the sensitivity of the assessment instrument and the experimental students' completion of only one-third of the package, this should not discourage teachers from working with this type of software since students' interests were piqued, which is an important first step in getting them to read..

One way of encouraging at-risk students to read more is to use "real-life" stories on disk as a stimulus for reading fictional and nonfictional trade books about similar topics. For example, Stephen Roos' (1987) *Confessions of a Wayward Preppie*, written at the sixth grade level for secondary students, deals with the issue of cheating, and Joan Phipson's (1985) *Hit and Run*, written at the same level, deals with the issue of stealing. Both narratives provide students with insights about other teenagers' experience with these issues.

Interestingly, after working with students for a few months, the lack of difference in writing scores was expected based on my observations of how students used the experimental software. Students' writing experiences with the experimental software was not as frequent as I had anticipated at the beginningof the study. Experimental students had four activity choices: 1) multiple choice; 2) cloze (every 5th, every 9th, or highlighted vocabulary from story); 3) discussion (questions about the main character(s) and events from the story); or 4) creative writing (open-ended questions about the main issue from the story). The latter two options require students to word process their answers. Invariably, students chose to do only the multiple choice and cloze activities, for which they were reinforced with some type of accuracy score. Since this study was developed to observe students' reactions and work with software written specifically for them, I gave very little teacher direction. Although tudents reacted orally to what they were reading, they did not choose to record their feelings in writing.

In addition to giving more teacher direction so that students know that they need to engage in the writing portion of a package, there are ways to encourage students' written responses. Besides orally discussing open-ended questions before recording answers, students can work in cooperative learning groups to discuss and write responses. Students also can record their ideas from the creative writing questions before introducing one of the previously mentioned books. For example, before students read a book about cheating, students can respond to the question, *What would you do if you were asked to cheat on an exam?* For stealing, students can respond to the question, *What would you do if someone tempted you to steal something that you*

had wanted for a long time? Discussion can precede or follow students' written responses.

Because the content of software for at-risk secondary students does seem to impact on how students respond to the computer, it is important to use software that is sensitive to their needs and cognitively respectful of their background experiences so that they want to keep reading.

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APPENDIX

Attitude Survey

ID# _____ Date _____

Directions: Circle the number that tells how you feel about each item. ("5" means "all of the time," "4" means "most of the time," "3" means "sometimes," "2" means "infrequently," and "1" means "never.")

1. I like to work with the computer.	5	4	3	2	1
2. When I read, I think about what I'm reading.	5	4	3	2	1
3. I can write about things that I read.	5	4	3	2	1
4. I read material on the computer that is interesting.	5	4	3	2	1
5. I don't like to work with the computer.	5	4	3	2	1
6. I write about interesting things on the computer.	5	4	3	2	1
7. When I read, I don't think about what I'm reading.	5	4	3	2	1
8. I enjoy writing on the computer.	5	4	3	2	1
9. I'm getting better as a reader.	5	4	3	2	1
10. I don't read material on the computer that is interesting.	5	4	3	2	1
11. When I read, I can tell a friend what the story is about.	5	4	3	2	1
12. I'm not getting better as a reader.	5	4	3	2	1
13. I don't write about interesting things on the computer.	5	4	3	2	1
14. I like to read on the computer.	5	4	3	2	1
15. I don't like to read on the computer.	5	4	3	2	1
16. I like to read interesting material on the computer.	5	4	3	2	1
17. When I read, I can't tell a friend what the story is about.	5	4	3	2	1
18. I can't write about things I read.	5	4	3	2	1
19. I'm not getting better as a writer.	5	4	3	2	1
20. I don't enjoy writing on the computer.	5	4	3	2	1
21. I don't like to read interesting material on the computer.	5	4	3	2	1
22. I'm getting better as a writer.	5	4	3	2	1