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ABSTRACT

A year-long study examined the effects of a computer-based reading project on students' attitudes and performance in reading and writing. Subjects (73 "at-risk" eighth-grade students in an inner-city school in Paterson, New Jersey) were randomly divided into control and experimental groups. The experimental group used a software package that dealt with the real-life issues of this special population. The control group used a variety of skill-based reading packages from the Minnesota Educational Computing Consortium as well as test preparation software for the New Jersey statewide assessment test. Three pre-post assessment instruments were used: (1) a 22-item teacher-made attitudinal survey; (2) alternate forms of the Gates-MacGinitie Reading Tests; and (3) part 1 of the writing section of New Jersey's High School Proficiency Test. Analysis of variance procedures indicated that while there were no significant differences attributable to the group for reading and writing, the attitudes of the experimental group toward their work with computers and themselves as readers and writers improved significantly. (Seven tables of data are included.) (Author/RS)

The Effects of a Computerized Reading Program on "At-Risk" Secondary Students

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Abstract

This study describes a computer-based reading project with 73 "at-risk" eighth grade students in an inner-city school in Paterson, New Jersey. The experimental group used a software package that deals with the real-life issues of this special population. The control group used a variety of skill-based reading packages from the Minnesota Educational Computing Consortium as well as test preparation software for the New Jersey statewide assessment test. Three pre-post assessment instruments were used: (1) a 22-item teacher-made attitudinal survey; (2) alternate forms of the Gates-MacGinitie Reading Tests, Levels 7-9; and (3) Part 1 of the writing section of New Jersey's High School Proficiency Test. Analysis of variance procedures indicated that while there were no signficant differences attributable to group for reading and writing, the attitudes of the experimental group toward their work with computers and themselves as readers and writers increased significantly. Plausible reasons for these findings are explained.

The Effects of a Computerized Reading Program on "At-Risk" Secondary Students

Introduction

Given that "in some inner-city public schools, more than 50 percent of the students leave before graduating" (Bialo & Sivin, 1989a, p. 35), educators are constantly searching for intervention programs and resources to reverse this trend (Moskowitz, 1989; Ryan & 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 & Sivin, 1989a, 1989b; Knights, 1988; "Programs," 1989; "Technology and," 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 & 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. A major purpose was to determine whether software makes a difference in students' attitudes toward their work with computers and themselves as readers and writers. A secondary purpose was to determine whether software affected students' achievement in reading and writing.

Methodology

Subjects and Procedures

Seventy-three eighth grade students (86% Afro-American, 14% 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. Because these students went to an "I Have a Dream" School (#6) in Paterson, New Jersey, they were identified as "dreamers" at the beginning

of seventh grade, qualifying 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 groups of students in the Apple computer lab for approximately 40 minutes, alternating between experimental and control groups within each section (e.g., below average experimental, below average control). 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 (e.g., cheating, stealing, addiction, and pregnancy), jury series (real court cases with students acting as jurors), and careers (e.g., lawyer, secretary, hairdresser, and 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 School Proficiency Test (HSPT), New Jersey's statewide test for high school graduation. Control students spent 85% of their time with the MECC software and 15% of their time with the HSPT software. Each group ended up having 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 procedure: (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." 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 (see Tables 1 and 2).

Insert Tables 1 and 2 about here.

There were no significant differences attributable to group for the posttest vocabulary and comprehension scores of the Gates-MacGinitie (vocabulary ($F(1, 72)=0$, ns) (see Table 3); comprehension ($F(1,72)=2.98$, ns) (see Table 4)), 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.

Insert Tables 3 and 4 about here.

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 ($F(2,71)=5.90$, $p < .01$) (see Table 5), with the below average group doing significantly better (see Table 6). Further analysis with the adjusted means and the Scheffe test indicated that the difference was not significant.

Insert Tables 5 and 6 about here.

There were no significant differences attributable to group for the posttest writing samples of the HSPT ($F(1, 72) =.43$, ns) (see Table 7), indicating that the experimental students did not have a stronger command of written language than the control students.

Insert Table 7 about here.

Discussion

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. Moreover, the experimental group had options for manipulating how they read (i.e., speech, control for reading rate, type of reading mode (word-by-word, phrases, or whole screen)), which may have contributed to their positive attitudes. On the other hand, the control group was reading content which eluded them much of the time (e.g., 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. Informal observations and students' journal recordings revealed that the experimental group was much more interested in their computer work than the control group, relating to the content of the stories rather than the technology per se.

Assessment instrument characteristics may have contributed to students' reading achievement scores. In retrospect, the Gates-MacGinitie probably was not a good indicator of the kind of reading experience students had with the experimental software. All of the stories from the software contain narrative text about issues relevant to these students' lives whereas the Gates-MacGinitie primarily contains a combination of expository and narrative text from content areas that differ markedly from the content of the software. This realistic and interesting content may have contributed to the interaction effect with the CAT which contains longer, seemingly more functional passages than the Gates-MacGinitie. Research with a more sensitive assessment measure with a larger sample size would provide further clarification.

A couple of factors seemed to contribute to students' writing scores. While the prompts for both essays required students to tell about something which they had experienced, the outside readers for the writing samples noted that the complexity for each essay topic was different. "The pre-test topic required a simple narrative, while the post-test topic required that both a problem and solution be described. Hence, more planning and greater familiarity with organizational strategies may have been required to successfully manage the post-test topic" (Monheit & White, 1990, p. 6).

Furthermore, students' writing experiences with the experimental software was not as frequent as anticipated. 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, very little teacher direction was given. Curiously, while students reacted orally to what they were reading, they did not choose to record their feelings. Replication of this study would have to include more teacher direction concerning the writing activities in order to adequately assess whether students' practice with writing about important issues can transfer to the kind of experiential writing required on an HSPT-type assessment test.

It also should be noted that, because of time constraints and unforeseen weekly interruptions, experimental students worked with only one-third of the software package. More time needs to be allotted to examine the potential of this type of software for reading and writing achievement.

Nevertheless, the content of software for "at-risk" secondary students does impact on how students respond to the computer. Continued research needs to be conducted to identify how these positive attitudinal differences can translate into improved achievement scores.

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Table 1.
Analysis of variance for attitudinal survey by section and group

Source of Variation	Sum of Squares	DF	Mean Square	F	p
Covariates	.451	1	.451	2.567	.114
ATTPRE	.451	1	.451	2.567	.114
Main Effects	5.220	3	1.740	9.906	.000
SECTION	.855	2	.427	2.434	.096
GROUP	4.685	1	4.685	26.672	.000
2-way Interactions	.096	2	.048	.273	.762
SECTION GROUP	.096	2	.048	.273	.762

Table 2.
Cell means for attitudinal survey by section and group

	GROUP	
	Experimental	Control
SECTION		
Above Average	4.83	4.25
	(13)	(19)
Average	4.47	3.95
	(10)	(8)
Below Average	4.39	3.95
	(11)	(5)

Table 3.
Analysis of variance for vocabulary subtest of Gates-MacGinitie by section and group

Source of Variation	Sum of Squares	DF	Mean Square	F	p
Covariates	72.129	1	72.129	70.083	.000
GMVPRST	72.129	1	72.129	70.083	.000
Main Effects	7.656	3	2.552	2.480	.069
SECTION	7.505	2	3.753	3.646	.032
GROUP	.000	1	.000	.000	.983
2-way Interactions	1.079	2	.540	.524	.595
SECTION GROUP	1.079	2	.540	.524	.595

Table 4.
Analysis of variance for comprehension subtest of Gates-MacGinitie by section and group

Source of Variation	Sum of Squares	DF	Mean Square	F	p
Covariates	52.452	1	52.452	42.872	.000
GMCPRST	52.452	1	52.452	42.872	.000
Main Effects	30.048	3	10.016	8.187	.000
SECTION	23.429	2	11.715	9.575	.000
GROUP	3.645	1	3.645	2.979	.089
2-way Interactions	.944	2	.472	.386	.681
SECTION GROUP	.944	2	.472	.386	.681

Table 5.
Analysis of variance for total score of CAT by section and group with Gates-MacGinitie comprehension and vocabulary subtests as covariates

Source of Variation	Sum of Squares	DF	Mean Square	F	p
Covariates	21378.014	2	10689.007	64.309	.000
GMCPRST	4119.650	1	4119.650	24.785	.000
GMVPRST	5937.601	1	5937.601	35.723	.000
Main Effects	7037.473	3	2345.824	14.113	.000
SECTION	7017.346	2	3508.673	21.109	.000
GROUP	21.561	1	21.561	.130	.720
2-way Interactions	1962.502	2	981.251	5.904	.005
SECTION GROUP	1962.502	2	981.251	5.904	.005

Table 6.
Cell means for CAT by section and group

	GROUP	
	Experimental	Control
SECTION		
Above Average	757.64	760.58
	(14)	(19)
Average	736.91	743.43
	(11)	(7)
Below Average	724.78	703.86
	(9)	(7)

Table 7.
Analysis of variance for HSPT by section and group

Source of Variation	Sum of Squares	DF	Mean Square	F	p
Covariates	37.576	1	37.576	45.398	.000
HSPTPRE	37.576	1	37.576	45.398	.000
Main Effects	.715	3	.238	.288	.834
SECTION	.548	2	.274	.331	.719
GROUP	.354	1	.354	.428	.516
2-way Interactions	1.601	2	.801	.967	.386
SECTION GROUP	1.601	2	.801	.967	.386