

DOCUMENT RESUME

ED 281 190

CS 008 811

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 TITLE College Students' Reading Efficiency with
 Computer-Presented Text.
 PUB DATE 5 May 87
 NOTE 22p.; Paper presented at the Annual Meeting of the
 International Reading Association (32nd, Anaheim, CA,
 May 3-7, 1987).
 PUB TYPE Speeches/Conference Papers (150) -- Reports -
 Research/Technical (143)
 EDRS PRICE MF01/PC01 Plus Postage.
 DESCRIPTORS College Freshmen; *Computer Assisted Instruction;
 Computer Software; Higher Education; instructional
 Material Evaluation; *Reading Improvement; *Reading
 Instruction; Reading Interests; *Reading Rate;
 Reading Research; *Speed Reading; Teaching Methods;
 Time Factors (Learning)
 IDENTIFIERS Presentation Mode; *Speed Reader II; Text
 Structure

ABSTRACT

Focusing on improving college students' reading efficiency, a study investigated whether a commercially-prepared computerized speed reading package, Speed Reader II, could be utilized as effectively as traditionally printed text. Subjects were 70 college freshmen from a college reading and rate improvement course with borderline scores on the reading comprehension section of the New Jersey College Basic Skills Placement Test. The experimental and control groups both read the same passages and the reading rate of both groups were recorded. The experimental group saw a full page of text on a computer screen and was able to control reading rate by pressing the keyboard's space bar each time the display of a new screen of text was desired. The control group read a computer printout of the same material in a self-paced manner. Consistent with other studies, findings showed that computers can be used as effectively as traditional approaches in delivering timed, whole-text readings with comprehension checks to improve the reading efficiency of college students. The reading efficiency of the experimental group was found to increase in a more predictable way from session to session than did that of the control group. An attitudinal survey indicated that subjects in the experimental group were interested in pursuing reading practice via computer assisted programs. (JD)

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College Students' Reading Efficiency
with Computer-Presented Text

International Reading Association Conference
Anaheim, California
May 5, 1987

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College Students' Reading Efficiency with Computer-Presented Text

According to Harris and Sipay (1985), one goal of the many college reading programs in our nation's junior and senior colleges is to increase students' reading efficiency, a combination of rate and comprehension (McWhorter, 1983). Accordingly, a number of instructional approaches such as controlled readers, tachistoscopic training, and Evelyn Wood-type programs have been employed systematically to determine their effects on college students' reading rate and comprehension (Carver, 1983; Lafitte, 1963; Mathis & Senter, 1973; Maxwell, 1964; Rankin, 1970-1971).

Generally speaking, while students can be trained to read rapidly (fixate on fewer words and for less time on each fixated word), their comprehension scores seem to drop. Just and Carpenter (1987) refer to this phenomenon as a trade-off, with students trading away accuracy for more speed and vice-versa. Encouraging us to exercise caution in our development of speed reading programs per se, Just and Carpenter suggest that we search for instructional materials and strategies that help to develop efficient readers who know how to use speed reading as a tool for some situations and for some texts.

According to Robinson (1983), the microcomputer is a useful medium for the development of reading efficiency. However, as McConkie (1984) and Paisley & Chen (1982) assert, the computer should not be used to train the eyes to move along text by means

of flashed perceptual exercises since these exercises do not increase rate. Rather, the computer should be used for whole text techniques, enabling a reader to be able not only to view the whole text in one display but also to have control over the rate of display.

There has been minimal research done with college students comparing the use of computer screen displayed text versus traditional printed page text. Most computer studies done with adults or college students have dealt with testing (Hansen, Doring, & Whitlock, 1978; Heppner, Anderson, Farstrup, & Weiderman, 1985; Hoover, 1977; Schmidt, Urry, & Gugel, 1978) or isolated instructional experiences (Askwall, 1985; Muter, Latremouille, Treurniet, & Beam, 1982). Similarly, at the pre-college level, studies comparing computer screen displayed text with traditional printed page text (Gambrell, Bradley, & McLaughlin, 1985) have dealt with isolated instructional experiences, comparing comprehension, rate, and attitudinal differences. In addition to not addressing reading efficiency differences over time, these studies have not considered the feasibility of using commercially-prepared rate improvement packages.

What these studies have revealed is that comprehension will not be impeded if students have sufficient familiarity with reading passages from a screen (Gambrell, Bradley, & McLaughlin, 1985; Heppner, Anderson, Farstrup, & Weiderman, 1985) and can employ familiar work habits (Hansen, Doring, & Whitlock, 1978); students' rate will not be impaired if the length of time reading continuous text from a screen is monitored (Muter, Latremouille, Treurniet, & Beam, 1982). Given these conditions, can commercially-prepared speed reading packages

delivered by computer be utilized as effectively as traditionally printed paper text with college students over time to improve reading efficiency?

In an effort to answer the aforementioned question, this study used the same content and procedures (i.e., methods for controlling students' reading rate of whole text) provided by a computerized speed reading program (Speed Reader II). Initiated to determine whether college students' reading efficiency differs when using computer screen displayed text as opposed to traditional printed page text, this study is an extension of a pilot study conducted with a smaller sample size (Feeley & Wepner, 1986). Aware of McConkie's findings (1984), only the whole-text, paragraph reading parts of the program were used with both groups, with only the mode of delivery being varied.

Method

Subjects

The subjects were 70 college freshmen from four sections of the College Reading and Rate Improvement course, a half-semester course designed to help college students improve comprehension, study skills, and reading rate. Two of the sections were designated randomly as either the experimental or control group (see Table 1 for distribution of subjects). These 70 students had borderline scores on the reading comprehension section of the New Jersey College Basic Skills Placement Test (NJCBSPT), qualifying these students for this second-level Basic Skills course. (The first level course, Introduction to College Reading, was designed for students with scores noticeably below

the state's minimum standards.) To be certain that the two groups were equal on the NJCBSPT, their reading preprogram subtest scores were subjected to analysis of variance procedures. There was no statistically significant difference ($F = .364$).

Insert Table 1 about here

Procedures

Each week, for five 75 minute sessions, students from both groups were assigned to read the same passages for improving reading efficiency. The passages and questions from a commercially prepared computerized speed reading program, Speed Reader II, were printed out for the control group so that both groups were using the same material in the same format. These passages were from two of the supplemental data disks, Data Disk C (High School) and Data Disk D (College/Adult). The first 20 of the 35 passages on each data disk were designed as column reading exercises (approximately 180 words per passage with approximately 3 words per line) with four follow-up comprehension questions; the remaining 15 passages were designed as passage reading exercises (approximately 380 words per passage with approximately 7 words per line) with eight follow-up comprehension questions.

Students in both groups read approximately 14 passages per session, beginning with the column reading in Data Disk C and ending with passage reading in Data Disk D. Although progressing at their own rate within sessions, students were not permitted to read more than the specified number of passages during each class session.

Rate of reading scores were recorded similarly for both groups. The experimental group used computer screen displayed text; the control

group used traditional printed page text. Both groups had control over their rate of reading. The experimental group, presented with a full page of text on the computer screen, was able to control reading rate by pressing the keyboard's space bar each time the display of a new screen of text was desired; their rate of reading was recorded by the computer program. The control group read the printed pages until finished, at which time they recorded their rate according to the instructor's notations on the chalkboard.

The same questions used to assess comprehension were used for both groups. Reading efficiency was assessed similarly for both groups. Once a passage was completed, students recorded their Words Per Minute (WPM) reading rate, answered and scored a series of literal and higher level comprehension questions, and then calculated their reading efficiency (the product of their words per minute and percentage of correct comprehension questions).

As in the pilot study, the Fast Reading section of the Stanford Diagnostic Reading Test was used for post-testing. Scores were subjected to a two-way analysis of variance (sex x treatment). In addition, a progress chart to indicate changes in reading efficiency was kept.

To assess attitudinal differences between the experimental and control groups, an attitude survey, developed by the researchers, was administered to both groups immediately before the posttest.

Results

Since the repeated measures pilot study (Feeley & Wepner, 1986) showed that students in whole-text rate programs made significant gains

in reading efficiency whether using computer or traditional text approaches, this study used the more rigorous, post-test only, control group design.

According to the ANOVA source table (Table 2), there were no significant main effects or interaction effects. Table 3 shows the means for the sub-groups. Only the mean for the control females (20.48) looks different from the others, but the large standard deviation (13.18) indicates that the scores were widely dispersed and consequently not significantly different from those of the other sub-groups. As in the pilot study, the mode of presentation, computer or traditional text, did not affect the results.

Insert Tables 2 & 3 about here

While the groups scored similarly on the Fast Reading test, (which was intended to see if they would transfer their reading efficiency patterns differently), they did exhibit different reading efficiency patterns while working with Disk C (high school level) and Disk D (college level) during the four sessions. Figure 1 shows the group means of each student's median reading efficiency score experimental groups (02 and 03) and one control group (01). These three groups were taught by the same instructor, and their folders contained comparable records of their reading efficiency scores for the four data points. Since the records in the folders of the other control group (04) were incomplete and not always kept accurately, they were not included in this comparison.

Insert Figure 1 about here

As may be seen in Figure 1, the two experimental groups performed similarly and in the expected direction. Starting at 203 and 209, they both went to 251 the second time they worked on the high school level passages; they dropped to 215 and 218 when they began the more difficult college level passages but rose to 236 and 243 respectively in the last session. The control group started higher (226) on the high school passages but rose to only 237; they also scored higher than the experimental groups on the first college level session but fell during the last session to a point (210) that was even lower than their beginning mean. It could be that while the computer groups maintained their interest and motivation to improve reading efficiency, the control group was becoming less motivated. This observation is supported by the results of the course evaluation survey which contained items designed to assess the students' attitudes toward using the computer.

Table 4 shows the means for the survey items which were rated on a four-point scale with four being the highest. Both groups rated their degree of improvement in comprehension, study skills, and rate of reading from To some extent to Greatly (means ran from 2.11 to 2.62). The computer group (experimental) scored their improvement in rate slightly higher than did the control group, 2.62 vs. 2.40.

Insert Table 4 about here

When asked to evaluate the course components, students in both groups were generally more positive about the rate component than about the class texts (experimental \bar{M} = 2.70; control \bar{M} = 2.62).

Some differences may be noted in the way the two groups responded to the items on the pace of instruction and the format of presentation. While "pace of instruction" was rated slightly higher (2.40 vs. 2.28) by the experimental group, the "format" item was rated considerably higher (2.84 vs. 2.43). Comments from the experimental (computer) group reinforced their enthusiasm for this form of presentation. Some examples were: "The computers were fabulous," "Working with the computer improved my rate and comprehension," "The computer program helped a lot, even though some of the selections were difficult," "Use the computers more often."

To assess more directly attitudes toward working with computers, students were asked two questions about using computers to improve reading. Possibly because these items appeared on the back of the survey, not all students responded to them.

To the question, "Given the opportunity, I would use the computer for general reading development," the experimental group (N=24) said Yes 63% of the time and Maybe 33% of the time, with only one student saying No. The control group also was positive, but understandably more tentative, since they hadn't used the computer. They said Yes 30% of the time and Maybe 61% of the time, with only two responding with an absolute No. (See Table 5.)

Insert Table 5 about here

When asked if they would use the computer specifically for rate improvement, the response from the experimental group was even more positive: 88% said Yes and ^{8%}33% said Maybe. The control group's response echoed their answer to the first question: 39% said Yes and 57% said Maybe. Only one student in each group checked off No.

It appears that these college students were very open to using the computer to improve their reading, with those having had the experience in the computer lab being even more positive than those who didn't.

Discussion

The results of this study are consistent with those of other studies dealing with the mode of presentation (computer-displayed vs. traditional text) on specified reading variables. Gambrell, Bradley, and McLaughlin (1985) found no significant differences in reading comprehension and recall when third- and fifth-graders read computer vs. printed text. They, too, assessed attitudes and found that the computer group indicated a greater interest in reading the text, leading them to conclude that computer-aided learning has positive motivational factors.

When Muter, Latremouille, Treurniet, & Beam (1982) studied adults reading short stories for two hours in a book or video condition, they found no significant differences in comprehension. Again, the computer group expressed slightly more interest in continuing reading, but the difference was not significant. They did find that subjects reading in the video condition read 28.5% more slowly than did the book condition subjects.

Muter, Latremouille, Treurniet, & Beam (1982) had several explanations for this difference in rate, including the subjects' lack of familiarity with videotext and several technical features such as the fewer number of words per page on the screen vs. the book form and the fewer number of characters per line in the video condition. In the

present study, all the technical variables were controlled because the print version was exactly the same as the video version, having been printed out from the computer program.

As for familiarity with videotext, American students in 1986 probably have had more exposure to reading computer screens than adults in Sweden five years ago. It should be noted that we did not assess this experience variable before the study and acknowledge this as a limitation. However, to familiarize the students with our procedures and record keeping, we did conduct one lab session (and one class session for the control group) that didn't "count." Students read seven of thirteen selections that come with the Speed Reader II package during this preliminary phase.

In any event, the computer group did as well as the traditional print group on the Fast Reading section of the Stanford Diagnostic Reading Test and improved their reading efficiency scores dramatically as they worked in the two levels of readings while the control group actually went down by the fourth session. Therefore, it may be concluded that the mode of presentation did not slow them down and that they were progressing in the desired direction more than were the traditional print group who may have been less motivated to do the exercises.

The computer mode did offer managerial benefits to both students and instructor. The computer group did not have to wait for the instructor to pass out materials first, record the time on the board, and supply answers at the end. Instead, they booted up the program, timed themselves by pressing the space bar, and received immediate feedback on the results of the comprehension check. The words per

minute plus comprehension scores were supplied on the screen, and they merely copied them onto their chart, having only to calculate their reading efficiency scores. On the other hand, the control group had to figure out their words per minute and check their comprehension questions before doing their reading efficiency scores. Because of the difference in record-keeping time, the computer group consistently finished before the allotted time while the control group sometimes had to do their paperwork after class. The instructor who taught both groups found it much easier to just distribute disks and folders (computer group) than to have to distribute readings, keep track of time by stop watch, and supply answers after reading (traditional mode). Hansen, Doring, & Whitlock (1978), who studied computer-administered examinations, concluded that the managerial benefits of using computers justified their use.

Conclusions

As far as transfer measures show, computers can be used as effectively as traditional approaches in delivering timed, whole-text readings with comprehension checks to improve the reading efficiency of college students. In fact, students who use computers for this purpose appear to increase reading efficiency from session to session in a more predictable way than do students working in the traditional manner. It may be that because the computer can take care of the "chore" routines (clocking time, figuring words per minute, scoring comprehension), students are more motivated to concentrate on improving reading efficiency. According to our attitudinal survey, college students are certainly interested in and

open to pursuing reading practice via computer-assisted programs. Because there are no real negative aspects to using computers to improve reading efficiency and some benefits in terms of motivation and management, it is recommended that instructors try this mode for the reading efficiency/rate component of their college reading courses.

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Table 1
Distribution of Subjects

	Female	Male	Total
Experimental	24	13	37
Control	23	10	33
Total	47	23	70

Table 2

Analysis of Variance for Fast Reading: Sex x Treatment

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>Significance</u>
Sex	59.152	1	59.152	0.845	0.362
Treatment	22.051	1	22.051	0.315	over 0.500
Interaction	67.930	1	67.930	0.970	0.329
Unit	4622.242	66	70.034	not tested	
Total	4771.367	69	69.150		

Table 3

Post-test Means: Fast Reading Subtest of the Stanford Diagnostic Reading Test

N=70

	N	Experimental		N	Control
Females	24	17.17 (4.18)		23	20.48 (13.18)
Males	13	17.31 (4.68)		10	16.40 (3.92)

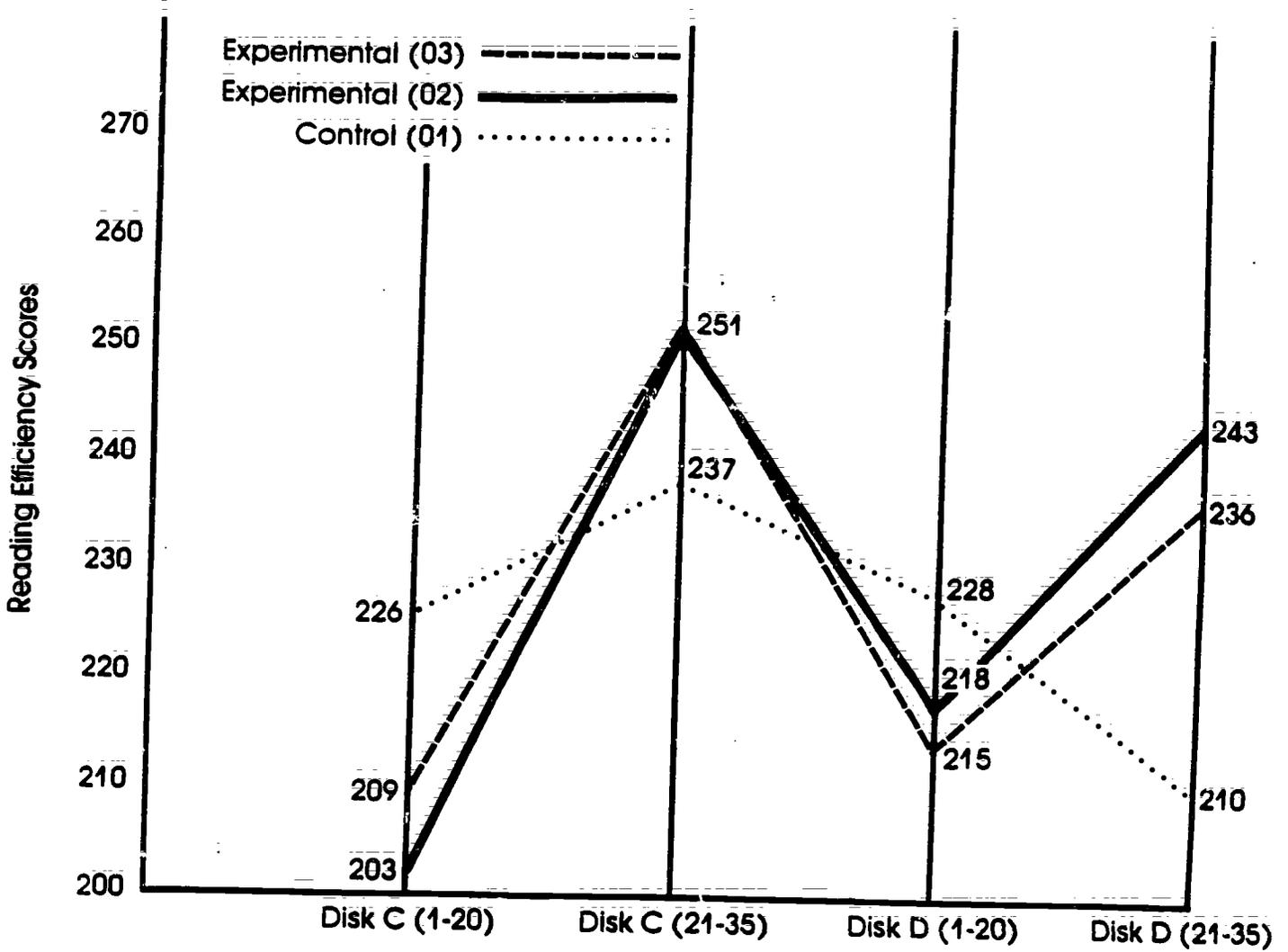


Figure 1.

Means for experimental sections 02, 03 and control section 01: Reading efficiency at four lab sessions (Disk C (1-20); Disk C (21-35); Disk D (1-20); Disk D (21-35)).

Table 4

Course Evaluation: College Reading and Rate Improvement

Item	Experimental	Control
	N=37	N=33
A. To what extent do you think this course has helped you to improve...	(Very Greatly = 4; Greatly = 3; To Some Extent = 2; Not At All = 1)	
1. General comprehension	2.46 (.73)	2.23 (.45)
2. Study skills	2.11 (.66)	2.32 (.65)
3. Rate of reading	2.62 (.64)	2.40 (.67)
B. To what extent did you find the following course components helpful?	(Very Helpful = 4; Helpful = 3; Of Some Help = 2; Of No Help = 1)	
1. Text	1.86 (.58)	1.53 (.63)
2. Novel (<u>The Fountainhead</u>)	2.32 (.81)	2.23 (.95)
3. Rate exercises	2.70 (.63)	2.62 (.77)
a. Content of exercises	2.43 (.69)	2.48 (.72)
b. Difficulty of rate exercises	2.24 (.60)	2.13 (.77)
c. Pace of presentation	2.40 (.64)	2.28 (.53)
d. System for self-assessment of program	2.62 (.72)	2.31 (.54)
e. Format of presentation	2.84 (.68)	2.43 (.49)

Table 5

Attitude Toward Interest in Using the Computer for Reading Development

	N	Yes		No		Maybe	
		F	%	F	%	F	%
Question: "Given the opportunity, I would use the computer for general reading development."							
Experimental	24	15	63	1	4	8	33
Control	23	7	30	2	9	14	61
Question: "Given the opportunity, I would use the computer for rate improvement exercises."							
Experimental	24	21	88	1	4	8 ²	33 ⁸
Control	23	9	39	1	4	13	57