

**COMPUTER-AIDED INSTRUCTION AND  
LEARNING DISABLED STUDENTS**

---

**SUSAN MARIE JONES OWENS**

To the Graduate Council:

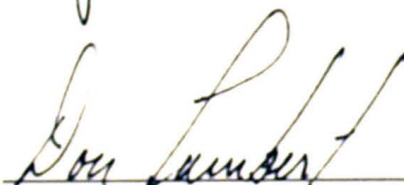
I am submitting herewith a Field Study written by Susan Marie Jones Owens entitled "Computer-Assisted Instruction and Students with Learning Disabilities." I have examined the final copy of this paper for form and content and I recommend that it be accepted in partial fulfillment of the requirement for the degree of Education Specialist, with a major in Special Education.



Major Professor



Second Committee Member



Third Committee Member

Accepted for the  
Graduate Council:



Dean of The Graduate School



## STATEMENT OF PERMISSION TO USE

In presenting this Field Study in partial fulfillment of the requirements for a Ed.S. degree at Austin Peay State University, I agree that the Library shall make it available to borrowers under rules of the Library. Brief quotations from this Field Study are allowable without special permission, provided that accurate acknowledgement of the source is made.

Permission for extensive quotation from or reproduction of this Field Study may be granted by my major professor, or in Dr. Ann Dillon's absence, by the Head of Interlibrary Services when, in the opinion of either, the proposed use of the material is for scholarly purposes. Any copying or use of the material in this Field Study for financial gain shall not be allowed without my written permission.

Signature Susan J. Owens

Date 11-19-93

COMPUTER-AIDED INSTRUCTION AND  
LEARNING DISABLED STUDENTS

---

A Field Study  
presented to  
the Graduate Council of  
Austin Peay State University

---

In Partial Fulfillment  
of the Requirements for the Degree  
Education Specialist

---

by  
Susan Marie Jones Owens

December 1993



## ACKNOWLEDGMENTS

The author wishes to express appreciation and gratitude to Dr. Ann Dillon whose support and encouragement made this graduate experience one of positive professional growth. Appreciation is also extended to Dr. Judith Bartley and Dr. Don Lambert for their assistance.

Special appreciation is felt for the support and patience of my husband, John, without whom the successful completion of this research would have been impossible.

This work is dedicated to my parents, Barbara J. and Arthur U. Jones, Jr. who have spent my lifetime encouraging me to set worthwhile goals and pursue the achievement of those goals to the best of my ability.

## ABSTRACT

A CAI with speech feedback was employed with a group of fourth- and fifth-grade students with learning disabilities in the area of reading. A second group of students from the same population served as a control group, receiving traditional textbook reading instruction. All students responded to an Incomplete Sentence Test concerning attitude toward reading. A pre- and posttest was administered to all students to measure reading achievement. A pre- and post Incomplete Sentence Test was also administered to all students. The results of the reading achievement tests were analyzed to determine statistical significance of the results. The Incomplete Sentence Test was analyzed manually to determine changes in attitude toward reading.

Statistical analysis of the data resulted in the finding that the students exposed to the CAI with speech feedback performed significantly higher on the reading posttest than the students receiving traditional textbook instruction. The analysis of the Incomplete Sentence Test revealed that students who experienced CAI with speech feedback had positive changes in attitude toward reading in the areas of reading enjoyment and opinions about the most difficult thing about reading. It was also noted that, though students in both groups were at least two years below grade level in reading, many of them expressed some positive feelings about reading on the presurvey.

## TABLE OF CONTENTS

CHAPTER	Page
1. Introduction . . . . .	1
Significance of Study . . . . .	2
Statement of Hypotheses . . . . .	3
2. Review of Literature . . . . .	4
CAI Without Speech Feedback . . . . .	4
CAI With Speech Feedback . . . . .	10
Conclusions . . . . .	17
3. Method . . . . .	19
Statement of Hypotheses . . . . .	19
The Sample . . . . .	19
Materials . . . . .	20
Procedure . . . . .	21
4. Results . . . . .	25
Analysis of Data . . . . .	25
Statistical Presentation . . . . .	29
5. Discussion, Conclusions, and Summary . . . . .	31
Interpretation of Data . . . . .	31
Instructional Implication of Data . . . . .	33
Summary . . . . .	35
REFERENCES . . . . .	37



## APPENDICES

A.	Informed Consent Statement . . . . .	41
B.	Incomplete Sentence Test . . . . .	43
C.	Age Equivalent Scores . . . . .	45
D.	Control Group Incomplete Sentence Test . . . . .	47
E.	Experimental Group Incomplete Sentence Test . . . . .	50

## CHAPTER 1

### INTRODUCTION

Researchers have explored the use of computers in education. Several studies have been conducted on the use of computer assisted instruction (CAI) with students with learning disabilities, as well as their mainstreamed peers. It is widely acknowledged that a computer can play an important role in reading instruction and remediation (Casteel, 1989; Swann, Guerrero, Mitrani, & Schoener, 1990; MacArthur & Malouf, 1991). Although it is agreed by researchers that CAI can be a useful tool in the area of reading, actual methods vary. For example, Casteel (1990) used the computer to teach reading through chunking. Van Daal and Reitsma (1990) determined that CAI could be a more effective tool when speech, as auditory feedback, was added. Lin, Podell, and Rein (1991) used CAI to improve reading skills through automaticity training. Higgins and Boone (1990) used hypermedia CAI, in which students were allowed to access information of their choice while reading information in content areas. Van Daal and Van Der Leij (1992) believe that CAI is even more effective when interaction between the computer and the learner is intensified. The authors achieved this through the addition of spelling exercises to the pre-existing reading exercises. These studies have shown that CAI can be an effective instructional tool with students with learning disabilities. As it is the task of the user to determine which CAI approach best fits the learner's needs, it is important for educators to be able to make informed decisions about CAI and its use in the classroom.

## Significance of Study

The use of CAI has been studied in conjunction with several different aspects of reading. The reviewed studies demonstrated that CAI has great potential for improving reading skills in students with learning disabilities (Swan et al., 1990; Casteel, 1990; Van Daal & Van der Leij, 1992). These students show evidence of normal intellectual ability, associated with a significant discrepancy between the expected level of academic performance (as determined through individually administered intelligence tests) and actual levels of achievement in major areas of academic endeavor (as reflected in individual achievement tests). [Student Evaluation Manual (SEM), p. 17.1, 1982].

Traditional reading instruction has failed our populations with learning disabilities, as shown by the ever increasing number of students with learning disabilities in special reading classes (Swan et al., 1990). Teachers must be informed as well as have access to tools which can provide effective alternative techniques of teaching reading.

This study investigates the use of CAI with speech feedback with a group of students who, to this point had received reading instruction through the basal reading approach. The study investigates CAI as an effective technique to improve reading skills of readers with learning disabilities, as well as change their perceptions of reading. Based on the literature review presented later, it is apparent that CAI has great potential for students with learning disabilities. It is



hoped that the findings from this study will further support CAI as an effective technique for students with learning disabilities.

### Statement of Hypotheses

For the purpose of this study, the following hypotheses were proposed:

1. Those students in the experimental group (those participating in CAI with speech feedback) will show significant improvement in reading skills as compared with the students in the control group (those students exposed to the traditional textbook approach to reading).
2. The experimental group will show a positive change in attitude toward reading instruction, as demonstrated on the Incomplete Sentence Test, while the control group will show no change in attitude toward reading instruction.

## CHAPTER 2

### REVIEW OF THE LITERATURE

In recent years, the advent of computer technology has offered a learning alternative, not only to students with learning disabilities, but to all students. In fact, Lemonick (1992) suggests that, in the not so distant future, computers will act as tutors, and teachers will be mere facilitators of learning. The historically formal rigidity of education will be replaced by lessons newly tailored to the individual student. Many researchers, who agree with Lemonick (1992), have conducted studies focused on CAI and students with learning disabilities. The following is a review of the literature which explores CAI as an effective learning tool for students with learning disabilities.

#### CAI Without Speech Feedback

In a study by Casteel (1989), CAI was used to teach chunked reading, the grouping of words in a sentence into short meaningful phrases of three to five words, to students with learning disabilities (Casteel, 1989). The purpose of the research was to discover whether or not the use of chunking would improve reading skills of students with learning disabilities. The subjects in this study were thirty tenth- and eleventh-grade students with learning disabilities. They were placed in three groups. One experimental group was instructed in chunking on the computer, while chunked passages were administered in the traditional paper/text style to the other experimental group. The control group was administered non-chunked passages with CAI rather than the paper/text method. The results of this study revealed that students in the control group performed

lower than either of the other groups. Both groups using the computer performed higher on the posttest. The group using CAI and chunking performed slightly higher than the control group, but the differences in these scores were not statistically significant at  $p < .01$ .

Malouf, Wizer, Pilato, and Grogan (1990) conducted a study to determine success of CAI with a small group of students with mild handicaps in the area of language arts. One group of students was instructed using daily computerized lessons. A second group was instructed using cooperative learning techniques to teach language arts skills. The posttests given showed that both groups appeared to benefit from their interventions. However, one group did not outperform the other.

A computer pilot program was implemented in New York City in twenty-six schools to assess the effectiveness of thirteen computer-assisted instructional programs (Swan, Guerrero, Mitrani, & Schoener, 1990). The CAI's were evaluated in ten elementary schools, seven junior high schools, and nine high schools throughout New York City. Groups involved in the study included the general education population, Chapter 1 students, bilingual students, and a group of special education students with mild mental handicaps and learning disabilities. The results showed increases in both reading and mathematics performance for students participating in the pilot program.

An overall effect size, (defined by the authors as measured gains of the students), of 0.8 was found for reading improvements, indicating, in general, that



the increases were educationally meaningful. It was also noted that effect sizes decreased with advancing grade levels. Elementary students made the greatest gains when CAI was used.

Further, Swan et al. (1990) noted that, of the groups included in the study, the group which included special education students showed the highest gains. As noted with the other groups, the highest gains in both reading and mathematics were made at the elementary level.

A study by Lin, Podell, and Rein (1991) focused on the assumption that the human mind is a limited-capacity processor, and consequently when word recognition is sufficiently automatized, students can devote greater attentional resources to comprehension. Traditionally, automaticity is achieved through extended practice, which usually is provided by means of flashcards or worksheets. Lin, et al. (1991) felt that the inherent features of the microcomputer made it a highly effective tool for providing extended practice. Programs could be designed to give students repeated exposure to material until a specified mastery level had been met. The researchers also felt that it was important for the programs to allow students to monitor their own performance with regard to accuracy and speed. This type of CAI could provide feedback and reinforcement on an item-by-item basis, which teachers are unable to do in the classroom situation (Lin et al., 1991).

Students from ten elementary public schools in New York City participated in the study. The experimental group consisted of 45 students with mild mental

handicaps, including students with learning disabilities in various grades, with reading achievement on second grade level. The control group consisted of 48 second graders who were on grade level (Lin et al., 1991). One group was instructed using the computer in word recognition training; the other group received the same training using flashcards and worksheets.

Results of the study showed that both paper-and-pencil instruction and CAI had differential effects on automatization of word recognition skills. Teachers' moment by moment decisions about pacing and verbal instruction tailored to the performance of individual learners led to greater accuracy in the control group. The opportunity for students with handicaps to monitor their performance and the immediacy of feedback and reinforcement in the CAI condition led to more rapid responses. It was confirmed that students with mild mental disabilities required more practice as compared to non-disabled students. Also, it was concluded that both methods were useful with respect to different learning styles and individual student needs (Lin et al., 1991).

Lin et al. (1991) demonstrated that ability to read was significantly affected by acquisition of spelling skills. Cunningham and Stanovich (1990) stated that beginning learners' acquisition of spelling skills could have an effect on the ability to learn reading skills.

In a study conducted by Cunningham and Stanovich (1990), two experimental conditions were examined. In the first experiment twenty-four first graders were presented with a list of spelling words. During their training sessions



children were presented with spelling words in three ways: first, they were trained to spell words by copying them from a card using a computer keyboard; second, they spelled words from cards by arranging tiles in correct order; and third they spelled words from cards by writing them on paper.

Following training, a written test revealed that words trained in both tile and computer method had a mean score of between 1.29 and 1.5 words spelled correctly. The writing method had a mean score of 3.1 words spelled correctly.

Cunningham and Stanovich (1990) wanted to substantiate their findings further by conducting a second experiment with a slight variation to the first experiment. The difference in this research was that, following training, tests were given using letter tiles and computer keyboard to test mean words spelled correctly. Results of this experiment revealed that words trained in both tile and computer method had a mean score of between 2.38 and 2.5 spelled correctly, while the handwriting method had a mean score of 3.29 words spelled correctly. Though it was shown that handwriting was superior to training with both tiles and computer keyboarding, this superiority did not extend to the children's reading of the words, as there were no significant differences among the three training conditions.

Vaughn, Shay, and Gorden (1992) replicated and extended the Cunningham and Stanovich (1990) study using forty-eight primary grade students, half of which were students with learning disabilities. Vaughn, Shay, and Gorden (1992) modified the replication in two areas. The students with learning



disabilities were slightly older than the nonhandicapped group, and were exhibiting severe spelling difficulties. A second modification in the study by Vaughn et al. (1992) was that on the pretest, any words spelled correctly were eliminated. In all other ways, this study was conducted exactly as Cunningham and Stanovich (1990) implemented their experiment.

Results from the Vaughn et al. (1992) study concurred with Cunningham and Stanovich's (1990) results that the computer condition was not more effective than the other two conditions, and that none of the methods improved reading of words. However, the handwriting condition was not found to be superior to the other two methods of training.

A concern stated by Vaughn et al. (1992) was that their study focused on immediate recall of spelling words. The researchers expressed the need for future research to concentrate on the effects of various training procedures on both immediate and delayed recall of spelling words, as well as spelling in context.

A recent study by Vaughn, Shay, and Gorden (1993) used procedures similar to those used by Cunningham and Stanovich (1990) and Vaughn et al. (1992). A word list was developed for each student with only three words taught during a session. Students were provided with opportunities to self-check for accuracy, clear feedback and error analysis. Information was reduced in the target spelling words until the student could spell the word without a model. The three motoric conditions used were training with computer, writing, and tracing. The training period was extended from five days to eleven. One month after the

instruction, students were given a follow-up test to determine retention of spelling words.

More empirically based procedures were implemented in this study (Vaughn et al., 1993), but no significant differences were found between conditions for numbers of words spelled correctly ( $p=.67$ ). Even over time, condition was not shown to be a significant factor ( $p=.64$ ). It was evident that significant differences existed between the group with learning disabilities and the group without handicaps in favor of the later group ( $p<.001$ ). Over time both groups decreased in the number of words spelled correctly, indicating that retention rate was about the same for both groups. It was suggested that future interest in the acquisition of spelling skills in students with learning disabilities focus on the extent to which learning to spell words in isolation generalizes to writing in context.

### CAI With Speech Feedback

Van Daal and Reitsma (1990) conducted a study to determine the effects of independent word practice with speech feedback using twenty-six boys and girls from three special education schools for students with learning disabilities. Their average age was ten years and they were at least two years below grade level. During practice sessions, the experimental group was exposed to whole-word and syllabic pronunciation of unknown words.

The researchers discovered that the proportion of requests for speech feedback was significantly higher in the whole-word condition,  $f(1-5)=7.59$ ,



$p=.015$ . Also, no selective pattern was clear, indicating that students were not very selective when they requested speech feedback. The overall proportion of requests for speech feedback was .46, indicating that children with reading disabilities are in need of speech feedback in approximately half the words they encounter. Though posttest scores indicated higher quality of reading ( $p=.001$ ), an analysis of variance revealed no significant change in reading fluency ( $p=.137$ ), (Van Daal & Reitsma, 1990).

Van Daal and Reitsma (1990) concluded that further research was necessary to determine effects of speech feedback to aid readers with disabilities. Van Daal responded by conducting further research with Van der Leij (1992) on the effects of CAI in reading and spelling.

The effects of CAI in reading and spelling using eleven girls and seventeen boys diagnosed as learning disabled in reading and written language were examined (Van Daal & Van der Leij, 1992). Results of this study indicated a significant improvement in spelling ( $p=.001$ ), however, no generalization to words other than those spelled repeatedly during the practice sessions occurred. The method of practice found to be most successful was that of repeatedly copying the words from the screen.

It was also discovered that reading skills improved when CAI was used. When spelling tasks were added to the reading practice, significant improvements were noted in the students ( $p=.001$ ). The authors concluded that both reading and spelling skills improved with CAI, and that spelling tasks should be integrated



in the CAI programs for students with reading disabilities. It was concluded that the spelling activities provided variation in the learning situation, and stimulated the type of processing required to remediate reading and spelling problems.

Farmer, Klein, and Bryson (1992) studied the effect of CAI which provided whole word synthesized speech feedback to adolescents who were reading at least two years below expected reading level. It was hypothesized that this approach to reading would improve word recognition and comprehension.

CAI provided short stories for students to read, while offering speech feedback for unknown words as well as offering comprehension questions for each story. The computer stored data on words tagged by students for pronunciation and percentages of correct answers to questions for each story (Farmer et al., 1992).

Reading test results indicated that the use of CAI made no difference in the ability to recognize words. It was concluded that future research should direct investigations to determine whether repeated practice would improve ability to recognize words. Farmer et al. (1992) further suggested that speech feedback be given at the subsyllabic level. The researchers felt that poor readers could improve speed and accuracy for the recognition of these smaller units.

At the University of Colorado, Wise et al. (1989) explored the use of computers to improve reading skills of students with severe reading disabilities. Their research specifically attempted to determine whether the availability of immediate speech feedback could be an effective remedial technique for decoding

problems of non-disabled students who read at or below the 10th percentile. Further, they were interested in determining what form of computerized speech feedback would be most effective in improving students' abilities to attack unknown words.

Fifty-eight third- to sixth-grade students from three elementary schools were provided with appropriately designed computerized reading sessions several times a week for three months. The students were assigned to one of four feedback conditions: (a) whole-word, (b) syllable, (c) subsyllable, and (d) mixed. In the whole-word condition, students targeting a word would see it highlighted and then hear the entire word pronounced by syllables. In the subsyllable condition, a targeted word would be highlighted and then pronounced using "onset-rime" units (e.g., pl/ant, d/ish). In the mixed condition, feedback was provided first at the subsyllable level and then at the syllable level.

Analysis of the data according to pretest and posttest scores indicated that students receiving speech feedback outperformed students who did not receive any speech feedback. The type of speech feedback seemingly did not influence improvement in reading skills. Wise et al. (1989) concluded that for the purposes of providing students with learning disabilities with generalizable skills in decoding large numbers of words, speech feedback below the whole word level is most effective.

A review of the Wise et al. (1989) study by Anderson-Inman (1991), supported the exploration of the potential use of CAI's for enabling students with



learning disabilities. Anderson-Inman agreed that reading recognition and comprehension could be improved with the support of CAI. The author stated that students were able to associate the skills learned at the computer to other areas of learning. The use of computers in this study enhanced strengths, while minimizing weaknesses of the student. This could, in turn, enable their success within the existing classroom curriculum.

In 1990, Higgins and Boone explored yet another form of CAI with students with learning disabilities in the area of social studies. This relatively new tool, known as hypermedia CAI, was used to enhance classroom instruction with three groups of students - learning disabled, remedial, and traditional education students. When using this hypermedia program students were presented with the original text to read. In addition, they were allowed, through a menu system, to access additional information, such as obtaining help with unknown words, building comprehension, or graphics.

All students in the study were exposed to a classroom lecture, an identified reading passages, and a worksheet containing eight multiple choice questions. The experimental group read the passages and answered the questions using the hypermedia CAI, while the control group read from the adopted textbook and answered questions on paper for a ten day period.

Each day's quiz scores were analyzed by means of 3 x 3 ANOVA. The experimental group scored higher than the control group on all ten daily quizzes, although the difference was not significant. When analyzed separately, the quiz



scores of the students with learning disabilities in the CAI group were higher than those in the control group. The posttest resulted in higher overall scores in the control group. When a retention test was given two weeks after the unit was completed, the students with learning disabilities who were in the control group, showed a decline in posttest scores from an average score of 68% to 62%. Students in the experimental group showed a difference in average score of 71% to 70%, which demonstrates that these scores were consistent with their posttest scores.

Higgins and Boone (1990) suggested that the results of this study indicate that hypertext computer study guides were found to be as effective an instructional technique as a teacher presented lesson. It was further stated that students with learning disabilities who used the study guides were allowed control of and access to information more than once, which enabled them to pass quizzes their traditional classroom peers were taking. Further investigation in utilizing hypertext as an instructional tool for students with learning disabilities was suggested.

The previous study by Higgins and Boone (1990) inspired further research in the area of hypermedia CAI used to enhance classroom reading instruction. Also, the study focused on the needs of students with disabilities in the integrated classroom.

Research by Higgins and Boone (1991) focused on the use of hypermedia CAI to supplement an elementary school basal reader program for those with

disabilities in the integrated classroom, as well as the non-disabled students. The CAI used in this study was designed to enhance the basal reader, rather than replace it.

Hypermedia, as defined by Higgins & Boone (1991), is a relatively new educational idea for computer text and information presentation. It provides a flexible format for adapting materials currently in use by teachers to the CAI medium. Rather than being limited to the print on paper, hypermedia format provides a reader access to related information by means of menu choices which bring to the screen related text, related pictures, and a computer generated voice that provides supplementary information, clarification, and elaboration needed by the reader.

Higgins and Boone (1992) grouped 175 students in grades K-3 into control and experimental groups, with three subgroupings of low, medium, and high. The hypermedia CAI reading lessons used with the experimental group included enhancements in vocabulary and decoding skills; no strategy was included to aid in comprehension skills. The control group was provided no access to computers.

Results, reported in class averages, showed that when entire classrooms were compared, in the kindergarten group, the control group scored 91% on the total test, while the experimental group scored 95.05% with a significance reported at  $p=0.0000$ . In first grade there was a difference in favor of the control group on total test, with 98.82%, while the experimental group scored 86.84% with no significance reported. In second grade, control students performed at 92.20%, and



experimental students at 93.91% with a significance reported of  $p=0.0000$ . In third grade, when entire classrooms were compared, the experimental group scored 93.39% on the total test, and the control group scored 93.11% with a reported significance of  $p=.0419$ . When ability groups were examined in isolation, it was discovered that the low groups, as defined in this study, seemed to benefit most from the intervention.

It was also demonstrated that students scored higher on the reading posttest in all grade levels when hypermedia CAI lessons were given before preceding instruction. Higgins & Boone (1991) stated that results of this study provided sufficient support for the continued exploration of hypermedia computer assisted reading material as a supplement, but not as a replacement, to teacher directed instruction.

### Conclusions

According to the professional literature, CAI can have a positive effect on certain learning situations with students with learning disabilities. Sixty-two percent of the research reviewed found that CAI was a tool which could be used to help students with learning disabilities. In the studies where no significant differences were found, it was noted that in some cases slight improvement occurred, though it was not statistically significant.

An important finding in the review of research was that CAI could be successful especially when used in combination with speech feedback. However, its effectiveness depends on how CAI's are integrated with individually defined



educational goals and activities. This tool could be used in conjunction with the regular classroom curriculum to enhance and to reinforce learning. It was also emphasized that the teacher's role should be that of decision maker and integrator, so that computer instruction fits with the overall curriculum of the classroom. In addition, the majority of researchers concluded that CAI was not intended to take the place of teaching and learning in the mainstream, but that it should be used to enhance the strengths of the students with learning disabilities in both special education classrooms and within integrated settings in the traditional education classrooms. Also, it should help the student remediate the weaknesses which impair participation and success when it is integrated into the traditional educational program.

## CHAPTER 3

### METHOD

#### Statement of Hypotheses

For the purpose of this study, the following hypotheses were proposed:

1. Those students in the experimental group (those participating in CAI with speech feedback) will show a significant improvement in reading skills as compared with the students in the control group (those students exposed to the traditional textbook approach to reading).

2. The experimental group will show a positive change in attitude toward reading instruction, according to the Incomplete Sentence Test, while the control group will show no change in attitude toward reading.

#### The Sample

To test the above hypotheses, a total of twenty-four fourth and fifth-grade students with learning disabilities participated in the investigation. Two groups (one experimental, one control) were comprised of seventeen boys and seven girls. Ages ranged from ten years, five months to thirteen years, one month. The intelligence quotients (IQs) ranged from 80-98 as revealed on school records. The students' academic classification (learning disabled) had been previously assigned by the psychologist in the local school system.

All students were from a middle to lower middle class inner city area with a school population of approximately six hundred students. None of the twenty-four students had repeated a grade, but one-third had participated in a one year

transition program between kindergarten and first grade. All students were involved in one to four resource classes each day.

The student with learning disabilities is basically the student who shows evidence of normal intellectual ability, associated with a significant discrepancy between the expected level of academic performance (as determined through individually administered intelligence tests) and actual levels of achievement in major areas of academic endeavor (as reflected in individual achievement tests). The achievement test and the IQ test must be administered by a licensed psychologist. Eligibility for services for the learning disability is determined by a multidisciplinary team [Student Evaluation Manual (SEM), p. 17.1, 1982].

### Materials

Major equipment consisted of four microcomputer systems (IBM and IBM compatibles, 3.5 inch disk drive, monitor and printer), and a speech synthesizer (ECHOPCII). Software chosen was Project Star, produced by Hartley Educational Courseware Inc., 1989. Components of the program were: (a) seventy-four vocabulary lessons, with seven words each, in which students were shown a word in combination with a visual cue, heard the word spoken, then responded to the word in word recognition and meaning exercises, (b) thirty-five comprehension lessons which required students to recall and apply vocabulary in sentences, stories, and related questions presented on the monitor, (c) a spelling unit of seventy-four lessons which provided guided practice of the vocabulary words as well as verb forms (ed, ing, etc.), compound words, and contractions, and



(d) two twelve item short answer worksheets provided written practice of vocabulary and comprehension after every fourth computer lesson.

An Incomplete Sentence Test (Miller, 1986) consisting of ten open ended sentences concerning individual opinions about reading was administered to all twenty-four participants.

### Procedure

This investigation was designed to assess the effects of two reading interventions, traditional adopted textbook instruction and CAI with speech feedback and to determine which of the two methods, if either, would significantly improve reading levels. The control group served as a baseline to assess changes, either positive or negative in the students' reading abilities.

Permission was obtained from parents before the study began (See Appendix A). In all cases, parents were contacted before the consent forms were sent. The students' role was explained to each parent; at this time parents were able to ask questions before making the decision to allow their child to participate in this study. All twenty-four participants were given the incomplete sentence test to determine their attitude toward reading. There were no identifying marks on the test, enabling participants to remain anonymous (See Appendix B).

The students were randomly placed in one of two groups. The control group contained four girls and eight boys. The experimental group contained three girls and nine boys. Students in both groups were pretested using the Woodcock Reading Mastery Test Revised (American Guidance Services, 1987).

During the intervention period of six weeks, both groups received thirty reading sessions. The control group received reading from the Silver Burdett Ginn Reading Series (1989). Lessons included vocabulary presented orally by the teacher, and lessons visually presented using a chart. Stories were first read silently by the students, then orally in group. Discussions were conducted by the teacher. Decoding and comprehension skills were taught using a group sized chart and reinforced using workbook pages.

The experimental group received instruction using the CAI Project Star (Hartley Courseware, Inc., 1989). Each student was given a placement test provided by the program. Students were assigned an individual starting point in the program based on this test. The format of the program required three vocabulary lessons followed by a comprehension lesson, then a spelling lesson. Vocabulary lessons, which included seven words each, were presented on computer with speech feedback in the form of voice instruction. Students heard the word pronounced and saw the word with an illustration, then were required to locate the new word from a list of four words. Through the teacher's menu, mastery criteria of 85% was set. The computer allowed the student to proceed to the next lesson only after criteria was reached. Since the students recorded progress on their own computer data disks, they were not required to have the teacher check progress until the end of the session. Despite this fact, most students did show the teacher their scores at the end of a lesson. After twenty-



five minutes at the computers, students worked in groups of four reviewing vocabulary with flashcards.

Upon successful completion of three vocabulary lessons, students proceeded to a comprehension lesson, which assessed use of vocabulary words through sentence completion, story completion, and responses to comprehension questions. Comprehension practice included skills such as factual comprehension, inference, drawing conclusions, making predictions, figurative language, and sequencing. Mastery criteria was again set at 85%.

The students interacted with the computer during both vocabulary and comprehension lessons when the speech feedback was provided. The computer voice mechanism gave directions to the students, pronounced the vocabulary words, and provided immediate feedback and positive reinforcement for correct responses. Messages such as, "That's right", "Super", "Good Job", and "Congratulations" appeared on the monitor and were heard by the students. When they responded incorrectly, "Try Again" appeared on the monitor and was spoken by the computer. If the student erred more than twice, the computer automatically provided the correct answer with a picture cue on the monitor.

After each set of four lessons, the students practiced skills learned by completing two worksheets independently. One worksheet contained twelve closed sentences which required students to insert the correct vocabulary word. The other consisted of two short paragraphs with twelve missing vocabulary words. When sheets were complete, a teacher checked them. If an error was made, the



student was told to try again. If the answer was incorrect a second time, the teacher provided the correct answer.

Next, a spelling lesson was presented by the computer. The students practiced vocabulary words by copying them from the screen. The computer gradually faded these prompts, until the student could hear the word, then type it correctly. Mastery criteria remained at 85%.

Each day's session lasted forty minutes. Students completed approximately two lessons per day.

At the end of the six weeks of intervention, the Woodcock Reading Mastery Test Revised (American Guidance Service, Inc., 1987) was administered to all participants in a posttest setting. The sentence completion test was also readministered in the posttest setting (See Appendix B).

## CHAPTER 4

### RESULTS

Results of the reading pre- and posttests demonstrated that the experimental group receiving CAI with speech feedback, made considerable gains during the six week training period. The raw scores were converted to age equivalent scores using the Woodcock Reading Mastery Test (American Guidance Service, 1989). The differences were arithmetically converted to months and then statistically analyzed using a paired t-test (Hale, 1992).

#### Analysis of Data

The 12 students in the experimental group completed 30 training sessions. One student was capable of completing 33 lessons on the computer. Nine students completed between 23 and 25 lessons. Two students completed 22 lessons during the six week training period. The results demonstrated gains in the reading scores of all 12 participants. One student gained 17 months, one student gained 11 months, two students gained eight months, one gained six months, two students gained four months, and five students gained between one and two months as shown on the reading posttest (See Appendix C).

The 12 students in the control group, using the traditional textbook approach, completed 30 sessions in the six weeks during which data was collected. Results showed that the control group made fewer gains as a group. One student made no progress in reading, and five students regressed in reading ability. Three students gained between six and eight months in reading, and three students gained three months in reading ability (See Appendix C).

The survey administered to the control group at the beginning of the study indicated several results (See Appendix D). For the first statement: The thing I like best about reading is..., 67% of the students responded that they liked to read aloud, 17% said they enjoyed acting out plays, 8% liked written work, and 8% liked nothing about reading. The post-attitude survey changed very little for this item. Fifty-nine percent of the students reported that they liked to read aloud, 17% stated that learning words was easier, 16% enjoyed free time earned, and 8% liked nothing. The second statement: I think that reading books is..., resulted in 84% of the students responding that it was fun, 8% said it was easy, and 8% said it was hard. Again the post-attitude survey changed very little for this item. Eighty-four percent stated that reading books is fun, 8% said reading books is helpful, and 8% said reading books is boring. The next statement: Sometimes the words in reading..., was responded to with 84% saying the words were hard, and 16% saying they were easy. The post-attitude survey indicated that 75% said the words were hard, while 25% said they were easy. The fourth statement: I think the hardest thing about reading is..., was answered with 84% of the subjects saying reading the words, 8% saying written work, and 8% responding that the teacher was hard. The post-survey changed slightly with 67% stating that reading the words was hard, 25% felt written work was hard, and 8% felt the teacher was hard. The fifth statement: I think that reading comic books is..., resulted in 75% answering fun, with 17% saying they had not read them, and 8% were bored by comic books. In the post-survey, 84% said reading comic books is fun, 8% had



not read them, and 8% were bored by them. For the next statement: I like to read books about..., 100% of the students responded that they liked a variety of subjects. On the post-survey, 92% responded with their former answer, while 8% said nothing. The seventh statement: I think that reading math word problems is..., resulted in 67% of the subjects stating that they were easy, 17% said they were hard, and 16% said they were boring. The post-attitude survey revealed that 75% of the students felt math problems were easy, 17% felt they were hard, and 8% felt they were boring. The next statement: I think that reading social studies books is..., for the pre-attitude survey, answers of 67% hard, 25% easy, and 8% no opinion were noted. For the post-survey 75% responded with good or easy, 17% responded hard, while 8% still had no opinion. The ninth statement: My parents think that reading is..., resulted in the same answers for pre- and post-survey. All students responded that their parents felt reading was important and good for the student. The final question: I hope that special help in reading..., was answered with 84% responding that they hoped to improve their reading ability, 8% hoped to get better grades, and 8% hoped to get help doing their work. The post-attitude survey indicated that 92% of the sample population wanted to improve their reading, while 8% of the population said it was much better than trying to do it by themselves with no help.

The pre- and post-attitude survey was also administered to the experimental group (See Appendix E). Students' responses to the first statement: The thing I like about reading is..., were varied, with 25% responding that they

liked nothing about reading, 25% responding fun, 17% liked decoding words, 17% enjoyed questions and answers, 8% liked the work, and 8% liked the teacher.

The post-survey responses showed differences with 75% saying that they liked working on the computer, 17% enjoyed reading stories, and 8% said they liked not having to write definitions. The next statement: I think that reading books is..., brought a variety of responses on the pre-attitude survey with 58% responding that reading books is fun, 26% that reading is hard, 8% responded with easy, and 8% didn't know. The post-survey showed changes with 75% of the subjects responding that reading books was fun or easy, and 25% answering that it was hard. The third statement: Sometimes words in reading..., revealed that 75% thought they were hard, 17% thought they were fun or easy, and 8% said the words made them tired. The post-survey indicated that 83% felt that the words in reading were hard and 17% felt they were easy. When asked to state the hardest thing about reading, 42% said the words were the hardest, 42% said answering questions was hardest, 8% said reading aloud was the hardest, and 8% said it was boring. The post-attitude survey showed changes with 42% responding that nothing was hard about reading, 42% felt written tests were hardest, and 16% felt reading aloud was most difficult. The fifth statement: I think that reading comic books is..., was answered with 67% of the students saying that it was fun, 17% said it was not fun, 16% said it was hard to read comic books. The post-survey showed that 75% reported reading comic books to be fun, while 25% said it was not fun. The next item: I like to read books about..., had 92% expressing interest in a



variety of subjects, while 8% said they did not like to read books on any subject. For the post-survey all students expressed interest in a variety of subjects. For item seven: I think that reading math word problems is..., the pre-attitude survey responses were 50% said it was hard, 34% responded with easy, 8% thought it was necessary, and 8% felt it was stupid. In the post-attitude survey 50% said it was easy, 34% said it was hard, and 16% felt it was stupid. The next item: I think that reading social studies books is..., revealed that for the pre-survey 75% said it was hard, 17% said it was boring, 8% felt it was necessary. The post-survey indicated that 50% felt it was easy, 42% thought it was hard, 8% still thought it was necessary. For item nine: My parents think reading is..., 84% said it was good for me, while 16% said that their parents thought reading was easy. The post-survey indicated that 67% said it was good for them, 17% said their parents believed reading was important, and 16% said reading was easy. The final item: I hope that special help in reading..., resulted in 78% hoping it will improve their reading, 17% hope it will be fun, and 8% hope they will like the teacher. The post-survey revealed that 50% of the population sample would like special reading to help them read better or faster, and 50% of the sample population hoped it would help them perform better and make better grades in all classes.

### Statistical Presentation

Statistical analysis of the data for reading level was done using a paired t-test in order to determine whether the results shown by the reading tests were



significant. Choice of the paired t-test also allowed for testing direction. The analysis demonstrated that the results were significant at less than .05 level.

## CHAPTER 5

### DISCUSSION, CONCLUSIONS, AND SUMMARY

This study investigated the use of CAI with speech feedback, and the traditional textbook method of teaching reading to students with learning disabilities. The experimental group was exposed to CAI with speech feedback, and the control group was exposed to the traditional textbook approach for a period of six weeks. The purpose of the study was to determine which group in the sample population would show a significant improvement in reading skills, those instructed using CAI or those who received instruction using the traditional textbook method. A second purpose of the study was to determine whether the experimental group would experience a change in attitude toward reading as a result of the use of the CAI approach. It was further hypothesized that the control group would experience no change in attitude in reading. Both of the hypotheses were supported by the data.

#### Interpretation of Data

There was a greater improvement in the reading scores of the experimental group as demonstrated by the comparison of the pre- and posttest scores of both groups (See Appendix C). More than 50% of the experimental group made gains of from four to seventeen months during the six week training period, while 50% of the control group gained from three to eight months. Another important finding was that 50% of the students in the control group had made no progress or regressed in reading ability at the end of training.

Comparison of the attitude surveys administered at the beginning and at the end of the study revealed no pattern of change in the response of the control group, with the exception of item eight. When asked how they felt about reading social studies books, over half of the students responded that it was hard, but on the post-survey, three-fourths felt it was fun.

When asked to say what they thought about reading books, 58% of this group said it was fun or interesting. On the post-survey, 75% felt that reading books was fun or interesting. On the pre-survey, all students in the experimental group had an opinion on what they felt was hard about reading, but on the post-survey, 42% said they thought nothing was hard about reading. This group also showed a change in attitude about doing math word problems; at first, 50% said they were hard, but at the end of the study 50% said they were easy. Similar changes were noted concerning social studies; on the pre-survey, 75% said it was hard to read, while that figure dropped to 42% on the post-survey.

The most obvious change in attitude for the experimental group was for item one. When asked, on the pre-survey, what they liked best about reading, one-fourth said nothing. On the post-survey, three-fourths of the subjects said they liked working on the computer during reading.

The results of the study revealed that the CAI approach with speech feedback was successful, though to varying degrees, with all students in the experimental group (See Appendix C). Forty-two percent of the students made from one to three months progress, 25% made from four to six months progress,



and 33% made from seven to twelve months progress. Further comparison revealed that 83% of the experimental group students progressed more than one and one-half months, which is the length of time training sessions occurred. This demonstrates that CAI with speech feedback is a successful mode of instruction for this sample population of students with learning disabilities. Comparison of data between the two groups also demonstrates that CAI with speech feedback was more successful with the sample population than the traditional textbook approach (See Appendix C).

Results also showed that those students in the experimental group had positive changes in attitude toward reading (See Appendix E). At the beginning of the study 25% said they liked nothing about reading, but at the end 75% reported that they enjoyed working on the computer. It was also noted that at the beginning of the study all members of the experimental group had an opinion concerning what was hard about reading, and at the end of the study 42% reported that there was nothing hard about reading. These post-survey statements may indicate that, as a result of CAI with speech feedback, students felt more confident and comfortable in their reading classes.

#### Instructional Implication of the Data

The students involved in this study were functioning at least two years below grade level in reading. The attitude survey revealed that despite the fact that reading has been difficult for this sample population, many of them still expressed a positive attitude about reading on the pre-survey. In addition, some

of them who expressed negative opinions became more positive after the training sessions. This may indicate motivation for reading. The reading posttest indicated that the CAI with speech feedback was successful, and can be considered to be one reason for the change in the students' attitude. If students enjoy using computer-aided reading systems with speech feedback, they may spend more time reading than they previously did. The increased practice time may, in itself, lead to gains in reading achievement. CAI with speech feedback may also be used to motivate poor readers. Use of a CAI program with speech feedback may be used to teach reading to students, with reading disabilities. Implications are that their confidence level would increase along with their reading level, and that their performance in other academic areas would also increase.

It is important to consider that CAI alone will not be sufficient to remediate the problems of these or any students. As Lin et al. (1991) pointed out, learning should begin with instruction provided by the classroom teacher focusing on the students' accuracy, then followed with computer instruction to further enhance the learning. CAI may be used in cooperation with a well designed individual educational program developed by teachers in response to specific student needs. The presence, as well as the interaction, of the teacher as an instructor and monitor for students at the computer may also enhance the effectiveness of the CAI with speech feedback. This could be especially true for older students who may have developed a habit of guessing at or omitting words they are unable to decode (Farmer, et al., 1992).



## Summary

The potential of CAI for educational use as a tool for enabling students with learning disabilities to improve reading skills is promising. Results of this study as well as the review of research suggests that providing speech feedback to students with learning disabilities is an effective way to improve reading performance. It may also be an effective way of using the computer to motivate and support students who have difficulty learning to read in the traditional classroom. Future research is needed to focus on CAI with speech feedback and its use with students exhibiting learning disabilities. To provide more conclusive results, it may be beneficial to compare groups receiving CAI with speech feedback to groups receiving CAI without speech feedback.

In order to maximize the potential of CAI with speech feedback it is imperative that special education teachers have access to the resources and training necessary to make use of this technology. Teachers who are not exposed to and do not have experience with alternative methods of teaching are limited in their ability to deliver appropriate individualized instruction to students. If they do have access to these alternative methods, teachers are able to make decisions about pacing and can give verbal instruction, which may give students an advantage. Also students are able to monitor their own performance and receive immediate feedback and reinforcement.

As CAI programs become more sophisticated the potential of this mode of instructional presentation will need to be explored more fully. Future research is



needed to determine how CAI with speech feedback can be used to provide maximum benefits in decoding as well as word recognition and comprehension skills. The results of this study with elementary school students provides support for continued exploration of CAI with speech feedback as a supplement to teacher directed instruction.

## REFERENCES

- American Guidance Service, Inc. (1987). Woodcock Reading Mastery Tests Revised. Circle Pines, Minnesota.
- Anderson-Inman, L. (1991). Enabling students with learning disabilities: Insights from research. The Computing Teacher, 19(4), 26-29.
- Becker, H., & Schur, S. (1986). The advantages of using microcomputer-based assessment with moderately and severely handicapped individuals. Journal of Special Education Technology, 8(2), 53-56.
- Casteel, C. A. (1989). Effects of chunked reading among learning disabled students: An experimental comparison of computer and traditional chunked passages. Journal of Educational Technology Systems, 17(2), 115-121.
- Cunningham, A. E., & Stanovich, K. E. (1990). Early spelling acquisition: Writing beats the computer. Journal of Educational Psychology, 82(1), 159-162.
- Farmer, M. E., Klein, R., & Bryson, S. E. (1992). Computer-assisted reading: Effects of whole-word feedback on fluency and comprehension in readers with severe disabilities. Remedial and Special Education, 13(2), 50-60.
- Hale, Robert L. (1992). Mystat Statistical Applications. Course Technology, Inc.
- Hartley Courseware, Inc. (1989). Project Star. Diamondale, Missouri.

- Higgins, K., & Boone, R. (1990). Hypertext computer study guides and the social studies achievement of students with learning disabilities, remedial students, and regular education students. Journal of Learning Disabilities, 23(9), 529-540.
- Higgins, K., & Boone, R. (1991). Hypermedia CAI: A supplement to an elementary school basal reader program. Journal of Special Education Technology, 11(1), 1-15.
- Lemonick, M.D. (1992, Fall). Tomorrow's lesson: Learn or perish. Time, 59-61.
- Lin, A., Podell, D. M., & Rein, N. (1991). The effects of CAI on word recognition in mildly mentally handicapped and nonhandicapped learners. Journal of Special Education Technology, 11(1), 16-25.
- MacArthur, C. A., & Malouf, D. B. (1991). Teachers' beliefs, plans, and decisions about Computer-Based Instruction. The Journal of Special Education, 25(1), 44-71.
- Malouf, D. B., Wizer, D. R., Pilato, V. H., & Grogan, M. M. (1990). Computer-Assisted Instruction with small groups of mildly handicapped students. The Journal of Special Education, 24(1), 51-67.
- Miller, W. H. (1986). Reading Diagnosis Kit. West Nyack, New York: The Center for Applied Research in Education, Inc.



- Okolo, C. M., Reith, H. J., & Bahr, C. M. (1989). Microcomputer implementation in secondary special education programs: A study of special educators', mildly handicapped adolescents', and administrators' perspectives. The Journal of Special Education, 23(1), 101-117.
- Ryan, L. B., & Rucker, C. N. (1986). Computerized vs. noncomputerized individualized educational plans: Teachers' attitudes, time, and cost. Journal of Special Education Technology, 7(1), 5-11.
- Silver Burdett and Ginn. (1989). The World of Reading Series.
- Swann, K., Guerrero, F., Mitrani, M., & Schoener, J. (Summer, 1990). Honing in on the target: Who among the educationally disadvantaged benefits most from what CBI? Journal of Research on Computing in Education, 22(4), 381-403.
- Tennessee State Department of Education. (1982). Student Evaluation Manual. Nashville: Tennessee State Board of Education, p. 17.1.
- Van Daal, V. H., & Reitsma, P. (1990). Effects of independent word practice with segmented and whole-word sound feedback in disabled readers. Journal of Research in Reading, 13(2), 133-148.
- Van Daal, V. H., & Van der Leij, A. (1992). Computer-based reading and spelling practice for children with learning disabilities. Journal of Learning Disabilities, 25(3), 186-195.

- Vaughn, S., Schumm, J. S., & Gordon, J. (1992). Early spelling acquisition: Does writing really beat the computer? Learning Disability Quarterly, 15(3), 223-228.
- Vaughn, S., Schumm, J. S., & Gordon, J. (1993). Which motoric condition is most effective for teaching spelling to students with and without learning disabilities? Journal of Learning Disabilities, 26(3), 191-198.
- Wise, B., Olson, R., Anstett, M., Andrews, L., Terjak, M., Schneider, V., Kostuch, J., & Kriho, L. (1989). Implementing a long term computerized remedial reading program with synthetic speech feedback: Hardware, software and real-world issues. Behavior Research Methods, Instruments and Computers, 21(2), 173-180.

## APPENDIX A



DEPARTMENT OF EDUCATION  
AUSTIN PEAY STATE UNIVERSITY  
INFORMED CONSENT STATEMENT

The purpose of this investigation is to determine the effects of computer-based instruction on the reading levels of learning disabled students. Your child has been chosen because he has been labeled Learning Disabled in one or more academic areas and is more than one year below grade level in reading skills. There are no potential hazards which may occur from your child's participation in this research because all information collected will remain confidential; personal data collected will be used only for purposes of analysis. Your child's participation is completely voluntary, and you are free to terminate a participation at any time.

The results of this study will be made available to you upon its completion.

Thank you, in advance, for your cooperation.

---

I agree for my child to participate in the present study being conducted under the supervision of a faculty member of the Department of Education at Austin Peay State University. I have been informed, either orally or in writing or both, about the procedures to be followed and about any discomforts or risks which may be involved. The investigator has offered to answer any further inquiries as I may have regarding the procedures. I understand that I am free to terminate my child's participation at any time without penalty or prejudice and to have all data obtained from my child withdrawn from the study and destroyed. I have also been told of any benefits that may result from my participation.

---

Name (please print)

---

Signature

---

Date

## APPENDIX B

## INCOMPLETE SENTENCE TEST

GRADE: \_\_\_\_\_

DATE: \_\_\_\_\_

1. The thing I like best about reading is \_\_\_\_\_  
\_\_\_\_\_.
2. I think that reading books is \_\_\_\_\_.
3. Sometimes the words in reading \_\_\_\_\_  
\_\_\_\_\_.
4. I think the hardest thing about reading is \_\_\_\_\_  
\_\_\_\_\_.
5. I think that reading comic books is \_\_\_\_\_  
\_\_\_\_\_.
6. I like to read books about \_\_\_\_\_  
\_\_\_\_\_.
7. I think that reading math word problems is \_\_\_\_\_  
\_\_\_\_\_.
8. I think that reading social studies books is \_\_\_\_\_  
\_\_\_\_\_.
9. My parent(s) think that reading is \_\_\_\_\_  
\_\_\_\_\_.
10. I hope that special help in reading \_\_\_\_\_  
\_\_\_\_\_.



## APPENDIX C

Woodcock Reading Mastery Test Results

Pre- and Posttest Comparison

Experimental Group Total Reading-Age Scores			Control Group Total Reading-Age Scores		
Pretest		Posttest	Pretest		Posttest
1.	7-10	8-0	1.	8-2	7-6
2.	7-7	9-0	2.	7-11	8-2
3.	7-3	7-5	3.	9-1	9-0
4.	7-6	8-0	4.	7-7	8-3
5.	8-6	8-10	5.	8-0	8-3
6.	7-11	8-0	6.	7-11	8-2
7.	7-10	7-11	7.	7-9	8-3
8.	7-2	7-10	8.	8-6	9-1
9.	6-11	7-10	9.	9-0	9-0
10.	7-3	7-11	10.	8-0	7-6
11.	8-2	8-6	11.	8-2	7-10
12.	7-0	7-1	12.	8-6	8-5

## APPENDIX D



Control Group Incomplete Sentences Test  
Pre- and Postattitude Survey Results

---

Sentences Presented for Response

---

1. The thing I like best about reading is...
2. I think that reading books is...
3. Sometimes the words in reading...
4. I think the hardest thing about reading is...
5. I think that reading comic books is...
6. I like to read books about...
7. I think that reading math word problems is...
8. I think that reading social studies books is...
9. My parent(s) think that reading is...
10. I hope that special help in reading...

Item	Presurvey	Postsurvey
1.	67% reading aloud 18% acting out plays 8% written work 8% nothing	59% reading aloud 17% learning words 16% free time 8% nothing
2.	84% fun 8% easy 8% hard	84% fun 8% helpful 8% boring
3.	84% hard 16% easy	75% hard 25% easy
4.	84% words 8% written work 8% teacher hard	67% words 25% written work 8% teacher hard
5.	75% fun 17% had not ready any 8% boring	84% fun 8% had not read any 8% boring
6.	100% variety of subjects	92% variety of subjects 8% nothing

---

## Appendix D (continued)

Item	Presurvey	Postsurvey
7.	67% easy 17% hard 16% boring	75% good or easy 17% hard 8% boring
8.	67% hard 25% easy 8% no opinion	75% easy 17% hard 8% no option
9.	100% important and good	100% important and good
10.	84% improve reading 8% get them better grades 8% get them help with work	92% improve reading 8% better than doing work alone

APPENDIX E



Experimental Group Incomplete Sentences Test  
Pre- and Postattitude Survey Results

Sentences Presented for Response

1. The thing I like best about reading is...
2. I think that reading books is...
3. Sometimes the words in reading...
4. I think the hardest thing about reading is...
5. I think that reading comic books is...
6. I like to read books about...
7. I think that reading math word problems is...
8. I think that reading social studies books is...
9. My parent(s) think that reading is...
10. I hope that special help in reading will...

Item	Presurvey	Postsurvey
1.	25% nothing 25% it is fun 17% decoding words 17% questions and answers 8% the work 8% the teacher	75% computer work 17% reading stories 8% no definitions
2.	58% fun 26% hard 8% easy 8% didn't know	75% fun or easy 25% hard
3.	75% hard 17% fun or easy 8% tiring	83% hard 17% easy
4.	42% the words 42% answering questions 8% reading aloud 8% it is boring	42% nothing 42% written tests 16% reading aloud
5.	67% fun 17% not fun 16% hard	75% fun 25% not fun

## Appendix E (continued)

Item	Presurvey	Postsurvey
6.	92% variety of answers 8% do not like reading	100% variety of answers
7.	50% hard 34% easy 8% necessary 8% stupid	50% hard 50% easy
8.	75% hard 17% boring 8% necessary	42% hard 50% easy 8% necessary
9.	84% good for me 16% easy	67% good for them 17% important 16% easy
10.	78% hope to improve 17% hope it is fun 8% hope to like teacher	50% makes them read better or faster 50% gets them better grades