THE EFFECT OF KEYBOARDING INSTRUCTION ON

LANGUAGE ARTS AND KEYBOARDING SKILLS

OF THIRD GRADE STUDENTS IN THE

WICHITA PUBLIC SCHOOLS

by

MATTIE C. SOWERS

Bachelor of Science in Education
Emporia State University
Emporia, Kansas
1973

Master of Science
Emporia State University
Emporia, Kansas
1975

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
December, 1989

THE EFFECT OF KEYBOARDING INSTRUCTION ON

LANGUAGE ARTS AND KEYBOARDING SKILLS

OF THIRD GRADE STUDENTS IN THE

WICHITA PUBLIC SCHOOLS

Thesis Approved:

Jeanine M. Rhea
Thesis Adviser

Donald D. Fisher

Joe W. Fowler

D. Daylhood

Norman N. Durham
Dean of the Graduate College

ii

1364915

ACKNOWLEDGEMENTS

professionalism. Without the participation of the fifteen third grade teachers and their students, this study could not have been completed. A heart felt thank you is expressed to all Wichita Public Schools employees who encouraged and supported me during the last two years.

The Administrative Services Department in the College of Business at Oklahoma State University has undergone major changes since I was first admitted into the doctoral program. I greatly admire the graduate faculty who were able to work through these changes in their professional careers and still provide guidance and assistance to the doctoral students assigned to them. Dr. Jeanine Rhea, chairperson of the committee, provided guidance for the study as well as a sense of peacefulness through her tranquil nature in the midst of turmoil. Her role model as professional, wife, and mother will forever be a personal inspiration to me. Thank you to Dr. Daryl Nord and Dr. Joe Fowler, committee members, who graciously agreed to serve on this committee. Dr. Donald Fisher, committee member, served as a major force in encouraging me during my year on campus. I will always be grateful for his willingness to continue serving on the committee after his retirement from the Oklahoma State University faculty.

The weekly dinner meetings of the several business education doctoral students, during my year in Stillwater, provided much insight into the work we were completing. Special thanks to Conchita for her never failing words of hope and reassurance.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Since the late 1970's, technological advancements have had a
tremendous impact on educational institutions in the United States.
The growth in the number of microcomputers in the public elementary and
secondary schools in the 1980's has been phenomenal. This growth has
been accompanied by a greater awareness on the part of educators of
the instructional uses of this technology. As a result, the keyboard
has become a common tool of communication for even the youngest
students. No longer can educators wait until the last few years of a
student's public school experience to introduce the proper use of this
tool. High school typewriting, as we have known it for decades, is
likely to become a thing of the past (Stewart and Jones, 1983).
Students must have an opportunity during their earliest years in using
this tool to develop some proficiency in its use. Elementary keyboard-
ing is becoming an essential part of the elementary school curriculum.

Need for the Study

As a result of district-wide computer literacy curriculum
planning, the Wichita Public Schools developed and piloted, in 1984, a
fifteen week unit of study in keyboarding to be taught in second, third
and fourth grade classrooms in three of the district's elementary

1

schools. After attending a one hour training session on teaching methodology and orientation to the materials, the elementary classroom teachers provided the instruction to the students. After the initial pilot, it was determined that students in the third grade responded best to the type of instruction presented and the materials were slightly modified to be of greater benefit to the students. The materials and teaching methodology were observed to be successful in teaching the objectives of the program, but no data were collected to substantiate these observations.

Because instructional time was being taken away from other subjects in order to teach this keyboarding unit, it must be proven that the costs, in relation to time, were justified through improved benefits to the education of the students. Although other studies (Rowe, Yuen, Unzicker, Tate, and Behrman) showed improved language arts skills as a result of typewriter use in language arts instruction, the materials and methods used in this keyboarding unit had not been tested for similar academic achievement gains.

The objectives of the keyboarding unit did not address a keyboard-ing skill level goal in terms of gross words per minute. Studies show that unless a student can enter words at a keyboard at a rate equal to or better than his or her handwriting rate, there is little benefit to keyboard use. There are no data to show what keyboarding speed and technique skills were developed at the end of the fifteen weeks of instruction.

Statement of the Problem

The problem of this study was to determine the effect that keyboarding instruction, gender and age have on keyboarding speed and technique skills and academic achievement of students in the third grade.

Purpose of the Study

The purpose of the study was to provide information that can be used for curriculum improvement. The effectiveness of the keyboarding instruction, related to keyboarding speed and technique skill, will affect keyboarding use in the upper elementary grades and will ultimately affect the typewriting curriculum in the secondary schools. The academic achievement in language arts of the students who learn keyboarding may impact curriculum development in the academic areas.

Variables

The independent variables in this study were keyboarding instruction, gender and age in months. The three dependent variables were academic achievement, keyboarding speed, and keyboarding technique of the students.

Delimitations

The following were delimitations of the study:

1. The study was limited to third grade students in the Wichita Public Schools, Wichita, Kansas.

2. Students were selected for inclusion in the study solely on the basis of the class in which they were enrolled for the 1988-89

school year. No attempt was made to select students on the basis of academic ability, gender, or race.

3. Classes were selected for inclusion in the study based on the willingness of the teacher to participate in the study.

4. Students who were identified as receiving special education services in the areas of physical impairment and learning disabilities programs were not included in the study.

5. All classes included in the experimental group were from buildings that maintained a computer lab.

Limitations

The results of the study were limited by the following factors:

1. There was no attempt made to determine the previous keyboarding experience of the students participating in the study. Those students who had considerable access to a computer at home may have had a greater knowledge of and skill in using a keyboard than those who did not have access to a computer at home.

2. There were variations in the years of teaching experience and teaching style of the classroom teachers providing the keyboarding instruction. This could cause some differences in the results shown by the various classes.

3. The size of the sample was limited by the number of parents who gave permission for their student to participate in the study by returning the consent form.

4. Student absenteeism may have limited the instructional contact time the student received.

5. Pre-test, post-test, and keyboarding skill scores were not available for students who were absent on the test days.

Assumptions

The following assumption was made:

1. All students included in the study were assumed to have the physical and mental capability to learn keyboarding skills.

Definition of Terms

For the purpose of this study, the following definitions of terms were used:

Keyboarding is the act of placing alphabetic information into various types of equipment through the use of a typewriter-like QWERTY keyboard. The specific alphabetic characters and related punctuation included in the keyboarding instruction of this study are listed in Appendix F.

Keyboarding instruction was the process of teaching students the proper touch technique of using a typewriter-like keyboard. This includes proper posture, hand position, and fingering. This instruction was provided by the regular classroom teacher and used the keyboarding materials provided by the Wichita School District. In this study, the keyboards of Apple IIe computers were used as the input devices.

The teacher was the regular elementary classroom teacher.

The experimental group was the group of students included in the study who received the keyboarding instruction.

The control group was the group of students included in the study who did not receive formal keyboarding instruction.

The ITBS is the Iowa Test of Basic Skills standardized test.

Academic achievement was defined as the student ability in the areas of vocabulary, reading, and spelling as reported on the ITBS. The grade equivalency score reported on each of these three categories of the ITBS was used as the measurement of academic achievement.

The pre-test scores used to measure existing academic achievement were obtained from the April, 1988 regular ITBS testing. The regular classroom teacher administered this test as part of the Wichita Public Schools annual testing program.

The post-test scores used to measure academic achievement following the prescribed treatment were obtained from the April, 1989 regular ITBS testing. The regular classroom teacher administered this test as part of the Wichita Public Schools annual testing program.

The software used for displaying the timed writing copy and calculation of gross words per minute, number of errors, and percent of accuracy was Typing Tutor IV from Simon & Schuster Inc. Because the software needed to be customized and diskettes duplicated to provide the same timed writing copy for each student, permission for limited duplication of the Typing Tutor IV diskette was requested from Simon & Schuster, Inc. Permission for this limited duplication of Typing Tutor IV was received from Prentice Hall, Simon & Schuster Consumer Group. Appendix C contains copies of these request and authorization letters.

Keyboarding speed skills were measured by timed writings consisting of four predetermined 35-character sentences. The sentences were taken from Lesson 34 of Key in on Keyboarding. The students entered

the timings at Apple IIe computers and gross words per minute for each timing were calculated by the software. The software also determined the number of errors and percent of accuracy for each timing. The researcher conducted these timings using the computers available in the school where the student attended.

The acronym gwam was used to identify the gross words per minute on the timed writings and was used as the score for keyboarding speed.

Keyboarding technique skills were reported as a subjective analysis of the ability of the student to use correct posture, reaching technique, and fingering when entering data into a computer through the keyboard. The researcher observed the student techniques and recorded scores for each student while the students were completing the timed writings.

Hypotheses

The following hypotheses were tested as part of this study:

1. There will be no significant difference in the academic achievement gains between the control and experimental groups.

2. There will be no significant difference in the keyboarding speed skills acquired by the control and experimental groups.

3. There will be no significant difference in the keyboarding technique skills acquired by the control and experimental groups.

4. There will be no significant difference in the academic achievement gains between males and females in the experimental group.

5. There will be no significant difference in the keyboarding speed skills acquired by the males and females in the experimental group.

6. There will be no significant difference in the keyboarding technique skills acquired by the males and females in the experimental group.

7. There will be no significant difference in the keyboarding speed skills acquired by students of various ages in the experimental group.

8. There will be no significant difference in the keyboarding technique skills acquired by students of various ages in the experimental group.

9. There will be no significant correlation between keyboarding speed skills and academic achievement of the students in the experimental group.

CHAPTER II

REVIEW OF LITERATURE

For many years prior to the advent of microcomputers in the
schools, creative elementary teachers were having their students use
typewriters for a variety of purposes. Their objectives for doing so
ranged from improvement in reading, writing and spelling to using the
typewriter as a motivational device. In more recent years, the
emphasis on computer literacy and word processing in language arts
instruction have included microcomputers in these uses of a typewriter-
like keyboard by elementary students. This literature review surveys
the variety of uses of a typewriter-like keyboard in elementary schools
as well as methodology for presenting this skill to the students.

Academic Skills

The use of typewriters in elementary classrooms is not a new
phenomenon in education. Early studies by Wood (1932), Rowe (1959) and
Yuen, et al (1962) showed increased academic skills, especially in the
areas of reading and language arts, among the students who used
typewriters. Unzicker (1934) found significant gains in the reading
skills of those first grade students who typed. Fourth, fifth, and
sixth grade students studied by Tate (1943) showed greater gains in
language arts and spelling among the typing students. Behrman (1978)

found significantly greater improvement in seven language arts skills among the students in the typing group. Sinks and Thurston (1972) reported that over 900 studies had been made during the previous forty years that dealt "in total or in part with the typewriter in classroom instruction." The results of their study supported the results of the Wood and Freeman study which was conducted forty years earlier.

The use of the typewriter by students in elementary classrooms also serves as a motivational device. Students who use typewriters in school typically enjoy their school work more and seem to be more willing to express themselves through writing (Unzicker, Wood and Freeman).

The studies reported above were all conducted prior to the advent of the microcomputer in the late 1970's. Although many studies have indicated the positive effects of typewriter use with elementary students, typewriting has not become an integral part of the elementary school curriculum. Attempting to state the reasons why typewriting has not become more widely accepted in the elementary curriculum would be speculation. However, the advancements in technology that provided low-cost microcomputers also provided a renewed emphasis on the use of the typewriter in elementary schools. More specifically, the emphasis in the early 1980's was on the keyboarding skill necessary in type-writing that also provided the means for inputting data into a microcomputer. If the availability of typewriters was one of the reasons for not using typewriters, that was no longer an issue. In the early 1980's, microcomputers were invading the elementary schools at a rapid pace. Hunter (1983) reported that the number of elementary schools that had computers grew from 5700 at the beginning of the 1982-

1983 school year to approximately 13,000 by the end of the school year. Elementary and secondary schools continued to experience growth in the number of computers, showing an 18 percent increase from 1986 to 1987 (Educational Technology 1987). The need for students to be able to interact with a microcomputer through its keyboard was becoming a necessity.

With this renewed interest came more studies regarding the importance of typewriting, or keyboarding, in elementary schools. Karen Piper (1983) used word processing software on microcomputers to teach writing to her students. She reported that the students were more motivated by this method and improved their writing ability. In her recommendations to other teachers, she encouraged that students be provided "typing instruction or keyboard familiarity prior to using the word processor as a writing tool."

The earlier studies that showed improvement in spelling among students who used typewriters were now being supported by studies which showed improvement in spelling among students who use micro-computers (Balajthy, 1986). This improvement was attributed to the motivation provided by the use of the technology and the advanced capabilities of the microcomputer to provide colorful and interesting practice for the students. The microcomputer also provided feedback to the teacher in regard to the student's progress.

The New York State Education Department (1986), in recognizing the importance of keyboarding, or typewriting, in the elementary language arts program, developed a state-wide guideline for the inclusion of keyboarding in the elementary language arts curriculum. In their curriculum guide, several reasons why "computers and word processors

are appropriate tools for teaching the English language arts" are stated. Additionally, the curriculum guide stated that students "need to learn keyboarding skills to use computers for composing text" and emphasize that this instruction should be incorporated into the language arts curriculum at the elementary level.

On April 26, 1983 The National Commission on Excellence in Education presented their report, entitled A Nation at Risk: The Imperative for Educational Reform, to President Reagan. The report warned that the "educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people" (Goldberg and Harvey). In the months and years following the release of this report, education and educational issues became a major focus of public concern and political rhetoric with emphasis being placed on improvement of education. An abundance of educational reform reports were published regarding the status of education in the United States with numerous suggestions for improvement of the educational system (Bell, Cross, and Howe). These reports emphasize the need to encourage excellence among students with greater emphasis on the "basics." The "basics" typically include reading, writing, and mathematics with technology thrown in as a new basic. Terrel H. Bell (1984) states that the "first priority for American education should be to concentrate on helping every student to attain the highest possible level of literacy." He further itemizes reading comprehension, writing, thinking, and speaking as elements of this literacy. President Ronald Reagan (1984) itemized six steps to "help turn our schools around and return excellence to American education." Two of these are to "raise academic standards and expectations"

and "teach the basics." If learning keyboarding in the elementary grades can provide a basis through which to learn the technology and improve reading and writing skills, then it will serve to achieve some of the goals of the educational reform movement of the 1980's and must become an integral part of the elementary curriculum.

Typewriting vs. Keyboarding

With the development of microcomputers and their increased use in elementary and secondary schools, the need for students to be able to communicate with the microcomputer through the keyboard became readily apparent. Because students as young as kindergarten, five years of age, were using microcomputers in school, the need for some instruction in the efficient use of the keyboard for young children became apparent (Craighead and Switzer, Kisner, Wetzel, New York State). The term "keyboarding" was being used synonymously with typewriting. This terminology caused great confusion among business educators and computer users. In 1984, the Policies Commission for Business and Economic Education of the National Business Education Association published a position paper entitled "This We Believe about Keyboard-ing." This document stated that "typewriting and keyboarding are NOT synonymous." Keyboarding was defined as "the act of placing informa-tion into various types of equipment through the use of a typewriter-like keyboard" with the emphasis on input rather than output. The New York State Education Department concurred with this definition in their keyboarding guidelines. Although there is agreement on these basic definitions, there is less agreement from experts on the objectives to be included in a keyboarding curriculum.

Computer Literacy

The number of microcomputers in the elementary and secondary schools of the country increased by 18 percent from 1986 to 1987. The total number reported now exceeds one million (Educational Technology 1987). These microcomputers are being used for a variety of learning activities which include games, drill and practice in academic areas, word processing, computer programming, and computer literacy (Educational Technology 1987, Craighead and Switzer). The 1987 Survey of the States conducted by Electronic Learning reported that "nearly 80% of all states plus the District of Columbia officially recommend that schools provide students with exposure to computers." Some schools offer this exposure through a specific computer course, while others recommend that computers "be integrated into the traditional curriculum." This exposure to computers and learning about the technology is referred to as computer literacy.

A student may become computer literate through a number of different exposures to computers. There is no specific, accepted definition of computer literacy nor are there standardized objectives for a computer literacy curriculum. It is known, however, that the keyboard is the device most often used to interact with a microcomputer. Therefore, keyboarding skill may be considered fundamental to any computer literacy curriculum (Craighead and Switzer, Hinson and Dickey). The keyboarding proficiency necessary for the various components of computer literacy will vary depending on the age of the student and the quantity of data being entered into the microcomputer.

Word Processing

In the early 1980's, one of the fastest growing applications of microcomputers in society, business, and schools was word processing. Language arts teachers became aware of the benefits of word processing to the writing process and began incorporating the use of microcomputer technology with word processing software in their classroom writing instruction. Students who had completed a formal typewriting course had a definite advantage over those who had no proficiency in keyboarding or typewriting. As the language arts use of word processing moved to the junior high and elementary schools, very few students trying to use word processing in writing had received prior instruction in keyboarding. Use of word processing prior to keyboarding instruction resulted in hunt-and-peck data entry and frustrated students (Erthal, Hall, Piper, Wetzel). Thus, the need for keyboarding instruction at the elementary level was again reinforced.

Teaching Methodology

Because the need for the development of proficiency in keyboarding skills among elementary students has evolved over the last eight to ten years, formal guidelines for teaching methodology, objectives, recommended grade level, materials, etc. have been evolving also. Local school districts or individual teachers who wanted to implement elementary keyboarding instruction have, in many cases, developed their own sets of guidelines. This resulted in a hodge-podge of learning objectives, teaching strategies and learner outcomes. Very little consistency could be found in what was being taught to the student, how it was being taught, and the related student achievement in keyboard-

ing. Elementary teachers who have had no formal preparation in the principles and philosophy of teaching typewriting are not likely to develop sound teaching practices related to keyboarding nor are they likely to be effective in their keyboarding instruction. Many states and school districts have developed sets of curriculum guidelines in various subject areas to give teachers some direction in course content and to provide some degree of standardization from school to school and district to district. Few states are as fortunate as New York to have a state-wide set of guidelines for keyboarding. In the following discussion, these guidelines from New York will provide a foundation from which to compare recommendations from the literature.

A number of factors must be considered when planning an elementary keyboarding curriculum. These include: appropriate grade level, who will provide the instruction, objectives, time allocation, and materials. These will each be discussed individually.

Appropriate Grade Level

Studies involving keyboarding/typewriting skills have included students from every elementary grade level, from kindergarten through grade six. Those studies which involved students in the primary grades, kindergarten through grade two, found that the students progressed only to practicing words in their keyboarding and were hampered by their lack of reading skills, short attention span, and limited finger dexterity (Cowles and Robinson, Kaser).

Other studies, involving older elementary students, showed success in learning keyboarding skills among all age groups. Rowe (1959) and Sinks and Thurston (1972) studied third and fourth grade students.

Craighead and Switzer (1983), Frankeberger (1985), and Hall (1985) studied fourth and fifth grade students while Yuen (1962) studied only fourth graders. Kaser (1984) and Sormunen (1986) studied fourth through sixth grade students and Behrman (1978) studied only fifth graders. The older students were able to progress from typing letters and words to typing phrases and sentences. Thus, it seems that keyboarding could be taught successfully in grades three through six.

With positive results in learning keyboarding reported at a variety of grade levels, a specific grade level at which to first introduce formal keyboarding instruction is difficult to pinpoint. Although Cowles and Robinson reported success at all levels tested, the older of the children, ages seven and eight, "stayed on task" and progressed to keyboarding sentences rather than just words. Smith (1957) reported a generalization that age eight is probably the best average age at which to introduce children to typing while also stating that any child is ready to learn the skill at the "moment his curiosity and determination to learn to type are keen enough." In 1968 Lloyd predicted that by the year 2000 typewriting instruction would begin in grades five and six and would include the use of computer-assisted diagnostic instruments. Wetzel (1985), Kisner (1984), Piper (1983), and Erthal (1985) tied the appropriate grade level for the formal introduction of keyboarding to the need-to-know by indicating that a student who does a substantial amount of keyboarding needs prior keyboarding instruction. Kimball and Lane (1989) state, "keyboarding skills should be taught to students at the time they use computers with frequency" and further state, "third-grade students are physiologically ready to learn keyboarding and can become keyboard proficient." The

New York State guidelines also concur with this need-to-know philosophy by stating that students "shall be provided instruction in basic keyboarding techniques at the grade level in which they are first expected to use electronic keyboards in learning situations requiring efficient input, retrieval, and manipulation of words, symbols, and data."

Who Will Provide the Instruction?

Typewriting instruction has traditionally been provided by business teachers at the junior and senior high school level. If keyboarding is to be taught to elementary students, it has been the opinion of business educators that those best prepared to provide this instruction are the business teachers who are versed in the correct teaching methodology (Kaser, Kisner, Policies Commission, and Frankeberger). According to Erthal (1985) and Frankeberger (1985) most business educators are not proficient in teaching elementary children and in many states are not certified to teach in elementary schools. Kimball and Lane (1989) reported that of those elementary and middle/junior high school keyboarding instructors who responded to their survey 51 percent were not certified in keyboarding. They state further, "a teacher who is responsible for providing keyboarding instruction for elementary and middle/junior high schools should be trained in methods and techniques for teaching keyboarding." They also believe that "it is most important that teachers receive training in the traits, needs, and interests of the student age group with whom they will be dealing."

There are three common solutions to this dilemma. Kisner (1984) reported two of the three solutions being used in Omaha, Nebraska. One of these involves business teachers and elementary teachers working together in a team-teaching approach. In the second approach, business teachers provide the instruction outside of the normal school day in evening or summer classes. The third solution is to equip the elementary teachers with the skills required to teach keyboarding (Frankeberger and Wetzel). Business educators can play an important role in providing in-service instruction to elementary teachers in relation to keyboarding teaching methodology. The New York State guidelines concur with this third solution by integrating keyboarding instruction into the language arts program taught by the regular elementary classroom teacher. The guidelines themselves provide considerable guidance for the elementary teacher in proper teaching methodology.

Objectives

One significant difference between many of the above reported studies involving elementary students is the method used in presenting the use of the keyboard to the students. In the earlier studies involving typewriters, Wood and Freeman (1932), Unzicker (1934) and Tate (1943) allowed the students to use any technique they desired to manipulate the keyboard while Rowe (1959) and Yuen (1962) provided formal touch typing instruction to the students. Rowe's instruction was provided during a summer class, while Yuen's study provided typing instruction during the time allotment for language arts instruction during the school year. With the advent of the microcomputer and word

processing in more recent years, the emphasis has been on touch typing instruction provided as a regular part of the curriculum (Craighead and Switzer, Erthal, Frankeberger, Kisner, Wetzel). The minimum major objectives of elementary keyboarding instruction should be proper fingering, stroking skill, and technique (Erthal, Frankeberger, Kisner, and Wetzel).

There has been less agreement, however, on the level of skill in the touch method of keyboard manipulation that should be required. The stroking skill that can be developed will depend heavily on the grade level at which the instruction is provided and the time allocated to the instruction. Older elementary students typically will be able to develop a higher keyboarding speed than younger students. Likewise, students provided with twenty hours of formal keyboarding instruction should be able to develop a higher speed skill than students provided only ten hours of formal instruction (Policies Commission).

Kaser (1984) reported kindergarten through third grade students were able to develop a speed of 15 to 25 words per minute while Kisner (1984) reported a speed of 20 words per minute for students of the same age group. Older students, grades four through six, should be able to achieve a stroking speed of 20 to 40 words per minute (Kaser) or 25 words per minute (Kisner). Wetzel (1985) recommends that for elementary students to have a usable skill, they should be able to type faster than their handwriting speed which is usually 7 to 10 words per minute for intermediate grade students, grades four through six. West (1986) believes that a skill sufficient for realistic tasks requires a gross stroking speed in the mid-20s.

The literature appears to show that an elementary keyboarding instructional program provided for third grade students should be designed with a minimum stroking skills goal of 20 words per minute. If the instruction is to be provided to students in grade four, a minimum goal should be 25 words per minute. If the instruction is provided to students in grade six, perhaps 35 or 40 words per minute would be an appropriate speed goal. The age of the student should determine the speed goal of the keyboarding instruction. Therefore, the older the student when keyboarding instruction is provided, the higher the minimum stroking speed goal should be.

Time Allocation

The time allocated to keyboarding instruction will have a direct effect on the stroking speed achievement of the students. Because it is difficult, if not impossible, to add content to the elementary curriculum without replacing other content (Wetzel), designing a keyboarding curriculum that will achieve the maximum stroking speed achievement in the minimum of time becomes extremely important. Some studies have reported that elementary keyboarding instruction can be provided in as little as ten hours (Cowles and Robinson). Development of a usable keyboarding skill may, however, require more than ten hours of instruction.

In Kisner's opinion (1984), students in grades four through six can achieve a usable keyboarding skill after four or five weeks with instruction provided thirty minutes per day. Frankeberger (1985) recommends that keyboarding instruction for fourth and fifth grade students be provided in thirty-minute class periods for eight weeks.

She reports that the most limiting factor on the length of an instructional period is the student's attention span. With this in mind, younger students should be provided keyboarding instruction in shorter instructional periods. Wetzel (1985) recommends that keyboarding be taught prior to sixth grade in thirty-five minute instructional periods for twenty days.

No matter what length of instructional period or duration of instruction is chosen, it must be recognized that "practice at skills must be distributed" (West). This fact may justify reducing the length of the instructional periods and lengthening the duration of instruction. This may be accomplished by providing the instruction only two or three days per week for twenty to thirty minutes per day and extending the duration of the instruction to fifteen to twenty weeks, keeping in mind the total number of hours of instruction desired. Behrman (1978) used this technique by meeting twice weekly for twelve weeks with the fifth graders in her study.

The length of time allocated to keyboarding instruction may vary greatly depending on the grade level of the students involved and the stroking speed goal desired. The structure of the elementary school day provides a variety of opportunities for incorporating this instruction into the existing curriculum. If keyboarding instruction is being provided to the students for use in language arts instruction, incorporating the instruction into the time allocated for language arts would be quite appropriate (New York).

Materials

There are three different types of materials that are typically used in elementary keyboarding instruction: keyboard charts, keyboarding/typewriting textbooks, and keyboarding software. All three of these include drill lines for the students to practice.

Craighead and Switzer (1983) and Wetzel (1985) suggest that one effective method of introducing elementary students to the location of the keys on the keyboard is to use a paper keyboard chart. Each student would have a copy of the chart on his or her desk and could place their fingers on the home row keys and practice the correct finger reaches to the appropriate keys. Color coding could be used to match the correct key to the correct finger. Once the students recognize the location of the keys and appropriate reaches, they need to move beyond the paper keyboard to an actual typewriter or micro-computer keyboard (Craighead and Switzer).

Whether using typewriters, microcomputers, or keyboard charts, students need to have practice material to keyboard. Selection of practice material that is appropriate to a student's grade level is extremely important. Traditional typewriting textbooks are designed for secondary students who have a larger vocabulary. There are now keyboarding/typewriting textbooks on the market that are designed for the more limited vocabulary of the elementary student. Candy Colborn (1988), lists four such books along with the features and appropriate uses of each. Drill lines may also be displayed with an overhead projector and dictated by the teacher. Another excellent source of drill material is the language arts curriculum. As soon as students have developed a sufficient mastery of the alphabetic keyboard, words

from spelling lessons may be used for drill material and students may be encouraged to compose (Kaake).

Computer software may be used to introduce the keyboard or provide extra drill (Craighead and Switzer). Sormunen (1986) classified keyboarding software into two categories: computer-based educational game format software and keyboarding software using psychological motor skill theory. Her study showed "that the method of keyboard presentation using psychological motor skill development theory produced higher scores on typewriting speed achievement" (1986). Students may also use word processing software to enter exercises from a text and provide additional drill (Sormunen).

Summary

The literature does show that the language arts skills of students should show significant improvement in students who use a typewriter-like keyboard in their language arts program. Educational use of microcomputers and word processing in the 1980's has caused an increased need for students to be able to interact efficiently with a typewriter-like keyboard. Keyboarding is now understood to be a subset of typewriting with the emphasis on input and stroking skill. Upper elementary students should be taught the touch method of keyboard use in formal keyboarding instruction, with a usable keyboarding stroking skill goal appropriate to the grade level, using materials appropriate for elementary students. The instructor must have a strong background in typing techniques and needs to relate well to elementary age students (Frankeberger).

Hinson and Dickey (1984) state that for the "students in today's classroom . . . keyboarding is mandatory!" From Wetzel's point of view "Keyboarding instruction is an investment in more efficient learning."

CHAPTER III

METHODOLOGY

The purpose of the study was to provide information that can be used for curriculum improvement. The effectiveness of keyboarding instruction, related to keyboarding speed and technique skill, will affect keyboarding use in the upper elementary grades and will ultimately affect the typewriting curriculum in the secondary schools. The academic achievement of the students who learn keyboarding may impact curriculum development in the academic areas.

This methodology chapter is organized into four sections: (1) design, (2) procedures, (3) description of the sample, and (4) data analysis. The first section describes the experimental design that was used in this study. The second section itemizes the procedures that were followed in conducting the study, including the sample selection, keyboarding instruction and data collection. The third section describes the random sample, and the last section explains the statistical measurements used in analyzing the data.

Design

In this study a quasi-experimental design (Hillestad) was used to compare the academic achievement, keyboarding speed skills, and keyboarding technique skills between students in the experimental and

26

control groups. Academic achievement, keyboarding speed, and technique skills of male and female students in the experimental group were also compared. Keyboarding speed and technique skills of students in the experimental group were also reported according to the age in months of the students. The correlation between keyboarding speed and academic achievement was also examined.

The students in the experimental group received fifteen weeks of formal keyboarding instruction taught by the regular elementary classroom teacher. The instruction was provided, by the regular classroom teacher, during the fall semester of the 1988-1989 school year to third grade students in the Wichita Public Schools who were selected to be in the experimental group. The students in the control group, also third grade students in the Wichita Public Schools, received no formal keyboarding instruction, but did use the computer for various instructional activities during the school year.

Procedures

In April, 1988 the researcher presented the proposal for this study to the Research Council of the Wichita Public Schools. The approval of the research council was necessary in order to include students in the Wichita Public Schools as subjects in the study. This approval provided access to routine school district data as needed. The research council granted approval for the study to proceed.

In August, 1988 a letter was sent to each of the third grade teachers in the Wichita Public Schools which explained the purpose of the study, asked whether the teacher would be willing to participate, whether he/she planned to teach keyboarding during the 1988-1989 school

year, and whether the school in which he/she teaches maintains a computer lab. A copy of this letter is included in Appendix A. Of the 156 letters mailed, 78 teachers responded, 77 teachers did not respond, and one was returned as undeliverable. These 78 responses represented a 50 percent return of the 156 letters mailed. Twelve of the 78 responses were received too late to be considered in the sample. The remaining 66 teachers' responses were divided into three groups: (1) those who were willing to participate and intended to teach keyboarding, (2) those who were willing to participate and did not intend to teach keyboarding, and (3) those who were not willing to participate. The group one responses were further divided into two groups based on whether or not that teacher's school maintained a computer lab. Table I shows the number of teachers in each of the resulting groupings.

The experimental group was selected from the 38 teachers who indicated a willingness to participate, who intended to teach keyboarding, and whose school maintained a computer lab. The control group was selected from among the seven teachers who indicated a willingness to participate and did not intend to teach keyboarding.

TABLE I

RESPONSE FROM THIRD GRADE TEACHERS
IN THE WICHITA PUBLIC SCHOOLS

Willing to Participate in the Study and Planned to Teach Keyboarding	
School had a computer lab	38
School did not have a computer lab	1
Willing to Participate in the Study and Did Not Plan to Teach Keyboarding	7
Not Willing to Participate in the Study	20
Response received too late to include in the study	12
No Response	77
Returned as Undeliverable	1
Total Number of Third Grade Teachers	156

Sample Selection

The population of the study included all third graders in the Wichita Public Schools. Because of the large number of third grade students in the school district, a sample was selected. The sample size was determined by the following formula:

$$N = \left(\frac{z}{e} \right)^2 (p)(1-p)$$

where N is the sample size; z is the standard score corresponding to a given confidence level; e is the amount of tolerable sampling error in a given situation; and p is the proportion of cases in the population (Sax). Given an acceptable confidence level of 95 percent (z = 1.96), sampling error allowance of 4.5 percent, and proportion of cases in the population of 25 percent based on an estimate that 25

percent of the students in the Wichita Public Schools were receiving keyboarding instruction in the third grade, the sample size would be calculated as:

$$N = \left(\frac{1.96}{.045} \right)^2 (\ .25 \ ) \ (\ 1 \ - \ .25 \ )$$

This calculates to a sample size of approximately 356 students. Assuming an average class size of 24 students, this sample size equates to approximately fifteen classrooms. Six classes made up the control group and nine classes made up the experimental group.

Because of the diversity of the Wichita community and the elementary schools in the Wichita Public Schools, the sample was selected using a stratified random sample (Van Dalen and Meyer). Demographic information was obtained from the Coordinator of Administrative Research of the Wichita Public Schools. The March 28, 1988 report to the federal government for the 1988-89 selection of Chapter I attendance centers, ranked the 68 elementary schools by the percent of students who received free lunches. Because the major determining factor for students to receive free lunches was family income, these data were considered accurate in identifying the approximate percent of low income students in each school.

Using the May, 1988 enrollment of each school, the number of students expected to receive free lunches at each school during the 1988-89 school year was calculated by multiplying this enrollment figure by the percent of students who were receiving free lunches, and a list was created which ranked the schools by the expected number of low income students per building. The ranked list was then divided into three groups, such that each group contained an approximately

equal number of low income students. The list of schools in each group and the approximate number and percent of low income students per group is included in Appendix B.

The teachers who were willing to participate in the experimental group were placed into three groups, numbered in alphabetical order by teacher last name, according to the group in which their school was placed. The seven teachers who were willing to participate in the control group were also placed into three groups, numbered in alphabetical order by teacher last name, according to the group in which their school was placed. Table II shows the breakdown of teachers in each group.

TABLE II

TEACHERS WILLING TO PARTICIPATE IN THE STUDY
BY GROUP

	Experimental	Control
Group 1	7	2
Group 2	12	2
Group 3	19	3
Total Number of Teachers	38	7

From the 38 teachers in the experimental groups, three of the teachers from each group were randomly selected using tables of random numbers generated with SYSTAT (Wilkinson). Because only two teachers were included in groups 1 and 2 of the control group, all of them were selected to be in the control group. Of the three teachers in group 3 of the control group, one received a teaching assignment change and was no longer scheduled to teach third grade. Therefore, the remaining two

teachers were included in the control group. The 15 schools whose teachers were selected through the random sample to participate in the research are identified in Appendix B. A breakdown of the expected percent and number of low income students per school and group is located in Appendix B.

Students were selected for participation in the study on the basis of the teacher to whom they were assigned for the 1988-1989 school year and whose parents consented to their child's participating in the study. No attempt was made to influence the placement of students in the classes.

The 15 teachers were notified, by telephone, of their selection to participate in the study and were asked to attend an evening meeting to clarify their role in the study. A letter was sent to the principal of each of the 15 schools explaining the study, notifying the principal of the teacher whose class would be participating in the study, and asking for the principal's support of the participating teacher. The remaining 43 teachers were notified in writing that they were not selected in the random sample and would, therefore, not be participating in the study. A copy of these letters is included in Appendix A.

Keyboarding Instruction

Teachers whose classes were selected to be included in the experimental group met together in September for clarification of the intent of the study, use of the materials provided, and methodology in teaching keyboarding. This was an attempt to standardize the unit of keyboarding instruction in the experimental group. At this meeting the keyboarding kit, which contained the instructional materials, was

reviewed. The teachers were already familiar with this kit and used this opportunity to share experiences and teaching suggestions. They were instructed to contact the Instructional Computing Services of the Division of Data Processing in the Wichita Public Schools to obtain additional materials for their kit or to acquire additional copies of instructional software for keyboarding. Teachers whose classes were selected to be included in the control group met together in September for clarification of the intent of the study and their role as teachers in the control group.

The unit of instruction was specified to be concluded within fifteen weeks from its start. Teachers were free to start the instruction anytime during September and conclude the unit by the end of the first semester of the school year, approximately January 15, 1989. The 28 lessons of the keyboarding materials were to be taught in sessions of fifteen to twenty minutes no more than three days per week. Materials to be used included: ROCK chart, Key in on Keyboarding by Carson-Dellosa Publishers, Inc., the keyboarding diskette for the Apple computer which was produced by the Wichita Public Schools, and Typing Tutor II by Microsoft. These materials were provided by the Curriculum Division of the Wichita Public Schools in the kit of materials for keyboard instruction. Introduction of new keys was presented using the ROCK chart with drill lines from Key in on Keyboarding. Only the teacher had a copy of the Key in on Keyboarding book. All copy for student drills was provided using transparencies to display the drill lines with the teacher modeling the technique, correct hand position, keystroking action, and finger reaches at the overhead projector. The student would then imitate the technique, hand position, keystroking,

and finger reaches at their desk using a paper keyboard chart, the ROCK chart. A copy of the ROCK chart, sample drill lines, and the sequence of letters introduced in the lessons are included in Appendix F. Reinforcement of the drill lines was provided with the keyboarding diskette for the Apple computer and Typing Tutor II. As soon as the students had learned a sufficient number of alphabetic keys, the teachers were encouraged to use spelling words and vocabulary words from other subjects as additional drill material for the students.

Data Collection

Prior to the beginning of the 1988-89 school year, the academic achievement of the students in the experimental and control groups were pre-tested using the ITBS test. This test was administered by the regular classroom teacher in April, 1988.

During September, 1988, data regarding the name, gender, birth-date, and special education coding of each of the students in both the experimental and control groups was obtained from class list printouts provided by the Division of Data Processing of the Wichita Public Schools.

Also during September, 1988, each of the 15 teachers participating in the study sent a consent form home with each student, as required by the policies of the Wichita Public Schools. The parent or guardian of the student was to sign the form and return it to the classroom teacher. Data were collected only for students who returned a signed consent form. A copy of the consent form is included in Appendix A. Table III shows the number of students in each class during the fall, 1988 semester and the number of signed consent forms returned.

TABLE III

NUMBER OF STUDENTS PER CLASS
AND CONSENT FORMS RETURNED

	Total Number of Students	Number of Consent Forms Returned
Class 1	26	23
Class 2	24	18
Class 3	25	23
Class 4	27	19
Class 5	19	17
Class 6	23	19
Class 7	24	23
Class 8	20	20
Class 9	20	19
Class 10	18	16
Class 11	21	18
Class 12	16	13
Class 13	23	21
Class 14	29	20
Class 15	23	18
Total Students	338	287

On the consent form, each parent was asked to indicate whether they had a computer in their home and, if so, whether their student used the computer for school work. Table IV shows the responses of the parents regarding a computer in the home.

TABLE IV

RESPONSE OF PARENTS REGARDING HOME COMPUTERS

	Had a Computer	Did Not Have a Computer	No Response
Class 1	2	15	6
Class 2	1	17	0
Class 3	0	22	1
Class 4	1	17	1
Class 5	2	15	0
Class 6	3	16	0
Class 7	9	12	0
Class 8	5	15	0
Class 9	1	5	13
Class 10	1	13	2
Class 11	3	15	0
Class 12	4	9	0
Class 13	2	18	1
Class 14	1	19	0
Class 15	5	12	1
Totals	40	220	27

Of the 260 who responded, the 40 who did have a computer in the home represented only 15.4 percent. Of these 40 students who did have a computer in the home, Table V shows how many of them used the computer for school work.

TABLE V

STUDENTS WHO USED A HOME COMPUTER
FOR SCHOOL WORK

	Number	Percent
Did Use Home Computer for School Work	6	15.0
Did Not Use Home Computer for School Work	33	82.5
No Response	1	2.5
Total	40	100.0

The keyboarding instruction was provided by the classroom teacher during the first semester of the school year. After the end of the semester, near the end of January, the keyboarding technique of the students in both the experimental and control groups was observed while the students completed the timed writing test on the Apple IIe computers in the computer lab of each school. In schools that did not maintain a computer lab, six or more computers were moved together in a classroom or library for use in conducting these observations and timings.

During these observations, the researcher recorded a score of zero to four on each of the four categories of the technique evaluation checklist: position at machine, keystroking, space bar, and return key. The scores were summed providing a total technique score of zero to 16 for each student. A copy of the technique evaluation instrument is included in Appendix D.

The timed writing test, used to determine the keyboarding speed skill of the student, consisted of four 35-character sentences. The students were instructed, in a group, in the procedures to be followed at the computers. They were also reminded of how to type capital letters and punctuation marks, and to press the return key at the end of each line. They were told to type as accurately and as quickly as possible, and to not worry about any mistakes they may make. However, if the student typed an incorrect letter, the computer beeped calling the attention of the student to the error. Many of the students did use the backspace key to back up and correct the error before proceeding. Any error corrected in this manner was not counted as an error by

the computer software. The results of the timed test completed by the students were recorded on disk. The software used, Typing Tutor IV by Simon and Schuster Inc., stored the gross words per minute and percent of accuracy for each timing. Most of the students were able to complete two timings. Due to the limited time provided for the researcher to conduct these timings, some students who typed very slowly were not able to complete a second timing. For the students who were able to complete two timings, the best of the two was used in the statistical analysis. The best timing was identified by the researcher to be the one with the greatest number of gross words per minute, provided the accuracy was at least 90 percent. If both timings scored a percent of accuracy of less than 90 percent, the one with the highest percent of accuracy was used. This method of determining the best timing was used to assure that the student made an honest attempt at typing the correct letters during the timing, while minimizing the emphasis on accuracy. The examples in Table VI demonstrate the decision making process followed by the researcher in determining the best timing. A copy of the sentences used for the timed writings is included in Appendix E.

TABLE VI

METHOD USED TO SELECT BEST TIMING
USING PERCENT OF ACCURACY
AND SPEED

Timing 1		Timing 2		Best Timing
Speed WPM	Accuracy %	Speed WPM	Accuracy %	Speed WPM
7	95	8	92	8 gwam
5	92	6	84	5 gwam
9	93	4	81	9 gwam
5	86	8	72	5 gwam
9	72	6	86	6 gwam

In April, 1989, the academic skills of the students in the experimental and control groups were post-tested using the ITBS tests which were administered by the regular classroom teacher. The results of both the pre-test and post-test were provided to the researcher on computer printouts from the Director of Pupil Evaluation and Testing of the Wichita Public Schools. Percentile ranks and grade equivalency scores were provided for each of several sub-tests of the ITBS including, vocabulary, reading, and spelling.

Description of the Sample

Of the 287 students whose parents signed consent forms, 11 students were dropped from the sample because they received special education services for physical impairments or learning disabilities. Table VII shows the remaining 276 students by gender and class in the experimental and control groups.

TABLE VII

STUDENTS IN THE EXPERIMENTAL AND CONTROL
GROUPS BY GENDER AND CLASS

| | Experimental Group | | Control Group | | Total |
	Female	Male	Female	Male	
Class 1	10	13			23
Class 2	10	7			17
Class 3	12	11			23
Class 4	9	8			17
Class 5	9	5			14
Class 6	12	6			18
Class 7	11	12			23
Class 8	14	6			20
Class 9	15	3			18
Class 10			6	10	16
Class 11			8	10	18
Class 12			4	7	11
Class 13			8	13	21
Class 14			10	10	20
Class 15			7	10	17
Total Students	102	71	43	60	276
Total Percents	36.96%	25.72%	15.58%	21.74%	100%
Total Females			145		52.54%
Total Males			131		47.46%

The birthdates of the students in the sample ranged from September 18, 1978 to November 5, 1980. As of January 31, 1989, the oldest student was 10 years and 4 months, or 124 months, old and the youngest student was 8 years and 2 months, or 98 months, old. Table VIII shows the age of the students in the sample, by class, in two-month increments. These two-month increments were used throughout the statistical analysis of the data when grouping the students by age.

TABLE VIII

STUDENTS IN THE SAMPLE BY CLASS
AND AGE IN MONTHS

| | Age in Months | | | | | | | | | | | | | | |
	97 to 98	99 to 100	101 to 102	103 to 104	105 to 106	107 to 108	109 to 110	111 to 112	113 to 114	115 to 116	117 to 118	119 to 120	121 to 122	123 to 124	Total
Class 1	0	1	2	4	2	2	3	6	1	0	1	0	0	1	23
Class 2	0	0	1	4	1	1	2	2	2	1	1	0	1	1	17
Class 3	0	0	3	0	1	3	4	4	3	2	1	0	1	1	23
Class 4	0	0	0	3	1	1	3	6	0	2	1	0	0	0	17
Class 5	0	0	2	2	1	1	2	2	2	0	1	0	1	0	14
Class 6	1	0	0	4	2	4	3	3	0	0	1	0	0	0	18
Class 7	0	1	3	2	4	2	3	5	1	1	0	1	0	0	23
Class 8	0	1	3	2	2	3	3	5	0	1	0	0	0	0	20
Class 9	0	1	2	0	3	4	2	6	0	0	0	0	0	0	18
Class 10	0	0	4	1	3	1	3	3	0	0	0	0	1	0	16
Class 11	0	0	1	3	1	2	2	3	2	1	1	1	0	1	18
Class 12	0	0	1	1	1	2	2	2	1	0	0	1	0	0	11
Class 13	0	0	2	2	2	3	3	3	4	0	2	0	0	0	21
Class 14	0	1	1	3	2	7	1	2	3	0	0	0	0	0	20
Class 15	0	0	3	1	3	4	2	1	1	1	0	1	0	0	17
Totals	1	5	28	32	29	40	38	53	20	9	9	4	4	4	276

Data Analysis

All data for independent and dependent variables were entered into and stored on microcomputer disks using SYSTAT. Various data manipulations and analysis were then performed using the Data, Statistics, Correlation, and Multivariate General Linear Hypothesis modules. The Multivariate General Linear Hypothesis module of SYSTAT is a true least squares program and could, therefore, handle the unbalanced analysis of variance designs in this research. The .05 level of significance was used in all hypothesis tests.

Hypotheses two and five, dealing with keyboarding speed skills and analyzed by treatment groups and genders respectively, were tested

with a t-test of significance. Similarly, a t-test of significance was used to test hypotheses three and six, dealing with keyboarding technique skills, by treatment and gender respectively. Hypotheses seven and eight, dealing with keyboard speed and technique skills by age, were tested with a one-way analysis of variance. This test was selected because of its ability to deal with more than two groups in the independent variable.

Hypothesis one, testing the academic achievement gains by treatment groups, was analyzed with a multivariate analysis of covariance. All three post-test dependent variables, vocabulary, reading, and spelling, were tested collectively for significance by treatment using the multivariate analysis of covariance, with all three pre-test scores used as covariates. Multivariate analysis of covariance was also used to test hypothesis four with all three pre-test scores used as covariates.

Hypothesis nine was tested using Pearson correlations of all three post-test dependent variables and the keyboarding dependent variable of keyboarding speed.

Results of these analyses are reported in Chapter IV according to the categories of keyboarding, academic achievement, and correlations.

CHAPTER IV

RESULTS OF DATA ANALYSIS

Data collected for this study included the following for each of
the 276 students in the random sample: gender; age; keyboarding
technique, speed, and accuracy; ITBS pre-test scores for vocabulary,
reading, and spelling; and ITBS post-test scores for vocabulary,
reading, and spelling. These data were collected during the 1988-1989
school year. The age data were categorized by the age in months of the
student at the time the keyboarding data were collected, with the
categories established in two-month intervals. Students who were absent
on the day that keyboarding data were collected did not have a score
for keyboarding technique, speed, and accuracy.

Scores for the pre- and post-tests on the ITBS were obtained from
computer printouts provided by the Director of Pupil Evaluation and
Testing of the Wichita Public Schools. Some individual test scores
were missing on these printouts due to absenteeism on test day or due
to student mobility into and out of the school district. The pre- and
post-test ITBS scores were reported using the grade equivalency score,
which is based on the raw score, to report the students' grade level
standing. "Grade equivalents have the advantage of simplicity and
direct meaning" (Rhea). Table IX shows the number of scores available

for each of the dependent variables by class, treatment group, and entire sample.

TABLE IX

NUMBER OF SCORES AVAILABLE FOR EACH
DEPENDENT VARIABLE

			ITBS Test Data					
	Total	Keyboarding	Vocabulary		Reading		Spelling	
Class	N	Data	Pre	Post	Pre	Post	Pre	Post
1	23	22	22	22	22	22	21	22
2	17	15	17	15	17	15	16	15
3	23	18	21	23	21	23	20	23
4	17	16	16	17	16	17	14	17
5	14	14	12	11	12	11	12	10
6	18	18	18	18	18	18	17	18
7	23	22	20	23	20	23	20	23
8	20	17	14	18	14	18	14	18
9	18	18	14	18	14	18	14	18
10	16	16	15	15	15	15	15	15
11	18	15	17	17	17	17	17	18
12	11	9	11	11	11	11	11	11
13	21	19	21	21	21	21	20	21
14	20	18	16	19	16	19	16	19
15	17	17	16	13	16	13	16	13
Experimental	173	160	154	165	154	165	150	164
Control	103	94	96	96	96	96	95	97
Total N	276	254	250	261	250	261	245	261

The data analyses is reported in this chapter according to the following three categories: (1) keyboarding, (2) academic achievement, and (3) correlation between keyboarding skills and academic achievement.

Keyboarding

Keyboarding data were collected from 254 third grade students in
the random sample; another 22 students in the sample were absent on the
day data were collected. A Pearson correlation was calculated to
determine the correlation of the three components of keyboarding skill
measured. Table X shows the results of this calculation.

TABLE X

PEARSON CORRELATION MATRIX OF KEYBOARDING
SPEED, ACCURACY, AND TECHNIQUE

	Correlation Coefficient	
	r	r^2
Speed		
Accuracy	0.169	0.029
Technique	0.323	0.104
Accuracy		
Technique	0.038	0.001

N = 254

A positive correlation was found among all three keyboarding
variables. The strongest correlation, 0.323, was between technique and
speed. The value of r^2 indicates that approximately 10 percent of the
variability in speed was associated with the variability in technique.
Although these findings show no direction to this correlation, Robinson
(1979) reports that "skillful technique is the best guarantee of
combined speed and accuracy." A weaker positive correlation, 0.169,
was found between accuracy and speed. Robinson (1979) and West (1983)
support these results with current research regarding the negligible
correlation between accuracy and speed.

Results of Technique Data

The technique scores of the students ranged from 1 to 14, with the maximum possible score being 16. The overall mean technique score was 6.4. Variances in technique scores were examined by treatment, gender in the experimental group, and age in the experimental group.

While collecting these data, the researcher noted the difficulty experienced by the students in demonstrating techniques due to the height of the keyboard in relation to the height of the seat of the chair and the size of the student. Many students were unable to place their feet on the floor because the chair was too high. Some students sat on their feet in order to raise their body to a better height in relation to the keyboard. For many students, the keyboard was shoulder high. This physical constraint makes good technique development nearly impossible.

Table XI shows the range, mean, and standard deviation of the technique scores by treatment group.

TABLE XI

RANGE, MEAN, AND STANDARD DEVIATION OF
TECHNIQUE SCORES BY TREATMENT

Treatment	N	Minimum	Maximum	Mean	Standard Deviation
Experimental	160	2	14	8.4	2.66
Control	94	1	12	2.9	1.56

The control group appeared to have a much smaller technique mean than the experimental group, with a difference of 5.6. The analysis of this difference is shown in Table XII using the t-test of significance at the .05 level.

TABLE XII

TEST OF SIGNIFICANCE OF TECHNIQUE SCORES
BETWEEN TREATMENT GROUPS

Treatment	N	Mean	T-Statistic	df	p-value
Experimental	160	8.4	18.547*	252	0.00
Control	94	2.9			

*Significant at the .05 level

The t-statistic of 18.547 in Table XII indicates a significant difference, at the .05 level, in mean technique scores between the two treatment groups. Therefore, null hypothesis three, no significant difference in the keyboarding technique skills acquired by the control and experimental groups, is rejected. The probability of 0.00 indicates a nearly 100 percent level of confidence in support of the rejection of the null hypothesis.

The technique scores of the students in the experimental group were also examined, through a t-test of significance at the .05 level, according to the gender of the student. Table XIII reveals the results of this analysis.

TABLE XIII

TEST OF SIGNIFICANCE OF TECHNIQUE SCORES
BETWEEN GENDERS IN THE
EXPERIMENTAL GROUP

Group	N	Mean	T-Statistic	df	p-value
Male	66	8.0	1.632	158	0.105
Female	94	8.7			

Mean technique scores of the males and females in the experimental group differed by 0.7 in favor of the females. This difference was not, however, significant at the .05 level as indicated by the t-statistic of 1.632. Therefore, hypothesis six of no significant difference in the keyboarding technique skills acquired by the males and females in the experimental group was not rejected.

Analysis of variance was used to compare the mean technique scores of students of various ages in the experimental group. The students in the experimental group were placed into fourteen categories according to their ages in months at the time the keyboarding data were collected. Table XIV reveals the results of the analysis.

TABLE XIV

ANALYSIS OF VARIANCE OF TECHNIQUE SCORES
AMONG STUDENTS OF VARIOUS AGES
IN THE EXPERIMENTAL GROUP

Source of Variation	Sum of Squares	df	Mean Squares	F	p-value
Age	160.509	13	12.347	1.87*	0.038
Error	962.866	146	6.595		

* Significant at the .05 level

Table XIV reveals an F value of 1.87 and a probability of 0.038 indicating a significant difference in the mean technique scores among students of various ages in the experimental group. Therefore, null hypothesis eight, no significant difference in the keyboarding skills acquired by students of various ages in the third grade, was rejected. Further analysis revealed that eight different pairs of age groups were responsible for this statistical difference. However, there appeared to be no clear distinction as to whether older or younger students scored higher technique scores.

Results of Speed Data

Speed scores of the students in the sample ranged from 1 to 17 words per minute, with an overall mean of 5.52. Variances in speed scores were examined by treatment, gender in the experimental group, and age in the experimental group.

Table XV shows the detail of the range, mean, and standard deviation of the speed scores by treatment.

TABLE XV

RANGE, MEAN, AND STANDARD DEVIATION
OF SPEED SCORES BY TREATMENT

Treatment	N	Minimum	Maximum	Mean	Standard Deviation
Experimental	160	1	17	5.73	2.81
Control	94	2	15	5.15	2.05

The mean speed score difference of 0.58 words per minute, in favor of the experimental group, was found to not be a significant difference at the .05 level. Table XVI reports a t-test of significance of 1.754.

TABLE XVI

TEST OF SIGNIFICANCE OF SPEED SCORES
BETWEEN TREATMENT GROUPS

Treatment	N	Mean	T-Statistic	df	p-value
Experimental	160	5.73	1.754	252	0.081
Control	94	5.15			

Based on the t-test of significance in Table XVI, hypothesis two, no significant difference in the keyboarding speed scores acquired by the control and experimental groups, was not rejected.

Speed scores of students of different genders were examined through a t-test of significance and the results reported in Table XVII.

TABLE XVII

TEST OF SIGNIFICANCE OF SPEED SCORES
BETWEEN GENDERS IN THE
EXPERIMENTAL GROUP

Group	N	Mean	T-Statistic	df	p-value
Male	69	5.89	0.613	158	0.541
Female	94	5.62			

Mean speed scores differed by 0.27 words per minute between males and females. Based on this difference, Table XVII reports a t-

statistic of 0.613, which was not significant at the .05 level. Therefore, null hypothesis five, no significant difference in the keyboarding speed skills acquired by the males and females in the experimental group, was not rejected.

Analysis of variance was used to examine the differences in mean speed scores by students of various ages in the experimental group. The analysis, shown in Table XVIII, reveals an F of 0.835 which was not significant at the .05 level. Therefore, hypothesis seven, no significant difference between in the keyboarding speed scores acquired by students of various ages in the experimental group, was not rejected.

TABLE XVIII

ANALYSIS OF VARIANCE OF SPEED SCORES
AMONG STUDENTS OF VARIOUS AGES
IN THE EXPERIMENTAL GROUP

Source of Variation	Sum of Squares	df	Mean Squares	F	p-value
Age	86.735	13	6.672	0.835	0.623
Error	1166.709	146	7.991		

Academic Achievement

Academic achievement was measured through grade level equivalency reported on the Iowa Test of Basic Skills. Pre- and post-test grade equivalency scores were recorded for the vocabulary, reading, and spelling sub-tests of the ITBS. Because of the selection of a stratified random sample of a relatively large size, it was appropriate to assume that the group variances were homogeneous.

A multivariate analysis of covariance was used to test hypothesis one, no significant difference in the academic achievement gains between the control and experimental groups with the vocabulary, reading, and spelling pre-tests used as the covariates.

TABLE XIX

MULTIVARIATE ANALYSIS OF COVARIANCE OF
ACADEMIC ACHIEVEMENT GAINS WITH
PRE-TEST SCORES AS COVARIATES
BY TREATMENT GROUPS

Test	F	df	p-value
Wilks' Lambda	0.496	3, 223	0.686
Pillai Trace	0.496	3, 223	0.686
Hotelling-Lawley Trace	0.496	3, 223	0.686

As reported in Table XIX, all three tests show an F of 0.496 which does not represent a significant difference at the .05 level. Therefore, null hypothesis one was not rejected.

Hypothesis four, no significant difference in the academic achievement gains between males and females in the experimental group, was tested using a multivariate analysis of covariance with the academic achievement pre-test scores of vocabulary, reading, and spelling as covariates. The results of this analysis are shown in Table XX.

All three tests in Table XX report an F of 3.167 which represents no significant difference between the mean academic achievement gains by genders in the experimental group. Therefore, null hypothesis four was not rejected.

TABLE XX

MULTIVARIATE ANALYSIS OF COVARIANCE OF ACADEMIC
ACHIEVEMENT GAINS WITH PRE-TEST SCORES
AS COVARIATES BY GENDER IN THE
EXPERIMENTAL GROUP

Test	F	df	p-value
Wilks' Lambda	3.167	3, 135	0.027
Pillai Trace	3.167	3, 135	0.027
Hotelling-Lawley Trace	3.167	3, 135	0.027

Data representing the range of pre- and post-test scores for each of the three sub-tests of the Iowa Test of Basic Skills are reported in the following sections. Having established the fact that there was no significant difference in academic achievement gains between treatment groups and between genders in the experimental group, these data are provided as informational.

Vocabulary Data

Pre- and post-test grade equivalency scores for the vocabulary portion of the ITBS are reported in Table XXI by treatment group. The lowest pre-test score on the vocabulary sub-test was grade 1.0 and the highest score was grade 6.6 with an overall mean of grade 3.28. The breakdown of these ranges is described in Table XXI.

By contrast, the lowest post-test score on the vocabulary sub-test was grade 1.3 and the highest score was grade 7.1 with a mean grade of 4.12. These data showed an increase from pre-test to post-test as would be expected. This increase from pre- to post-tests would indicate a possible positive correlation between these two dependent variables. This correlation is verified in Table XXII with r^2

indicating a 51.3 percent and 54.9 percent anticipated relationship between pre- and post-test scores for the experimental and control groups respectively.

TABLE XXI

RANGE, MEAN, AND STANDARD DEVIATION OF PRE-
AND POST-TEST VOCABULARY SCORES
BY TREATMENT

Treatment	N	Minimum	Maximum	Mean	Standard Deviation
Pre-Test					
Experimental	154	1.0	5.7	3.16	1.06
Control	96	0.8	6.6	3.47	1.26
Post-Test					
Experimental	165	1.3	7.1	4.05	1.11
Control	96	2.3	6.4	4.22	0.94

TABLE XXII

CORRELATION OF PRE-TEST AND POST-TEST
VOCABULARY SCORES BY TREATMENT

Treatment	N	Correlation Coefficient r	r^2
Experimental	147	0.716	0.513
Control	89	0.741	0.549

Reading Data

Pre- and post-test grade level equivalency scores on the reading sub-test of the ITBS are reported in Table XXIII. The lowest pre-test score was grade K.6, kindergarten plus 0.6, with the highest score of

grade 6.7 in both the experimental and control groups. The overall

mean grade level equivalency of the reading scores was 3.192.

TABLE XXIII

RANGE, MEAN, AND STANDARD DEVIATION OF PRE-
AND POST-TEST READING SCORES
BY TREATMENT

Treatment	N	Minimum	Maximum	Mean	Standard Deviation
Pre-Test					
Experimental	154	1.1	6.7	3.18	1.15
Control	96	0.6	6.7	3.22	1.33
Post-Test					
Experimental	165	0.5	6.5	4.14	1.12
Control	96	1.6	7.0	4.13	1.21

Post-test reading scores ranged from kindergarten plus 0.6 for a

low to a high of grade 7.0 with an overall mean of 4.139. This

increase from pre- to post-test would indicate a possible positive

correlation between these two variables. Table XXIV shows the results

of a Pearson correlation on these two variables.

TABLE XXIV

CORRELATION OF PRE-TEST AND POST-TEST
READING SCORES BY TREATMENT

Treatment	N	Correlation Coefficient r	r^2
Experimental	147	0.759	0.576
Control	89	0.810	0.656

Table XXIV reveals a strong positive correlation between pre- and post-test reading scores in both the experimental and control groups. Both of these correlations are stronger than those reported for vocabulary scores.

Spelling Data

Table XXV shows a breakdown of the pre- and post-test grade level equivalency scores for the spelling sub-test of the Iowa Test of Basic Skills. The pre-test scores showed a low of grade kindergarten plus 0.8, a high of grade 6.4 in both the experimental and control, and an overall mean of 3.1. This is the lowest overall mean of the three sub-tests examined.

TABLE XXV

RANGE, MEAN, AND STANDARD DEVIATION OF PRE-
AND POST-TEST SPELLING SCORES
BY TREATMENT

Treatment	N	Minimum	Maximum	Mean	Standard Deviation
Pre-Test					
Experimental	150	0.8	6.4	3.09	1.19
Control	95	0.8	6.4	3.12	1.21
Post-Test					
Experimental	164	1.4	6.8	4.31	1.06
Control	97	1.8	6.8	4.28	1.06

As was shown in the previous two sub-tests examined, the lowest and highest post-test scores are higher than the pre-test scores. Note that the experimental and control groups had the same maximum grade level equivalency. This was true on both the pre-test and post-test.

Table XXVI reports the results of a Pearson correlation on the pre- and post-test spelling scores by treatment.

TABLE XXVI

CORRELATION OF PRE-TEST AND POST-TEST
SPELLING SCORES BY TREATMENT

Treatment	N	Correlation Coefficient r	r^2
Experimental	142	0.703	0.494
Control	89	0.748	0.560

While Table XXVI reports a strong correlation between pre- and post-test scores in both the experimental and control groups, it is not as great as that of the reading scores.

Correlation Between Keyboarding Skills

And Academic Achievement

Testing hypothesis nine required a Pearson correlation between the dependent keyboarding variable of speed and the three post-test dependent variables of academic achievement. Table XXVII shows the detail of this analysis as well as correlations between all keyboarding and post-test dependent academic achievement variables.

Note that all correlations are positive with varying degrees of strength. West (1983) states "correlation coefficients between .20 and -.20 denote a negligible relationship, too low to have any practical utility." All correlations reported in Table XXVII are above .20. The correlations of technique to the three academic achievement areas are smaller than those of speed to the three academic achievement areas.

The strongest among these correlations is the correlation between speed and spelling, with 16.5 percent of the variability in speed scores associated with the variability in spelling scores.

TABLE XXVII

CORRELATION BETWEEN KEYBOARDING SKILLS
AND ACADEMIC ACHIEVEMENT

Dependent Variables	r	r^2
Technique		
Vocabulary	0.282*	0.080
Reading	0.307*	0.094
Spelling	0.248*	0.062
Speed		
Vocabulary	0.351*	0.123
Reading	0.364*	0.132
Spelling	0.406*	0.165
Vocabulary		
Reading	0.817*	0.667
Spelling	0.559*	0.312
Reading		
Spelling	0.605*	0.366

N = 152

*Significant at the .05 level (p < .01)

Snedecor and Cochran (1967) report a more scientific method of testing a null hypothesis which involves a correlation. Using the degrees of freedom of N-2, a table is provided for significance levels of .05 and .01. According to the table, for degrees of freedom of 150 and a .05 level of significance, the critical correlation coefficient is 0.159. Using this table, all correlations reported in Table XXVII were significant at the .05 level. In addition, the critical correla-

tion coefficient for significance at the .01 level is 0.208, thus showing all correlations reported in Table XXVII to be significant at the .01 level. Therefore, hypothesis nine, no significant correlation between keyboarding speed skills and academic achievement of the students in the experimental group, was rejected.

The strongest correlations reported in Table XXVII were among the three academic achievement dependent variables, with the strongest, 0.817, between vocabulary and reading. This analysis reports that 66 percent of the variability in vocabulary scores was associated with variability in reading scores. Review of literature in this field supports this finding.

Summary

Analysis of keyboarding technique scores revealed gender of students in the experimental group was not a significant predictor of technique. However, keyboarding instruction did result in significantly higher technique scores. Age groupings of the students in the experimental group did show a significant difference in variance between groups, but additional analysis did not show a pattern to this difference.

Speed scores ranged from 1 to 17 words per minute with an overall mean of 5.52 words per minute. Students in the experimental group did score a greater number of words per minute on the average, but analysis showed that the difference was not statistically significant. Gender and age of the students in the experimental group did not prove to be a significant predictor of keyboarding speed.

Although post-scores in the three areas of academic achievement measured, vocabulary, reading, and spelling, did show an increase over the pre-test scores, this difference was not statistically significant between the treatment groups. Gender of the students in the experimental group also did not prove to be a significant predictor of academic achievement in vocabulary, reading, and spelling.

A significant positive correlation was shown between keyboarding speed skills and academic achievement in vocabulary, reading, and spelling. Although this correlation test does not indicate a cause and effect between these variables, a relationship does appear to exist between the variables. Of the three correlations, the one between keyboarding speed and spelling achievement was the greatest with a correlation coefficient of 0.406.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The rapid growth of microcomputer use in education has brought a heightened awareness of the need for children to be able to efficiently use a keyboard prior to the traditional high school typewriting course. As a result, keyboarding is being taught in elementary school classrooms more often today than at any time in history. Development of keyboarding curriculum guidelines for elementary schools and preparation of elementary teachers to teach keyboarding have not kept pace with the implementation of keyboarding instruction. What has resulted is keyboarding instruction based on the desires and interests of the teachers rather than a scientific approach to keyboarding instruction based on sound philosophy of psycho-motor skill development.

Research shows that elementary students who learn to use a keyboard should show greater gains in reading, spelling and other language arts skills than those students who do not use the keyboard. The goals for elementary keyboarding instruction should vary depending on the age of the student. Third grade students should be able to achieve a minimal speed skill while developing excellent technique skills. Older students should be able to further develop technique skills and gain an even greater speed skill than third grade students. Experts in the field of typewriting instruction believe that technique

development is the foundation on which the development of keyboarding speed is built.

Purpose and Design of the Study

The purpose of this study was to provide information that can be used for curriculum improvement. The effectiveness of keyboarding instruction, related to keyboarding speed and technique skill, will affect keyboarding use in the upper elementary grades and will ultimately affect the typewriting curriculum in the secondary schools. The academic achievement of the students who learn keyboarding may impact curriculum development in the academic areas.

A quasi-experimental design was used to draw a sample of fifteen third grade classrooms from among the 68 elementary schools in the Wichita Public Schools such that the sample would be representative of the diverse population of the Wichita Public Schools. Nine of the classes where the teachers taught keyboarding were designated as the experimental group. The other six classes were designated as the control group and the students were not taught keyboarding.

Data Collected

Academic achievement in the areas of vocabulary, reading, and spelling were measured with the grade equivalency scores from the Iowa Test of Basic Skills. Because this test is part of the annual testing program in the Wichita Public Schools, test scores from the April, 1988 testing were available to be used as the pre-test. The April, 1989 test scores were used as the post-test.

Because the keyboarding instruction was to be completed during the fall semester of the 1988-1989 school year, keyboarding speed and technique skills were evaluated by the researcher at the end of the semester. Students typed four 35-character sentences at Apple IIe microcomputers using Typing Tutor IV software. The software recorded gross words per minute and percent of accuracy scores for each timing. While the students were completing the timings, the researcher recorded technique scores for each student. These data were used to determine the keyboarding speed and technique skills of the students.

Related Literature

The approach taken in this study for the review of related literature was to research the reasons why keyboarding might be taught in elementary schools and the appropriate methodology which might be used in this instruction.

Studies showed that elementary students who learned to use a keyboard experienced a greater growth in academic achievement in the language arts area. Technological advancements that made computer technology more cost effective for schools resulted in more equipment available with which to teach keyboarding to students. Keyboarding itself was defined, as a result of increased use of microcomputers in the schools, to be the act of placing information into various types of equipment through the use of a typewriter-like keyboard. Computer literacy curricula and the increased development and use of word processing further substantiated the need for keyboarding instruction with elementary children.

No firm standard has been set for the correct placement of keyboarding in the elementary curriculum, although third or fourth grade seems to be appropriate. Instruction is typically provided by the elementary classroom teacher who is not certified in keyboarding. Although no standardization exists in elementary keyboarding objectives throughout the country, research indicates that technique development should be a primary objective early in the instruction. With proper drills, speed development will naturally follow the development of excellent technique. Instruction should be provided in some consistent fashion in sessions of fifteen minutes or more per day with two or more sessions per week. Materials used in keyboarding instruction usually include a published textbook with drill lines providing the proper sequential introduction to the keyboard. These drill lines may be practiced on a typewriter or a microcomputer with appropriate software and should contain vocabulary appropriate for the grade level.

Results of the Study

The findings of the study are summarized in three sections: keyboarding, academic achievement, and correlation between keyboarding and academic achievement.

Keyboarding

Keyboarding speed and technique data were collected from 254 students in the sample. The experimental group consisted of 160 students with 94 students in the control group.

Technique scores ranged from 1 to 14 with the maximum possible score being 16. Students in the experimental group showed a mean technique score of 8.4 while the control group scored a mean of 2.9.

Females in the experimental group showed a mean technique score of 8.7 which was slightly higher than the mean technique score of the males of 8.0.

Students in the experimental group ranged in age from 8 years 1 month to 10 years 4 months and were grouped by two month increments. Although the data showed variances in the technique scores of the students in these age groups, there appeared to be no clear distinction as to whether older or younger students scored higher. The age of the students appeared not to be a predictor of keyboarding speed.

Speed scores of the students in the sample ranged from 1 to 17 words per minute, with an overall mean of 5.52. The students in the experimental group scored a slightly higher mean of 5.73 words per minute than the control group which had a mean of 5.15 words per minute.

The males in the experimental group scored a mean speed of 5.89 words per minute which was slightly higher than the mean speed of the females of 5.62 words per minute.

Academic Achievement

Grade level equivalency as reported on the Iowa Test of Basic Skills was used for the data analysis in vocabulary, reading and spelling. Gender in the experimental group did not appear to be a predictor of academic achievement.

A small difference was shown between the grade equivalency
increase from pre- to post-test in the experimental group over the
control group in vocabulary mean scores. The experimental group
experienced a mean increase of .89 while the control group mean
increased by .75. Reading mean scores showed a similar improvement.
The experimental group showed an increase of .96 from pre- to post-test
while the control group increased .91. Spelling mean scores increased
1.22 from pre- to post-test in the experimental group, and 1.16 in the
control group. Although these increases from pre- to post-test were
not significantly greater in the experimental group than in the control
group, it should be noted that the experimental group did score greater
increases in all three academic areas measured than did the control
group.

Correlation Between Keyboarding and

Academic Achievement

Data analysis revealed positive correlations of varying strengths
among the two keyboarding skills and three academic achievement areas
measured. Keyboarding speed showed greater correlation to all three
academic areas than technique. Although this correlation is itself a
significant finding, paired with the greater increases from pre- to
post-test shown by the experimental group, some support is shown for
the previous research findings of Wood, Rowe, Yuen, Unzicker, Tate, and
Behrman.

Conclusions

The following conclusions are based on the findings of the study and may be generalized only to students in the third grade who are taught keyboarding using the same materials and methodology as those in this study.

(1) Students in the third grade are physiologically capable of developing keyboarding skill. They can learn and demonstrate proper keyboarding techniques and begin the development of keyboarding speed skills.

(2) Students in third grade who learn keyboarding may be expected to show greater improvement in their academic achievement in vocabulary, reading, and spelling than students who do not learn keyboarding. Because of the correlation between keyboarding speed and the three areas of academic achievement measured, students who achieve a greater keyboarding speed skill will likely show a greater improvement in the three academic areas.

(3) Male and female students have an equal chance of being successful in developing keyboarding technique and speed skills.

(4) The age of the third grade student does not affect his or her ability to develop keyboarding technique and speed skills.

Recommendations

The following recommendations are based on this study and related literature:

(1) Keyboarding should be taught to elementary students at a grade level appropriate to their need to use a typewriter-like

keyboard. This instruction could be taught successfully in third, fourth, fifth, or sixth grade.

(2) Materials and methodology for teaching keyboarding should be carefully developed for use with elementary students. Methodology should reflect accepted techniques for teaching skill development. Materials used should be developed that appropriately motivate elementary students and use vocabulary appropriate to the grade level where the instruction is provided.

(3) If elementary teachers are to provide the instruction, they should be instructed in the proper use of the materials, teaching methodologies, and expected learner outcomes. Local school district in-service programs, taught jointly by experienced typing teachers and elementary teachers, should be provided.

(4) Adequate time should be allocated in the elementary curriculum to allow for the inclusion of keyboarding instruction. This instructional time should not be considered as lost time in other academic areas, but as an enhancement to the development of learning in other academic areas.

(5) Development of keyboarding technique skills should be emphasized in the initial keyboarding instruction with elementary students. This should be followed consistently and in the following school years with adequate keyboarding drills to allow for the further development of speed skills.

(6) Opportunities for further development of keyboarding speed skills should be provided in the secondary schools. The current secondary typewriting curriculum should be examined and revised to

more closely meet the needs of students who have developed keyboarding skills at the elementary level.

(7) Additional research should be conducted to determine whether like results would be obtained from other samples using different instructional materials.

(8) Data from this research should be used as the base data for a longitudinal study to determine the continued keyboarding skill development of the students in this sample.

Implications

While the keyboarding instruction for this study was being taught, observations of the students were made by the teachers. These observations were reported informally to the researcher when the keyboarding data were being collected. These observations, although not reportable as findings, may provide greater understanding of the findings of this study and are reported below.

Many of the teachers reported difficulty in finding time in their demanding daily schedule to teach the keyboarding lessons. As a result, it was not possible to complete all of the lessons in one semester. Three classes in the experimental group were able to complete only about one-half of the lessons. Therefore, the keyboarding speed skill developed by the students in those classes was likely to have been far less than it could have been had all lessons been completed. This would also explain why the researcher observed so many students in the experimental group that did not know the location of some of the characters in the test sentences.

The teachers also observed that the students seemed to get bored with the repetition in the keyboarding instruction. The teachers found it helpful to provide some variety in the instruction and supplement the keyboarding lessons with other activities to keep the students' interest. Only two of the teachers reported using the keyboarding skill that was developed for creative writing activities using word processing.

The number of computers in the lab and the accessibility to the lab seemed to impact on the development of the keyboarding skill. Some of the computer "labs" were located in the library. These computers were less likely to be used effectively than those located in a self-contained computer "classroom" setting. The amount of time that the students spent at the computer building keyboarding skill had a direct impact on the development of keyboarding speed skills.

The researcher made a variety of observations during the data collection period. One such observation was the size of the furniture being used compared to the size of the students. In some cases, the computer keyboard was nearly shoulder high to the student and the student's feet could not touch the floor. This makes the development of correct keyboarding technique difficult if not impossible. Care should be taken in computer labs to provide a table height and chair height that fits the physical size of the student.

BIBLIOGRAPHY

Anderson, Timothy Earl. Traditional Method Versus Computer-Aided
    Instruction in Teaching Keyboarding Skills to Elementary School-Age
    Children, Unpublished Doctoral Thesis, University of Nebraska,
    1983.

Balajthy, Ernest. "Using Microcomputers to Teach Spelling," Reading
    Teacher, Vol. 39, No. 4, January 1986, pp. 438,443.

Bell, Terrel H. "American Education At a Crossroads," Phi Delta
    Kappan, Vol. 65, No. 8, April 1984, pp. 531-534.

Behrman, Carol H. "Developing Basic Language Skills Through Typing:
    An Experiment at the 5th Grade Level," Business Education World,
    Vol. 58, No. 5, May-June 1978, pp. 23-25.

Colborn, Candy. "Keying In On Computers," Teaching and Computers, Vol.
    5, No. 4, January 1988, p. 19.

Colwell, Beverly Ann. A Comparative Study of Microcomputer and
    Typewriter Keyboarding Skills, Unpublished Doctoral Thesis,
    University of Arkansas, 1984.

Cothran, Ann and Mason, George E. "The Typewriter: Time-tested Tool
    for Teaching Reading and Writing," The Elementary School Journal,
    Vol. 78, No. 3, January 1978, pp. 171,173.

Cowles, Milly and Robinson, Mabel C. "An Analysis of Young Children
    and Learning Keyboarding Skills," ERIC Document No. ED 278 394.

Craighead, Donna and Switzer, Mary Ellen. "Is Typing the Key to
    Computer Literacy?" Instructor, Vol. 93, No. 2, September 1983, pp.
    178-180, 202.

Cross, Patricia K. "The Rising Tide of School Reform Reports," Phi
    Delta Kappan, Vol. 66, No. 3, November 1984, pp. 167-172.

Douglas, Lloyd V. Business Education. Washington, D. C.: The Center
    for Applied Research in Education, Inc., 1963.

_____. "Educational Computing Update," Electronic Learning, Vol.
    7, No. 2, October 1987, pp. 53-57.

71

_____. "Educational Technology 1987: A Report on EL's Seventh Annual Survey of the States," Electronic Learning, Vol. 7, No. 2, October 1987, pp. 39-42, 44, 83.

_____. "Elementary Keyboarding Reference Manual," Curriculum Services Division, Wichita Public School, Wichita, KS, 1984.

Elam, Linda Marie. "Effect of Typing Skills on Computer Skills in Elementary School Students," Unpublished Master's Thesis, Biola University, 1986.

Erthal, Margaret J. "The Status of Keyboarding," Journal of Business Education, Vol. 60, No. 5, February 1985, pp. 192-193.

Fouche, Gwyn. "Learn to Keyboard in Just Ten Hours," Business Education Forum, Vol. 41, No. 7, April 1987, pp. 14-15.

Frankeberger, Lynda. "Keyboarding: Success in Elementary Grades," Balance Sheet, Vol. 66, No. 3, January/February 1985, pp. 41-43.

Freeman, Jeff and Freeman, Maryellen. Key in on Keyboarding. Akron: Carson-Dellosa Publishing Company, Inc., 1984.

Goldberg, Milton and Harvey, James. "A Nation at Risk: The Report of the National Commission On Excellence in Education," Phi Delta Kappan, Vol. 65, No. 1, September 1983, pp. 14-18.

Grabe, Mark and Grabe, Cindy. "The Microcomputer and the Language Experience Approach," The Reading Teacher, Vol. 38, No. 6, February 1985, pp. 508-511.

Hall, Carol S. "Keyboarding in a Self-Contained Fourth-Fifth Grade Classroom." Unpublished Master's Project, University of North Carolina at Greensboro, July 23, 1985.

Hillestad, Mildred. Research: Process and Product. St. Peter, Minnesota: Delta Pi Epsilon, 1977.

Hinson, Charlotte W. and Dickey, Lila H. "A Practical Approach to Keyboarding Instruction," Business Education Forum, Vol. 38, No. 7, April 1984, pp. 10,12.

Howe II, Harold. "Education Moves to Center Stage: An Overview of Recent Studies, Phi Delta Kappan, Vol. 65, No. 3, November 1983, pp. 167-172.

Hunter, Beverly. "Elementary: Racing Ahead," Electronic Learning, Vol. 2, No. 8, May/June 1983, pp. 43-46.

Kaake, Dianne M. "Teaching Elementary Age Children Touch Typing as an Aid to Language Arts Instruction," Reading Teacher, Vol. 36, No. 7, March 1983, pp. 640-644.

Kaser, Kenneth J. "Keyboarding Course for K-6," Business Education Forum, Vol. 39, Vol. 2, November 1984, pp. 18-19.

Kimball, Linda D. and Lane, Patricia Marconi. "Keyboarding," Asserting and Reasserting Business Education at the Presecondary Level, NBEA Yearbook No. 27, 1989, pp. 70-76.

Kisner, Evelyn. "Keyboarding--A Must in Tomorrow's World," The Computing Teacher, Vol. 11, No. 6, February 1984, pp. 21-22.

Lloyd, Alan C. "Typewriting Futures," Business Education World, Vol. 48, No. 6, February 1968, pp. 9-10.

_____. New York State Education Department, "Developing Keyboarding Skills to Support the Elementary Language Arts Program," ERIC Document No. 276 050, 1986.

Perreault, Heidi R. A Comparison of Achievement of Students Receiving Computer-Assisted Keyboarding Instruction with Achievement of Students Receiving Keyboarding Instruction within a Traditional Typewriting Class, Unpublished Doctoral Thesis, Oklahoma State University, 1983.

Piper, Karen L. "The Electronic Writing Machine: Using Word Processors with Students," The Computing Teacher, Vol. 11, No. 5, December/January 1983-84, pp. 82-83.

_____. Policies Commission for Business and Economic Education, "This We Believe about Keyboarding," Business Education Forum, Vol. 39, No. 1, October 1984, pp. 8-9.

Rhea, Jeanine Newton. A Comparison of Achievement of Students Receiving Individually Paced Instruction with Achievement of Students Receiving Traditional Instruction in Seventh Grade Beginning Typewriting. Unpublished Doctoral Thesis, Oklahoma State University, 1975.

Reagan, Ronald. "Excellence and Opportunity: A Program of Support For American Education," Phi Delta Kappan, Vol. 66, No. 1, September 1984, pp. 13-15.

Robinson, Jerry W., ed. Strategies of Instruction in Typewriting. Cincinnati: South-Western Publishing Co., 1972.

Robinson, Jerry W. "Elementary Keyboarding: Some Factors to Consider," Database, Vol. 5, No. 1, Fall 1986, pp. 13-15.

Robinson, Jerry W., Erickson, Beaumont, Crawford, and Ownby. Typewriting: Learning and Instruction. Cincinnati: South-Western Publishing Co., 1979.

Rowe, John L. "Readin', TYPIN', and 'Rithmetic: Part 1-Background of the Experiment," Business Education World, Vol. 39, No. 5, January 1959, pp. 9-12.

Rowe, John L. "Readin', TYPIN', and 'Rithmetic: Part 2-Teaching Procedures," Business Education World, Vol. 39, No. 6, February 1959, pp. 17-19.

Rowe, John L. "Readin', TYPIN', and 'Rithmetic: Part 3-Results of the Experiment," Business Education World, Vol. 39, No. 7, March 1959, pp. 19-22.

Sax, Gilbert. Empirical Foundations of Educational Research. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1968.

Snedecor, George W. and Cochran, William G. Statistical Methods. Ames, Iowa: The Iowa State University Press, 1967.

Sherron, Jo Ann E. An Empirically Validated Model Program for Teaching Alphabetic Keyboarding Skills via Microcomputer, Unpublished Doctoral Thesis, Virginia Polytechnic Institute and State University, 1984.

Sinks, Thomas A. and Thurston, Jay F. "Effect of Typing on School Achievement in Elementary Grades," Educational Leadership Research Supplement, Vol. 5, No. 2, January 1972, pp. 344-348.

Smith, Harold H. "How Young is 'Too Young to Type?'," Business Education World, Vol. 37, No. 8, April 1957, pp. 34, 43.

Sormunen, Carolee G. A Comparison of Two Methods for Teaching Microcomputer Keyboarding at the Elementary School Level, Unpublished Doctoral Thesis, University of Minnesota, 1984.

Sormunen, Carolee G. "A Comparison of Two Methods for Teaching Keyboarding on the Microcomputer to Elementary Grade Students," The Delta Pi Epsilon Journal, Vol. 28, No. 2, Spring 1986, pp. 66-77.

Stewart, Jane and Jones, Buford W. "Keyboarding Instruction: Elementary School Options," Business Education Forum, Vol. 37, No. 7, April 1983, pp. 11-12.

Tate, M. W. "Use of the Typewriter in Remedial Reading and Language," Elementary School Journal, Vol. 43, No. 8, April 1943, pp. 481-485.

Unzicker, Cecilia E. An Experimental Study of The Effect of the Use of the Typewriter on Beginning Reading. New York: Teachers College, Columbia University, 1934.

Van Dalen, Deobold B. and Meyer, William J. Understanding Educational Research, An Introduction. New York: McGraw-Hill Book Company, 1966.

West, Leonard J. Acquisition of Typewriting Skills. Indianapolis, IN: Bobs-Merrill Educational Publishing, 1983.

West, Leonard J. "Some Cautions about Keyboarding Courses," The Delta
    Pi Epsilon Journal, Vol. 28, No. 2, Spring 1986, pp. 79-84.

Wetzel, Keith. "Keyboarding Skills: Elementary, My Dear Teacher,"
    The Computing Teacher, Vol. 12, No. 9, June 1985, pp. 15-19.

Wetzel, Keith Arthur. The Effect of Using the Computer in a Process
    Writing Program on the Writing Quality of Third, Fourth, and Fifth
    Grade Pupils, Unpublished Doctoral Thesis, University of Oregon,
    1985.

_____. Wichita Public Schools, Curriculum Services Division,
    "Elementary Keyboarding Reference Manual," Wichita, Kansas, 1984.

Wilkinson, Leland. SYSTAT: The System for Statistics. Evanston, IL:
    SYSTAT, Inc., 1987.

Witte, Robert S. Statistics. New York: Holt, Rinehart and Winston,
    1985.

Wood, Ben D. and Freeman, Frank N. An Experimental Study of the
    Educational Influences of the Typewriter in the Elementary School
    Classroom. New York: The Macmillan Company, 1932.

Yuen, Jack et. al. "The Electric Portable Typewriter As an
    Instructional Tool in Fourth Grade Language Arts," Elementary
    English, Vol. 39, February 1962, pp. 101-108.

APPENDIX A

LETTERS AND CONSENT FORM

WICHITA HIGH SCHOOL NORTHWEST
Wichita Public Schools
1220 N. Tyler Road
WICHITA, KANSAS 67212

August 10, 1988

Dear Third Grade Teacher:

As summer 1988 is growing to a close, the time has arrived to begin
thinking about the 1988-1989 school year. As you begin making plans for
your class activities, I would ask that you give consideration to the
request below.

The Research Council of the Wichita Public Schools has granted permis-
sion for a quasi-experimental study to be conducted, during the 1988-1989
school year, that will involve third grade students. Specifically, the
study is designed to "determine the effect that keyboarding instruction,
gender and age have on the keyboarding speed and technique skills and
academic achievement in language arts of students in the third grade." A
stratified random sample of third grade classrooms will be selected to
participate in the study.

With this letter, I am requesting your willingness to participate in this
study, whether or not you intend to teach keyboarding to your third grade
students. Each teacher who participates will be provided specific
instructions regarding his or her role in the study. The majority of the
data needed for the study will be collected by experts in the field of
typewriting and/or the researcher. This study is important to the future
development of curriculum in the area of typewriting/keyboarding at all
educational levels. Knowledge of the effectiveness of the third grade
keyboarding curriculum is imperative to typewriting/keyboarding
curriculum in the upper grades.

Please indicate on the attached form your willingness (or lack of
willingness) to participate in this study. Your participation in the
study would be greatly appreciated. If you are interested in knowing the
results of the study, I will be happy to provide a summary for you.

I will notify the appropriate building principal for each teacher who is
willing to participate. Please return the enclosed form to me in the
enclosed pre-addressed envelope as soon as possible.

Sincerely,

Chari Sowers

Mrs. Chari Sowers
Business Department Chairperson
Wichita High School Northwest

August 10, 1988

Teacher Name _____

Building _____

Principal _____

Please place a <u>check on one of the lines below</u> indicating your decision regarding your willingness to participate in this study of keyboarding in the third grade. Also, please respond to the computer lab question.

_____ I am willing to participate in the study and **do** plan to teach keyboarding to my third grade students this school year (experimental group).

_____ I am willing to participate in the study and **do not** plan to teach keyboarding to my third grade students this school year (control group).

_____ I am **not** willing to participate in this study.

_____ Other (please explain)_____

_____

_____

Does the elementary school in which you teach maintain a computer lab?

Please Circle One ==>   YES   NO   UNSURE

I appreciate your serious consideration of this request. Please return this form in the enclosed pre-addressed, stamped envelope by August 20, 1988.

                    Chari Sowers
                    Business Department Chairperson
                    Wichita High School Northwest

WICHITA HIGH SCHOOL NORTHWEST
Wichita Public Schools
1220 N. Tyler Road
WICHITA, KANSAS 67212

September 12, 1988

<Elementary Principal Name>, Principal
<Elementary Building>
<Street Address>
<City, State ZIP>

Dear <Principal Name>:

The Research Council of the Wichita Public Schools has granted permis-
sion for a quasi-experimental study to be conducted, during the 1988-1989
school year, that will involve third grade students. Specifically, the
study is designed to "determine the effect that keyboarding instruction,
gender and age have on the keyboarding speed and technique skills and
academic achievement in language arts of students in the third grade." A
stratified random sample of third grade classrooms was selected to
participate as part of the control group (not teaching keyboarding) and
experimental group (teaching keyboarding).

<Teacher>, third grade teacher at <Elementary Building> has been randomly
selected for participation in the study from among the third grade
teachers who indicated their willingness to participate.

I have contacted <Teacher> and will be meeting with her this week to
provide specific details of the study.

This study is being conducted as part of my work toward a doctoral degree
in business education at Oklahoma State University. Your support of
<Teacher> and her participation in this study will be greatly
appreciated.

Sincerely,

Chari Sowers

Mrs. Chari Sowers, Business Department Chairperson
Wichita High School Northwest

CONSENT FORM

The third grade class in which your child is a student has been selected to participate in a study which will examine the effects of keyboarding instruction upon academic skills in language arts and keyboarding skills. Some of the classrooms selected for the study will receive formal instruction in keyboarding during first semester (experimental group), while the others will receive no formal keyboarding instruction (control group). The instruction will be provided by your child's regular classroom teacher. The desire of your child's teacher in teaching or not teaching keyboarding will determine whether your child will be in the experimental or control group respectively.

The academic abilities of students in both groups will be pre-tested post-tested. These tests will be administered by your child's regular classroom teacher. The keyboarding technique of the students who receive the formal keyboarding instruction will be observed and recorded periodically by experts in the field of typewriting. The keyboarding speed of the students will be measured at the end of the keyboarding instruction and again at the end of the school year. These keyboarding speed tests will be administered on the computers in your child's elementary school by experts in the field of typewriting. When the results of the study are reported, the identity of each individual student will not be revealed.

Your child's teacher and the Research Council of the Wichita Public Schools have already given their consent for this study to be conducted. According to Board of Education Policy, the approval of each child's parent or guardian is also necessary. To indicate your approval, please sign in the space below and return this form to your child's teacher. Also, please circle YES or NO in response to the two questions at the bottom of the page. Your responses to these questions will be held in strict confidence.

If you have questions which are unanswered by the above explanation, please contact Chari Sowers, Northwest High School Business Department, 833-3354.

= =

We have been fully advised of the procedures to be used in this project (as described above) and understand the potential risks to the subjects involved all of which we hereby voluntarily assume.

_____   _____
Date   Student

                                 _____
                                 Legal Guardian

Do you have a computer in your home?   YES   NO

If you answered yes to the first question,
does your child use the computer for school work?   YES   NO

WICHITA HIGH SCHOOL NORTHWEST
Wichita Public Schools
1220 N. Tyler Road
WICHITA, KANSAS 67212

October 24, 1988

Dear Third Grade Teacher:

It seems like only yesterday that we were making plans for the beginning
of the school year. Near the beginning of the year I received your
response to my request for participants in a keyboarding study. How
impossible it seems that the end of the first nine weeks is this week!

Your willingness to participate in the keyboarding study was greatly
appreciated. However, there were so many third grade teachers willing to
participate that it was necessary to select a random sample. Fifteen
third grade teachers were selected and are currently participating in the
study.

When the study is completed and results prepared, a summary will be sent
to the third grade teachers in each building. The entire report will be
filed in the research office of the school district. Thank you again for
your interest in the keyboarding study.

Sincerely,

Chari Sowers

Mrs. Chari Sowers
Business Department Chairperson
Wichita High School Northwest

APPENDIX B

DESCRIPTION OF THE SAMPLE

SCHOOLS IN EACH GROUP OF THE
STRATIFIED RANDOM SAMPLE

Group 1	Group 2	Group 3
Arkansas Avenue	Anderson	Adams
*Cloud	Black	Allen
Colvin	Caldwell	Beech
Dodge	Cessna	Benton
*Enterprise/Sim	Chisholm Trail	Booth
*Franklin	Funston	Bryant
Irving	*Gardiner	Buckner
*Payne	*Harry Street	Carter
Park	Ingalls	*Chisholm
*Woodman	Jefferson	Clark
	Kelly	Cleaveland
(10 schools)	*Kensler	College Hill
	Lawrence	Earhart
	Lincoln	Emerson
	Minneha	Field
	*Mueller	Gammon
	*Stanley	Griffith
	Washington	Harris
		Hyde
	(18 schools)	Isely
		Kellogg
		Linwood
		Longfellow
		L'Ouverture
		McCollom
		McCormick
		McLean
		*OK
		*Peterson
		Pleasant Valley
		Price
		Riverside
		Riverview
		Seltzer
		*South Hillside
		Sowers
		*Stearman
		Sunnyside
		White
		Woodland
		(40 schools)

* Selected by random sample to be included in the study.

LOW INCOME STUDENTS PER GROUP

	Group 1	Group 2	Group 3
Number of Schools	10	18	40
Actual number of low income students on March 18, 1988	2319	2429	2352
Expected number of low income students for the 1988-89 school year	2894	2995	2819
Enrollment for May, 1988	5515	8221	12839
Average percent of expected low income students for the 1988-89 school year	52.5%	36.4%	22.0%

BREAKDOWN OF LOW INCOME STUDENTS IN
THE RANDOM SAMPLE BY CLASS

Class	Enrollment May, 1988	Percent of Low Income	Number of Low Income
GROUP 1			
1	449	47.58	214
2	340	55.33	188
3	621	53.24	331
10	442	37.24	165
11	917	30.85	283
Group 1 Totals	2769	42.65	1181
GROUP 2			
4	626	23.30	146
5	435	41.48	180
6	340	46.41	158
12	419	47.15	198
13	580	26.05	151
Group 2 Totals	2400	34.71	833
GROUP 3			
7	577	12.27	71
8	159	34.88	56
9	258	18.54	48
14	287	22.62	65
15	419	15.51	65
Group 3 Totals	1700	17.94	305
Grand Totals	6869	33.76	2319

NOTE: The average percent of students who receive free lunches in all
elementary schools was reported to be 32.43 percent on the March 28,
1988 federal report.

APPENDIX C

REQUEST AND AUTHORIZATION LETTERS

FOR DISKETTE DUPLICATION

WICHITA HIGH SCHOOL NORTHWEST
Wichita Public Schools
1220 N. Tyler Road
WICHITA, KANSAS 67212

January 20, 1989

Ms. Susan Kranberg
Simon & Schuster Inc.
One Gulf & Western Plaza
New York, NY 10023

Dear Ms. Kranberg:

The Wichita Public Schools developed a third grade keyboarding program in the elementary schools in 1984 and adopted Microsoft Typing Tutor II as a part of that instructional program. In the years that followed, nearly 700 copies of Typing Tutor II have been purchased by the school district so that each of the elementary schools would have ten disks for use in their computer labs.

This instructional keyboarding program is the focus of an experimental study that I am conducting for my doctoral dissertation at Oklahoma State University. As part of this study, it is necessary to collect keyboarding speed data from each of the third grade students included in the sample. I would like to use the test mode of the new version of Typing Tutor II, Typing Tutor IV, for this data collection. In doing so, it is necessary to customize the test lines so each student will type the same test.

Logistically, it would be next to impossible to customize several hundred disks for this purpose. It would, however, be feasible to customize one disk and duplicate it for the purpose of this data collection. Only ten customized disks would need to be duplicated and they would be needed only for the period of data collection which will begin near the end of January, 1989 and end in May, 1989.

Because this duplication of diskettes would violate Simon & Schuster's copyright of this software, I am asking for your permission to make ten copies of Typing Tutor IV to be used for a period not to exceed five months. The diskettes would be used only to collect data for this experimental study and would be destroyed in May, 1989 after all data has been collected.

This written request is being submitted as per our telephone conversation earlier today. I appreciate your verbal approval of this request and shall anxiously await your official response.

Sincerely,

Chari Sowers

Mrs. Chari Sowers
Business Department Chairperson

P R E N T I C E   H A L L

TRADE DIVISION

9 February 1989

Mrs. Chari Sowers
Business Department Chairperson
Wichita High School Northwest
1220 N. Tyler Road
Wichita, KS 67212

Dear Mrs. Sowers:

We hereby grant you one-time, nonexclusive permission to customize and duplicate
10 copies of the dish in Typing Tutor IV. You may use the duplicated disk for
a period not to exceed 5 months after the date of this letter. It is further
understood that no further use will be made of these disks without further
permission.

Sincerely,

Timothy J. Archey
Subsidiary Rights Associate

APPENDIX D

TECHNIQUE EVALUATION CHECKLIST

TECHNIQUE EVALUATION CHECKLIST

Ratings: Excellent   - 4
                  Good   - 3
                  Average   - 2
                  Poor   - 1
                  Unacceptable   - 0

                                                    Rating

POSITION AT MACHINE:

1. Sits in a comfortable, relaxed position directly
      in front of computer.
2. Keeps elbows in relaxed, natural position at sides
      of body to provide correct hand position.
3. Keeps wrists low and relaxed, but off frame of computer.
4. Keeps fingers well curved, upright, and in typing position.

KEYSTROKING:

1. Keeps fingers curved and upright over home keys.
2. Makes quick, snappy strokes with immediate key release.
3. Maintains uniform keystroking action (force).
4. Keeps hands and arms quiet, wrists low.
5. Strikes each key with proper controlling finger.

SPACE BAR:

1. Keeps the right thumb curved-on or close to space bar.
2. Strikes space bar with a quick, down-and-in
      (toward the palm) motion of right thumb.
3. Releases space bar instantly.
4. Does not pause before or after spacing stroke.

RETURN KEY:

1. Returns quickly at ends of lines.
2. Keeps eyes on copy during and following return.
3. Starts new line without break or pause.

                                    TOTAL POINTS

Teacher_____

Student_____   ID_____

APPENDIX E

TIMED WRITINGS

```
Disk Test                                    Testing
--------------------------------------------------
+------------------------------------------------+
|                                                |
|   Can you key this data for me today?          |
|   ^                                            |
|                                                |
|   This is your chance to be a winner.          |
|                                                |
|                                                |
|   You key with your eyes on the book.          |
|                                                |
|                                                |
|   Later it may help you to get a job.          |
|                                                |
|                                                |
|                                                |
|                                                |
|                                                |
+------------------------------------------------+
                  Esc -> Main Menu
```

The four 35-character sentences appeared on the computer screen as
shown above. The carat under the C moved as each character was typed.
If the student typed an incorrect character, the computer beeped once.
The backspace key allowed the students to back up and correct errors,
although they were told that it was not necessary to do so. The
students were reminded on how to type capital letters by using the
shift keys, where the period and question mark keys were located, and
were instructed to press the return key at the end of each line.
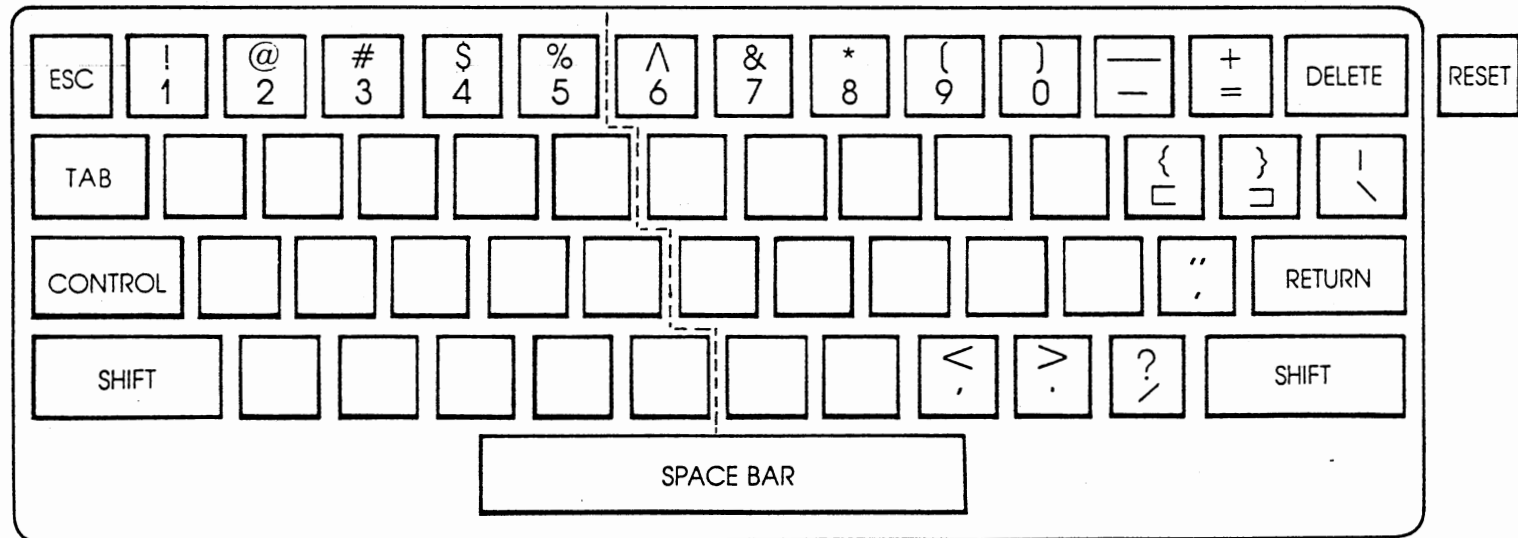
APPENDIX F

INSTRUCTIONAL MATERIALS

ROCK CHART

Name_____

This chart looks like the keyboard on an Apple IIe Computer. As you practice on this chart with your teacher, you will learn the correct position of the keys. You will then be able to use this new skill when you use the computer.

ESC	! 1	@ 2	# 3	$ 4	% 5	^ 6	& 7	* 8	(9	) 0	— _	+ =	DELETE	RESET
TAB											{ [	}]	| \\
CONTROL											" '	RETURN
SHIFT								< ,	> .	? /	SHIFT
SPACE BAR

READINESS ON COMPUTER KEYBOARDING CHART
A Computer Literacy Activity of the Wichita Public Schools.
USD# 259, Wichita, Kansas

```
1 ff jj ff jj ff jj ff jj ff jj ff jj

2 ff jj ff jj ff jj f j f j f j f j f

3 ff jj ff jj ff jj fj fj fj fj fj fj

4 dd kk dd kk dd kk dd kk dd kk dd kk

5 dd kk dd kk dd kk dk dk dk dk dk dk

6 dd kk dd kk dd kk d k d k d k d k d

7 ss ll ss ll ss ll ss ll ss ll ss ll

8 ss ll ss ll ss ll sl sl sl sl sl sl

9 ss ll ss ll ss ll s l s l s l s l s

10 aa ;; aa ;; aa ;; aa ;; aa ;; aa ;;

11 aa ;; aa ;; aa ;; a; a; a; a; a; a;

12 aa ;; aa ;; aa ;; a ; a ; a ; a ; a
```

Lesson #1

1 ff jj ff jj ff jj ff jj fj fj fj fj

2 dd kk dd kk dd kk dd kk dk dk dk dk

3 ss ll ss ll ss ll ss ll sl sl sl sl

4 aa ;; aa ;; aa ;; aa ;; a; a; a; a;

5 dd ee dd ee dd ee dd ee dd ee dd ee

6 dd ee dd ded dd ee dd ded dd ee ded

7 ded ded edd edd dee dee ded ded ded

8 ddd eee ddd ded ded eee ddd edd edd

9 e e e el el ed ed led led fled fled

10 e e e jell jell fell fell sell sell

11 e e e ale ale sale sale eel eel eel

12 e e e feel feel deal deal seal seal

13 e e e seek seek seed seed feed feed

14 a seal sale; seek a deal; see a sea

15 a sled led; a seed fell; seals feel

16 fall sales; jell a salad; feed lads

17 eels see; eels feel; feel eels; eel

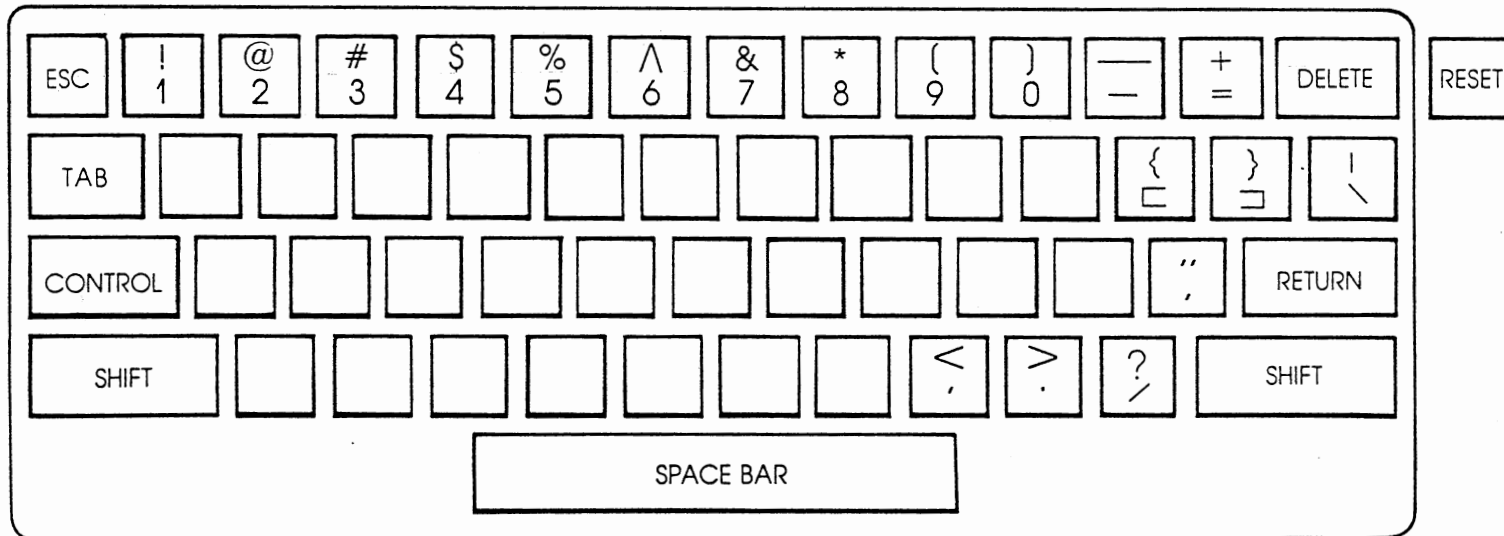Lesson #3

NEW KEYS INTRODUCED BY LESSON

NOTE: All letters are introduced as lower case letters. Drills start with letters only and advance as indicated below to words, phrases, and then sentences. The space bar and return key are introduced with lesson 1.

Lesson 1	a, s, d, f, j, k, l -- Home-Row Keys (drills are letters only)
Lesson 2	Home Row Reviewed (drills include words and short phrases)
Lesson 3	e
Lesson 4	o
Lesson 5	g
Lesson 6	u
Lesson 7	h
Lesson 8	i
Lesson 9	t
Lesson 10	Right Shift (Left hand capitals) (after this lesson, any left hand letter may be typed in upper or lower case after it is introduced in lower case)
Lesson 11	Period (drills include sentences)
Lesson 12	r
Lesson 13	w
Lesson 14	n
Lesson 15	Left Shift (Right hand capitals) (after this lesson, any right hand letter may be typed in upper or lower case after it is introduced in lower case)
Lesson 16	c
Lesson 17	m
Lesson 18	y
Lesson 19	v
Lesson 20	comma
Lesson 21	b
Lesson 22	p
Lesson 23	x
Lesson 24	colon
Lesson 25	z
Lesson 26	question mark
Lesson 27	q
Lesson 28	/

Name_____

ROCK CHART (POST-TEST)

This is a little test to see if you have learned the correct position of the keys. Write the correct letter on each of the blank keys. Color each key to show which finger is used to stroke it.

| ESC | ! 1 | @ 2 | # 3 | $ 4 | % 5 | ^ 6 | & 7 | * 8 | (9 |) 0 | — — | + = | DELETE | | RESET |

| TAB | | | | | | | | | | | { [| }] | \| \ |

| CONTROL | | | | | | | | | | | " ' | RETURN |

| SHIFT | | | | | | | | < , | > . | ? / | SHIFT |

| SPACE BAR |

READINESS ON COMPUTER KEYBOARDING CHART
A Computer Literacy Activity of the Wichita Public Schools.
USD# 259, Wichita, Kansas

VITA

Mattie C. Sowers

Candidate for the Degree of

Doctor of Education

Thesis: THE EFFECT OF KEYBOARDING INSTRUCTION ON LANGUAGE ARTS AND
KEYBOARDING SKILLS OF THIRD GRADE STUDENTS IN THE WICHITA
PUBLIC SCHOOLS

Major Field: Business Education

Biographical:

Personal Data: Born in Iola, Kansas, June 12, 1950, the daughter
of Clifford and Ruth Burtnett.

Education: Graduated from Iola High School, Iola, Kansas, in May
1968; attended Allen County Community Junior College, Iola,
Kansas, 1968-1969; received Bachelor of Science Degree in
Education from Emporia State University, Emporia, Kansas, in
May, 1973; received Master of Science Degree in Business
Education from Emporia State University, Emporia, Kansas, in
December, 1975; attended Wichita State University, Wichita,
Kansas, 1979-1989; completed requirements for the Doctor of
Education degree at Oklahoma State University, Stillwater,
Oklahoma, in December, 1989.

Professional Experience: Business Teacher, Iola High School,
Iola, Kansas, 1973-1976; Business Teacher, Mulvane High
School, Mulvane, Kansas, Spring Semester, 1977; Substitute
Teacher, Valley Center Public Schools and Wichita Public
Schools, 1977-1979; Math Teacher, Brooks Junior High School,
Wichita Public Schools, Wichita, Kansas, 1979-1981;
Specialist in the Division of Data Processing, Wichita Public
Schools, 1981-1985, Business and Computer Studies Teacher and
Department Chairperson, Wichita High School Northwest,
Wichita, Kansas, 1985-1987; Graduate Teaching Assistant,
College of Business, Oklahoma State University, Stillwater,
Oklahoma, 1987-1988; Business and Computer Studies Teacher
and Department Chairperson, Wichita High School Northwest,
Wichita, Kansas, 1988-1989.

Professional Organizations: Phi Delta Kappa, National Business
     Education Association, Mountain-Plains Business Education
     Association, Kansas Business Education Association, Delta Pi
     Epsilon.