A COMPARISON OF ACHIEVEMENT OF STUDENTS RECEIVING COMPUTER-ASSISTED KEYBOARDING INSTRUCTION WITH ACHIEVEMENT OF STUDENTS RECEIVING KEYBOARDING INSTRUCTION WITHIN A TRADITIONAL TYPEWRITING CLASS

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CHAPTER I

INTRODUCTION

Keyboarding is not just another word for typewriting. It has been defined as "the act of entering alphanumeric data on a stationary desk-top unit."[1] Note that output is not a part of the definition. The finished product is not stressed as it is in typewriting. The output may eventually be a letter or manuscript, but more likely the applications will create very different types of output. Some current applications of keyboarding in the office are: Accounting--Transactions are entered via the terminal producing such varied output as invoices, payroll checks, or balance sheets; Records Management--It is now less expensive (using high-capacity disc storage) to store an "electronic page" than to store a paper page in a filing cabinet in floor space in a metropolitan U.S. city;[2] Inplant Phototypesetting--The input for any typesetting device is a keyboard.

Many applications require keyboarding skill which differs from typewriting skill. Most of these applications are done on a computer terminal. The major purpose of the study is to compare the achievement of students taught keyboarding through computer-assisted instruction,

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[1]Elizabeth Goodrich, "Keyboarding: An Increasing Fact in Today's Society," Business Education Forum (February, 1979), pp. 15-17.

[2]Amy D. Wohl, "Office of the Future--Close but Still Elusive," The Office (January, 1981), pp. 93-190.

independent of daily teacher contact, with the achievement of students taught through a traditional, teacher-directed textbook approach. By doing so, it can be determined whether one method of instruction is more effective than the other or whether the two methods are equally effective in teaching keyboarding.

Statement of the Problem

The problem of this study was to compare the effectiveness of two methods of teaching keyboarding at the college level. The two methods were: (1) computer-assisted instruction in an independent learning environment and (2) teacher-directed instruction in a traditional classroom environment.

Null Hypotheses

After reviewing the literature related to keyboarding, computer-assisted instruction, and multimedia and/or self-paced instruction as compared to the traditional instructional approach in typewriting, the following hypotheses for this study were formulated. The null hypotheses will be tested for significance at the .05 level.

1. There will be no significant difference in combined technique achievement, straight-copy speed achievement, and straight-copy error achievement by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

2. There will be no significant difference in technique evaluation scores by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

3. There will be no significant difference in straight-copy speed by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

4. There will be no significant difference in straight-copy errors by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

Need for the Study

The concept of the electronic office has become a reality. Clerk typists have adjusted to the role of data-entry operators and typists to word processors. But it is time to realize that keyboarding is a necessity not only for office support functions but also for a wide variety of personal and professional applications. If computers are to be used as a tool for improving productivity, users must be able to devote major concentration to the procedure for solving the problem at hand rather than the mere operation of the equipment.[3]

Education needs to keep abreast with the demand for keyboarding skill for both professional and personal use. Arthur Luehrmann, founder of Computer Literacy Co., estimates that within five years 50 percent of all jobs will require interaction with computer-based information. Not every student will become a computer programmer, "but competency in computing will be as important as competency in writing."[4]

Keyboards have become a common sight in many businesses over the past few years. Airlines use them for passenger check-in, baggage

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[3]Arnola C. Ownby and Heidi R. Perreault, "Keyboarding: A No Fail Model," Business Education Forum (May, 1983), pp. 9-12.

[4]"Information Processing," Business Week (July, 1981), pp. 66-68.

control and reservations. Insurance companies update policies, and banks maintain account balances through keyboards. Transportation companies keep track of shipment pickups, transferring activities, and damages through keyboards. Business executives have desk top computer terminals to access current information to be used in managerial decisions. The aerospace industry uses keyboarding extensively, and the list will continue to grow. A keyboarding course can help prepare men and women for a multitude of careers, any one of which may have a typewriterlike keyboard in it.[5]

In pointing out the need for keyboarding in the business curriculum, Burford indicated that 52 percent of the office workers interviewed were using or had ready access to terminals.[6] As keyboarding has spread from word processing to data processing to telecommunications, the need for keyboarding skill has multiplied.

Bringing keyboarding into the curriculum requires careful consideration. How should the class be structured? What are the equipment needs? What is the ideal class size? Those are just some of the questions needing attention.

Computer-assisted instruction for teaching keyboarding has proved to be a viable alternative and deserves careful consideration by curriculum planners. In the past, attempts to individualize instruction meant self-paced learning activity packages. Those packages were either stand-alone printware or a combination of taped instruction and

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[5]Goodrich, pp. 15-17.

[6]Anna M. Burford, "Developing Trends in Office Technology and Career Paths as Related to the Office of the Future" (unpub. Ph.D. dissertation, The Ohio State University, 1979).

printware. Microcomputers offer tutorial packages capable of interaction with the student. The programs not only respond to the student but also evaluate and prescribe what is to be done next.

Computer-assisted instruction in keyboarding could offer major advantages over traditional group instruction:

1. The provision for variable course content through CAI to accommodate students enrolling for keyboarding, personal-use typewriting, or vocational typewriting skills.

2. The practicability of individualized working conditions through open laboratories to afford students the opportunity to develop keyboarding skills at a time convenient for them.

3. The allowance for individualized learning rates through CAI to adapt the course to the students' varying aptitudes for keyboarding.

4. The ability through careful scheduling to accommodate a large number of students with only a few pieces of equipment, by keeping the equipment accessible to students 12 to 16 hours a day.

5. The provision of an instructional system that better suits adult learners who may feel threatened in a traditional classroom environment.

The increased use of keyboards on various types of equipment in business, industry, government, and education has created a need to prepare people to use typewriterlike keyboards effectively. Quite conceivably, the office will soon require employees to work with multifunctioning computer-based systems in which word processing, data processing, records, telecommunications, and electronic mail are all integrated through similar electronic hardware. It seems quite possible that office jobs of the future will increasingly be those requiring high

equipment involvement and with equipment quite different from that available in the recent past.[7] In addition, many students need keyboarding skills to interact with computers as part of their academic program. In order to use these keyboards in the most efficient manner, it is important to develop keyboarding skills.

Limitations of the Study

Students having no previous keyboarding/typewriting instruction enrolled in basic typewriting and in keyboarding at Oklahoma State University, Stillwater, during the fall and spring semesters of the 1982-1983 school year were included in the study. The classes consisted of one section of basic typewriting (control group) and three sections of keyboarding (experimental group) each semester.

No attempt was made to assess the influence of student interest, motivation, or attitude toward CAI and independent-learning environments. The amount of time that students in the experimental group spent in computer-assisted instruction was not controlled as students worked on an independent schedule. The amount of time that students in the control group spent on out-of-class practice was not controlled. Students who had excessive absences (10 or more) in the control group were not included in the study. Any student who did not attend class during the technique evaluations or who did not take the series of 12 one-minute timings was also not included in the study.

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[7]Gerald Hershey, "Educational Implications of the Office of the Future," Journal of Business Education (November, 1979), pp. 66-69.

Definition of Terms

Achievement: The means of measuring results attained by the end scores in gross words per minute on the straight-copy timed writings, in errors per minute on the straight-copy timed writings, and on technique evaluations.

Attitude: The student's dispositon toward the use of computer-assisted instruction for keyboarding instruction.

Computer-assisted instruction (CAI): A process of teaching (or learning) in which a student utilizes a computer terminal (Apple II) to obtain lesson modules from the computer and to respond to these lessons.

Computer terminal: A device used for keying data into the computer and receiving responses from the computer.

Gross words per minute: A procedure for expressing the typewriting speed on timed writings and is found by dividing the total words typed (five strokes equal one word) by the number of minutes of typewriting.

Independent Learning Environment: A plan of study that enables students to progress at their own rate of learning without direct teacher supervision.

Keyboarding: The act of inputting information into various types of equipment through the use of a typewriterlike keyboard. The keyboard is the means by which the individual interacts with the equipment.

Lesson Module: A computer program listing the objectives and directing the learning and practice on the keyboard. Students respond using the computer terminal.

Multimedia instruction: An instructional system utilizing more than one delivery system. Some common types of media are programmed texts, the spoken word, chalkboard presentations, and videotapes.

Straight-copy errors: A means of expressing accuracy on straight-copy timed writings. It is found by totaling the number of typographical errors made on a one-minute timing. An error is any misstroke, a repeated word, an omitted word, a transposition (typing words or letters out of order), an improper indention, or an improper alignment. The spacing and punctuation after a word are a part of the word; thus, an error in them is an error in that word. Moveover, no more than one error may be counted against a word.[8]

Straight-copy speed: The gross words per minute typed on new, prearranged copy where the typist does not correct errors. The timings were of one minute duration.

Techniques: Refers to the motions (uniform striking action, quick snappy keystrokes, striking the return key quickly and with proper finger, striking the space bar with a quick down and in motion, etc.) and conditioners (fingers curved and upright, correct finger alignment, forearms parallel to keyboard, body erect and back in chair, feet on floor for balance, eyes on copy, etc.) used by typists at the keyboard. See Technique evaluation sheet in Appendix A, page 75.

Timed writings: A measurement of straight-copy typewriting timed for a predetermined number of minutes. Rate is stated in terms of gross words per minute. The copy used was triple-controlled alphabetic material having a low-average difficulty index (syllabic intensity, 1.4

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[8]Alan C. Lloyd, John L. Rowe, and Fred B. Winger, Typing 75: Basic (New York, 1970), p. 9.

syllables per word; average word length, 5.4 letters per word; and 85 percent high-frequency words).[9]

Traditional typewriting instruction: Refers to the teacher-directed class as used in this study. Each day the teacher explained and demonstrated the activities to be performed for the day and answered questions. Then the students performed these activities during the class period in a group environment. Generally all class members worked on the same lesson on a given day under the close supervision of the teacher.

Summary

This study compared the effectiveness of two methods of teaching keyboarding at the college level at Oklahoma State University during the 1982-1983 school year. The two methods were computer-assisted instruction in an independent learning environment and teacher-directed instruction in a traditional classroom environment.

Students in many curricula interact regularly with keyboards as more classes provide computer usage as a problem-solving tool, and the diverse business applications now requiring interaction with a keyboard makes keyboarding a skill every graduate needs.

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[9]J. W. Robinson et al., Typewriting: Learning and Instruction (Cincinnati, 1979), pp. 64-65.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to present a review of relevant articles appearing in the literature and the findings of related research dealing with keyboarding, computer-assisted instruction (CAI), and multimedia and/or self-paced instruction versus teacher-directed instruction in typewriting and/or keyboarding.

Keyboarding

Individuals in many walks of life are finding themselves lacking in a basic skill area--keyboarding. They are not typists; but in order to do their job efficiently, they need to operate a keyboard. The widespread use of computers in many occupations has resulted in terminals with keyboards at work stations previously not requiring typing. "By one estimate, 75 percent of all jobs by 1985 will involve computers in some way--and people who don't know how to use them will be at a disadvantage."[1] The challenge for education is to go beyond acknowledging the fact that the equipment exists to planning curriculums that prepare the student for the workplace.

Burford commented:

> A basic education for today's office employees seems incomplete without some skills on a typewriter keyboard because

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[1]John Naisbitt, Megatrends (New York, 1982), p. 33.

> keyboarding knowledge is needed for operating the computer and communication terminals that are an integral part of the office of the future.[2]

To prepare students for the workplace, educators must take a hard look at the typewriting course presently offered. Is it meeting the needs of all students? Those who will be operating a terminal need keyboarding as an auxiliary skill. Many operators do not need all of the skills required of a typist, such as setting margins; knowledge of spacing preferences; correct format for letters, tables, and reports. What is needed is a "touch" keyboarding rate of 25 to 30 words a minute with appropriate control. The most efficient way to operate any keyboard is primarily "by touch"--without looking.[3]

> Many students at the postsecondary level have not had the inclination or the time to learn to type (keyboard). They are seriously handicapped in job situations requiring interaction with a computer terminal. For those people without keyboarding skills, whether still in the education system or not, instruction is necessary. Because keyboarding does not confine itself to specific output, the focus must now be centered on the input In the beginning keyboarding class, the study of formats need not be emphasized. The kind of equipment students will be using on the job will probably have a programmed format.[4]

More and more business majors have been enrolling in basic typewriting courses. In many cases their primary goal is to prepare for programming courses and to learn how to use a keypunch or computer terminal rather than to learn how to type reports or letters. Dickey-Olson stated that courses need to be developed primarily for those business majors who

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[2]Anna Burford, "Keyboarding: An Important Skill for the Office of the Future," Journal of Business Education, 55 (1980), pp. 290-293.

[3]T. J. Crawford et al., Basic Information Keyboarding Skills (Cincinnati, 1982), p. iii.

[4]Goodrich, pp. 15-16.

plan to enter business at management levels requiring the use of computer terminals. The course (keyboarding) will provide students with the keyboard touch system techniques they need without burdening them with the complexity of skills necessary for typewriting proficiency.[5]

According to Wallace, CAI can be an effective teaching tool for typewriting/keyboarding. The microcomputer lab can provide the student with the rewards of individualized instruction while providing immediate feedback on error rate and speed. In addition, the computer would provide remediation whenever needed with unlimited patience and tolerance. It can repeat instructions endlessly until the student finally obtains comprehension.[6]

A survey of elementary schools encompassing six different school districts in the Omaha, Nebraska, area pointed up a need for keyboarding courses in the lower grades. Every school surveyed did have microcomputers in the building; most had several. The elementary teachers stated they realized that students were developing poor keyboarding techniques because of a lack of formal training. The findings indicated that keyboarding should be taught prior to or in conjunction with the microcomputer experience. If elementary-aged children are being exposed to microcomputers, their keyboarding needs should also be met.[7]

Using the computer to teach keyboarding can relieve teachers of the monotony of grading exercises and allow more time for working with

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[5]Patsy Dickey-Olson, "Keyboarding;" The Balance Sheet (November, 1981), pp. 91-93.

[6]Ivan G. Wallace, "Computers in the Typing Class?" Business Education Forum (November, 1981), pp. 27-28.

[7]Verda Rauch and Patricia B. Yanke, "Keyboarding in Kindergarten--Is it Elementary?" Business Education Forum (December, 1982), pp. 19-20.

students on an individualized basis. As the student keys in an exercise, the computer can immediately compare the work to a stored master file and indicate mistakes. The package can be programmed to supply each student with the number of words typed, the number of errors, the accuracy percentage, the time required to complete the exercise, and the date. If minimum performance standards were set by the teacher, students could compare their work and elect to record their results or to try again.

The instant feedback and evaluation are motivational. Remedial work is less tedious, and those who have met standards are challenged with new material. Sunkel and Cooper list the advantages of teaching touch keyboarding on the computer as:

1. It prepares students for the electronic office.

2. It virtually eliminates the tedious task of grading papers, thereby providing the teacher with more time to review student progress and assess needs.

3. Furthermore, greater consistency and accuracy in grading will be attained.

4. From the viewpoint of both the teacher and the student, it makes learning a skill easy and pleasurable.[8]

Robinson considered modeling a very effective strategy for teaching keyboarding. The correct body/hand/finger position, the direction/distance required in striking each of the keys, the action pattern in making proper keystrokes, and the technique for properly operating various service keys (space bar, shift keys, and return) all need to be modeled (demonstrated). He further noted that textbook illustrations

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[8]Mary Jane Sunkel and Martha Cooper, "Teaching Touch Keyboarding on Computer Terminals," Business Education Forum (October, 1982), pp. 18-21.

and verbal descriptions help students initiate proper techniques, but students also need to see the motions each finger makes in properly striking/releasing a new key or machine part. In pointing out the advantages in microcomputer-assisted instruction in keyboarding, he stated:

> Proper motions are now being modeled on microcomputer display screens. These animated demonstratons are correlated with special practice materials so that both focus vividly on one technique element at a time: keystroking, spacing, shifting, returning--the primary motions of keyboard learning. Once programmed, these animated models can be recalled wherever needed as spaced reviews that are correlated with technique improvement drills.
>
> Used in this way, the animated models of desired performance become the motivating goals of student practice (imitation of the model). Appearing on the display screen directly in front of the operator, the animated technique models are virtually impossible for the student to disregard.[9]

Robinson also pointed out the advantages of reinforcement, individualized goal setting, and pacing that CAI instruction offers. When learning any skill, knowledge of results is vital to successful performance. The microcomputer is ideal for providing immediate feedback and at the same time supplying the student with correction tactics as well.

Along with the immediate feedback capability is the ability to individualize goal setting. Each individual in the class learns at a different rate. The computer can handle these differences by timing each student on a sentence or paragraph and displaying immediately the exact speed typed. On the basis of that demonstrated base rate, the computer then sets a definite increment in speed and displays the new goal. The

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[9]J. W. Robinson and G. L. Johnson, "Learning Microcomputer Keyboarding," The Balance Sheet, 63 (1982), pp. 228-231.

computer not only sets new goals, it also identifies and supplies the next appropriate practice activity based on the student's performance.

> Thus, the microcomputer is a teaching/learning 'tool'. It cannot replace a well-prepared, interesting, and interested teacher.
>
> Used in the right way and for the right purposes, the microcomputer can make important contributions to keyboarding skill development. Its most important functions are to model, reinforce, individualize, time, pace, calculate, and report. All these are vital aspects of good teaching; but, alone, they are not a total substitute for it.[10]

Robinson used a case-study approach to examine how a microcomputer delivery system functioned as a teacher/tutor when compared to live instruction and when compared to a combination of micro-tutoring and "live" instruction. Three students were taught to keyboard using the different instructional delivery systems. Each of the students followed the same two-hour, twice-a-week, instructional schedule for an eight-week period.

The first student was taught by a teacher/textbook strategy. Material was first presented by the teacher using a demonstration/dictation/imitation method in which direct guidance, pacing, and timing were the predominant teaching tactics.

The second student was taught entirely by a commercially prepared microcomputer instructional delivery system. Keyboarding techniques were provided by animated computer graphics. The finger motions for each new reach were demonstrated on the screen and accompanied by verbal message displays. Once-a-week monitoring sessions were scheduled for 15 to 20 minutes where the teacher observed the student's techniques and offered suggestions.

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[10]Ibid., pp. 228-231.

The third student divided the two hour instruction time equally between microtutoring and "live" instruction. The first hour was spent completing the appropriate microcompter lesson with frequent monitoring by the live teacher. The remaining hour was spent at an electric typewriter with a correlating textbook. At this time, the teacher demonstrated, dictated, paced, timed, and provided feedback.

The student who was taught by the teacher-as-tutor and textbook method averaged 36 words per minute with 1.7 errors on one-minute timed writings. The student who spent half the time on the micro-tutor and the other half in the teacher-as-tutor strategy averaged 34 words per minute with 1.8 errors on one-minute timed writings. The student taught completely on the micro-tutor averaged 30 words per minute with 2.1 errors on the one-minute timings.

The student taught by the teacher-as-tutor and textbook method demonstrated consistently higher keyboarding rates than the other two students. In terms of accuracy, the differences were too small to be meaningful.

Although group results cannot reliably be predicted based on the case study, Robinson made the following observations:

1. Based on the performance scores attained, a microcomputer delivery system is a viable means of providing instruction.

2. Students in a teacher-as-tutor and textbook mode and those in a combination of micro-tutoring followed by the teacher-as-tutor and textbook mode appear likely to perform better than those taught by microtutoring alone.

3. Microcomputers seem to encourage a pushing or mashing keystroking motion rather than a quick striking motion. Alternating practice on

the micro with practice on the electric typewriter seems to correct this weakness.

4. A strictly visual approach to learning to keyboard (as represented by a micro delivery system) fails to provide the auditory feedback given by the element striking the platen. Practice on the typewriter following the micro lesson supplies this immediate feedback and reduces pauses.

5. Keyboarding, however taught, should be presented on the assumption that the students may use either the typewriter or the microcomputer or both at one time or another.[11]

Computer-assisted Instruction

As an instructional tool, the computer has two unique capabilities--memory and logic. Others (books, films, etc.) have displayable memory but only computer-assisted instruction (CAI) has a collated memory of student responses to individual displays of instructional materials. Nor do the others have the logical capability for making the organizing of information dependent upon the characteristics of the individual.

One purpose of CAI is to provide a means of individualizing instruction. It is accepted that all students do not learn at the same rate. Furthermore, some students seem to be visually oriented and respond best to visual instruction; other students seem to be aurally oriented and respond well to auditory instruction; still other students respond better to the proper combination of visual and auditory stimuli. While trying to provide programs to meet those individual differences, universities

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[11]Jerry W. Robinson, "Learning to Keyboarding: Micro-Tutoring and "Live" Instruction," Century 21 Reporter (Spring, 1983), pp. 11-12.

are also faced with economic constraints that require all programs to be economically justified. CAI can provide schools with an effective and inexpensive tool, particularly if equipment is already available for other purposes and is not being fully utilized. The ultimate criterion, however, for automated instruction is student achievement per unit of time and cost.

Bork listed some of the advantages of CAI as follows:

1. Interactive learning--The student is an active participant not a spectator. Pychologists agree that the best time for feedback is immediately after the event.

2. Individualization--Each response in computer dialoque is analyzed. Different actions are initiated based upon the answers given. Cumulative records can be maintained and used to affect flow of learning sequences. If the student is not grasping the material with one approach, another can be tailor made based on student needs.

3. Experience--The computer can create a world not otherwise available so the student can explore a multitude of possibilities.

4. Intellectual tool--Students can actually write their own programs.

5. Pacing--The student can control the speed. Many methods make no allowances for students learning at different rates (speed).

6. Time and sequence control--The student can control the pace and back up when necessary. Time and sequencing relate to each student's ability.

7. Control over content--The student is allowed a variety of choices. With many programs, the teacher controls sequencing but with flexibility so that each student can choose a desired path.

8. Testing as a learning mode--Immediate reinforcement is available by the computer. It relates which answers are wrong and why and can offer immediate learning sequences to the student dealing with that precise problem.[12]

Potts conducted a study to identify the factors affecting the success of computer-assisted instruction (CAI) programs in selected colleges and universities. The findings listed faculty support, enthusiasm, and initiative as the most important factors contributing to a successful CAI program. Following closely and tying for second were administrative support and the dedication and support of computer center personnel. The greatest problem in establishing CAI was a financial one as the initial cash outlay for equipment and training was prohibitive.[13]

An investigation of the relationship between computer-assisted instruction (CAI) and students' attitudes toward the instructor, the course, the computer, and the CAI programs in the teaching of undergraduate electronic data processing was conducted by Rusinek. Results indicated that the use of CAI significantly improved students' attitudes toward the instructor and the computer. The changes in attitude toward the course were statistically insignificant.[14]

An experimental study was done by Wolcott to provide information leading to the identification of the type of learner who can achieve

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[12]Alfred Bork, "Interactive Learning," The Computer in the School: Tutor, Tool, Tutee, ed. Robert Taylor (New York, 1980), pp. 59-64.

[13]Ann Shoemaker Potts, "A Study of Factors Affecting the Success of Computer-Assisted Instruction in Selected Colleges and Universities" (unpub. Ed.D. Dissertation, Florida Atlantic University, 1979).

[14]Avi Rusinek, "The Use of Computer-Assisted Instruction in the Teaching of Data Processing and Its Effect on Student Attitudes" (unpub. Ed.D. Dissertation, The University of Texas at Austin, 1979).

better results in the traditional typewriting classroom and the type of learner who can achieve better results in computer-assisted typewriting instruction. A related problem was to determine the effectiveness of the two methods of teaching beginning typewriting on student achievement.

Two sections of beginning typewriting at Ocean County College during the spring semester of 1974 were compared. One section was taught in the traditional classroom with conventional methods of instruction utilizing a textbook and workbook. The CAI section was taught by a different teacher who programmed the materials into lesson modules, and no group instruction or demonstrations were given. The teacher was available to help students who needed instruction.

The only student characteristic examined in this study was locus of control. Findings related to interaction between mode of instruction and locus of control revealed no significant difference between the control and experimental groups.

It was determined that beginning typewriting instruction is adaptable to the CAI mode of instruction. When compared to the CAI mode, the traditional mode took longer but did enable students to achieve higher straight-copy timed-writings scores. The length of time to complete the course for the experimental group ranged from 16 to 34 hours; the control group, 45 hours. The traditional mode was superior to CAI for improving straight-copy skill. Means scores on the five-minute timed writings were 23.0 for the control group and 17.05 for the experimental group. However, because of the substantially shorter instruction time and the flexibility of scheduling, CAI provided distinct advantages over the traditional mode. During the consultation periods, the students expressed a positive attitude for the CAI mode; they appreciated the flexibility

of scheduling since the demands on their time were often so stringent that it made it impossible for them to meet at a scheduled class time.

It was noted that the difference in straight-copy skill may have been attributed to the way in which this skill was affected by the technology of the computer. Before students were able to continue typing a new line of material, they were forced to wait until the computer acknowledged by displaying a prompt on the screen that it was ready for another line of input. This resulted in lost momentum.

Production scores of the two groups were not significantly different.[15]

Schmidt and Stewart conducted a research project to describe the role of the instructor in managing microcomputer typewriting instruction. Six microcomputer software programs designed to teach the keyboard were secured and evaluated. The two instruments used in the evaluation were the MicroSIFT Evaluator's Guide and an instrument designed by the researchers to evaluate microcomputer typewriting courseware. The second instrument contained sections on modeling, reinforcement, pacing, differentiated practice, appropriateness of the practice materials, motivation, effectiveness of the program, and practicality of the program. The instrument contained 52 statements that identified instructional procedures that should be adhered to if typewriting is taught according to known principles of typewriting skill acquisition.

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[15]Jeannette Mary Wolcott, "The Effect of Computer-Assisted Instruction, Traditional Instruction, and Locus-of-Control on Achievement of Beginning Typewriting Students" (unpub. Ed.D. Dissertation, Temple University, 1976).

Some of the weaknesses found in the six programs were that the programs taught only upper-case letters and that new keys were presented too quickly. Also, the programs did not have a sufficient amount of practice material, and too much nonsense drill material was used. In addition, the learner was under constant pressure to beat time allowances.

Other weaknesses noted included the program menu not adequately labeling the program contents and exiting from one lesson to enter another lesson was difficult to achieve. Documentation, or manual that accompanied program, was inadequate.

Sometimes the student was commended for a good job when errors had been made; likewise, sometimes the student was required to retype a line even though no errors occurred. Accuracy was stressed over speed from the very beginning, and only limited feedback was provided on speed. Very little emphasis was given to the use of appropriate keyboarding techniques.

Some of the strengths identified were that the programs were easy to load and use, and the student could choose from a variety of activities. Also, the keys were presented on the screen in a clear and logical way, and the programs would adjust to the student's skill level. Immediate feedback was provided at the time each key was struck, and an analysis of speed and accuracy for paragraph material typed was provided. A teacher mode existed whereby the instructor could edit or add material.

The two programs with the most strengths and fewest weaknesses were selected for use with students. A total of seven student volunteers completed the number of sessions necessary to provide data for the study.

Problems noted by the students included programs having too much repetition of the same drill material which led to frustration and

boredom. They felt inadequate instruction was provided for appropriate fingers to use with each key; and because only capital letters were used, no opportunity was provided to use shift keys for letters.

The keys were introduced too quickly; and once the numbers and symbols were introduced, everything that was practiced contained them. Also, the program frequently malfunctioned due to "bugs" in it, and the one-hour sessions caused fatigue.

The skills the students attained after 8-10 hours of typewriting instruction were comparable to expectations for the instructional time. On a series of three 1-minute timed writings, the mean speed ranged from 13 to 31 gross words per minute; the average number of errors ranged from 0 to 8 per minute. Students, however, displayed weaknesses in the use of correct typewriting techniques. In particular, they tended to let their wrists rest on the frame of the microcomputer, used incorrect fingers to strike keys, paused before and after striking the space bar, and frequently looked at their fingers to check placement.

The researchers identified a number of unique teaching and classroom management procedures the instructor can follow to achieve effective instruction in a microcomputer typewriting course. They are:

1. Select effective and appropriate software. Consideration must be given to characteristics of the software such as appropriateness for audience, use of graphics/sound/color, motivational and creative aspects, quality of support materials, ease of use, extent that computer capabilities are used, and reliability.

2. Familiarize students with operation of equipment and use of software.

3. Provide students with continuous reinforcement.

4. Establish appropriate goals, and monitor student progress.

5. Provide a variety of instructional activities.[16]

Schurdak compared CAI, programmed instruction (PI), and conventional instruction. He had 48 students at Columbia University learn a portion of a course in Fortran by one of the three methods. The average achievement score in the CAI mode was 87.4 percent compared with 76.2 percent for PI and 70.6 percent for the conventional lecture presentation. Student attitudes toward CAI and PI were generally good.[17]

The CAI Center at Florida State University had a self-paced, process-oriented set of science curriculum materials for use in seventh, eighth, and ninth grades. Dick reported that a comparative analysis of the performance of CAI versus regular classroom students indicated no significant difference in the performance of the two groups.[18]

Still at Florida State University, Hansen reported that the university granted accreditation to a CAI course in introductory physics based partly on the fact that students who received a CAI review showed a gain of 10 to 20 percent in performance on the conventional examination. Final grade assignments indicated the marked superiority of the CAI students over the partial CAI and the conventional students.[19]

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[16]B. June Schmidt and Jeffrey Stewart, "Microcomputer Typewriting in Business Education," Business Education Forum (March, 1983), pp. 23-30.

[17]John J. Schurdak, "An Approach to the Use of Computers in the Instructional Process and Evaluation," American Educational Research Journal, IV (1967), pp. 329-336.

[18]Walter Dick, Results of Curriculum Evaluation Via CAI for the Intermediate Science Curriculum, Progress Report, CAI Center, Florida State University (Tallahassee, 1967), pp. 42-54.

[19]D. N. Hansen, Learning Outcomes of a Computer Based Multimedia Introductory Physics Course, Progress Report, CAI Center, Florida State University (Tallahassee, 1967). pp. 51-53.

Hughes sought to determine whether the lecture-demonstration or the CAI method produced better mathematical skills in an office machines class. He also looked at the effectiveness of CAI compared to the lecture-demonstration approach on student attitude toward office machines.

The findings demonstrated no differences between CAI and the lecture-demonstration approach for teaching applied mathematic concepts to business machines students. There was no significant difference in student attitudes toward office machines between the two approaches.[20]

Anista conducted a study to investigate the results of using CAI to teach basic English grammar materials in a senior high school. The effects of CAI on student achievement and attitudes were considered. The results indicated no significant difference in achievement or attitude.[21]

Multimedia and/or Self-paced Instruction Versus Traditional Approach in Typewriting Instruction

Typewriting is categorized as a motor skill involving neuromuscular activity used in the operation of typewriting equipment. Singer defined motor skill as "muscular movement or motion of the body required for the

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[20]Robert Hughes, "An Experimental Study in Teaching Mathematical Concepts Utilizing Computer-Assisted Instruction in Business Machines" (unpub. Ed.D. Dissertation, North Texas State, 1976).

[21]John Anista, "A Comparative Study of Computer-Assisted and Non Computer-Assisted Instruction in Senior High School English Classes" (unpub. Ed.D. Dissertation, Wayne State University, 1974).

successful execution of a desired act."[22] Psychologists agree that a motor skill is learned through perception of a stimulus. Singer stated that various processes interact, e.g., cognitive, perceptual-motor, and sensory-motor, in order that the act may be integrated, meaningful, and successful.[23] Typewriting always consists of making a response to a situation. Sometimes these responses are overt actions that are directly observable, like striking the keys. Other responses may be thought processes or other internal activities which are not open to direct observation by others. The element that sets the occasion for a response is called a stimulus.[24]

Typewriting motor skill develops through the learner's discrimination of essential stimuli and through the learner's perception of the consequences of trial-and-error responses. Book, in discussing the control and use of varied stimuli, observed that when stimuli coming from different sense departments are combined and brought to bear on a learner, these stimuli may be extremely advantageous in aiding certain steps on the learning process.[25]

The multimedia approach has been used in many areas. In regard to typewriting instruction Rowe stated:

> The traditional typewriting classroom meeting five days a week for a 40- to 60-minute period is in the process of disappearing. Teachers conducted the class as a unit, gave all the

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[22]Robert N. Singer, Motor Learning and Human Performance (New York, 1968), p. 6.

[23]Ibid, pp. 52-53.

[24]Leonard J. West, Acquisition of Typewriting Skills (New York, 1969), p. 33.

[25]William Frederick Book, The Psychology of Skill (New York, 1925), p. 247.

> directions, and (generally) corrected all the papers. It was authoritarian at best as the students were followers, not creators or developers. With the growing popularity of programmed instructional materials, cassettes, videotapes, and computerized instruction, a near demise of traditional typewriting instruction is occurring in many schools. Through individualized instruction, the student is individually challenged and requests help only when it is needed. He works at a rate commensurate with his ability, and he usually works diligently.[26]

Lloyd predicted changes in typewriting instruction by the turn of the century:

> Instruction will be individualized. Instead of working in cadence with other learners in a class, the typing trainee will work alone in a carrel as he progresses through a course of programmed instruction. . . . The teacher will be a supervisor of typewriting instruction, operating the equipment from the perspective of his analysis of the learner's needs, knowledge and capacity.
>
> The four keys to increasing learning efficiency are programmed instruction, personal pacing, frequent instant analysis, and the individualized progress. Do we have to wait until the turn of the century before we start using these four keys?[27]

Intermediate collegiate typewriting students were used by Warner to determine if differences existed in the terminal achievement of students when instructed under three different teaching methods: (1) the traditional teacher-directed classroom environment (Traditional Group); (2) the tape recorded and teacher directed combination classroom environment (Tape-Teacher Group); and (3) the programmed instruction and tape recorded, non-teacher directed classroom environment (Programmed Group). The results of the study revealed that the three teaching methods were equally effective in teaching intermediate typewriting to collegiate

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[26]J. L. Rowe, " New Thinking in Teaching Typewriting," Effective Secretarial Education. National Business Education Yearbook, Vol. 12. (Reston, 1974), pp. 58-63.

[27]Alan C. Lloyd, "Typewriting Futures," Business Education World (February, 1968), pp. 9-10, 24-28.

typewriting students regardless of their initial ability level or amount of previous typewriting instruction.[28]

Stirk's experiment compared the straight-copy typewriting speed and accuracy achievement of high school students after 15 weeks of instruction by two methods. The control group was taught by the traditional, teacher-directed method; the experimental group was taught by the Automated Instruction Touch-Typing System, a multimedia, individualized program. Findings showed that the experimental group had a significantly higher speed achievement, but the accuracy rate showed no clear-cut association with the teaching method.[29]

Frye conducted an experimental investigation to analyze the effects of a multimedia instructional systems approach with a traditional, teacher-directed approach in intermediate typewriting at the two-year college level. The student-directed approach was utilized with the experimental group using the multimedia instructional system. Frye stated that the students who used the experimental approach typed significantly faster on straight-copy than the students in the control group. Also, the experimental group typed certain production problems with fewer typographical and placement errors as well as scored higher averages on basic information tests. Frye concluded that prior knowledge of performance activities before an instruction unit is taught and the attainment of

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[28]Sherman ElVon Warner, "An Experimental Study Utilizing Programmed Instructional Materials and Tape Recordings in the Teaching of Intermediate Collegiate Typewriting" (unpub. Ed.D. Dissertation, Arizona State University, 1969).

[29]Arlene Stirk, "Comparative Speed and Accuracy Achievements of High School Typewriting Students Taught by the Automated Instruction Touch-typing System and by the Traditional Teacher Directed Method" (unpub. Ed.D. Dissertation, Boston University School of Education, 1973).

minimum performance objectives before a student advances to a new lesson increases the efficiency in learning.[30]

An audio-tutorial approach was compared to the traditional approach by Jones. Students in the audio-tutorial group proceeded through the activities of each lesson at their own rates with no group instruction. A teacher was present in the classroom for individual guidance and assistance. The typewriting instruction was administered by means of video tape, listening stations, audio cassette players, printed matter, and films. Students in the control group received group instruction consisting of lectures, demonstrations, and discussions.

The experimental group taught by the audio-tutorial method developed typing skill and accuracy commensurate with those students taught by the traditional method. However, the attrition rate of those students in the audio-tutorial group was significantly greater than in the traditional groups.[31]

Typewriting at Robert Morris College in Corapolis, Pennsylvania, was taught via the use of audio-cassettes and slide carousels in an individualized study carrel providing unlimited individualization of typing instruction, practice, production typing, and testing. The teacher, called the "director of learning," recommended, diagnosed, prescribed, tested, and supervised the keeping of records. Teaching was

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[30]Marianne Elizabeth Frye, "A Comparative Analysis of the Effect of a Multimedia Instructional Systems Approach with a Teacher-Directed Group Approach in College Intermediate Typewriting" (unpub. Ph.D. Dissertation, University of North Dakota, 1972).

[31]Arvella Baird Jones, "An Experimental Study to Compare Audio-tutorial Instruction with Traditional Instruction in Beginning Typewriting" (unpub. Ed.D. Dissertation, North Texas State University, 1974).

done only on a one-to-one basis. Experiences at the school indicated great success, especially for students who have always encountered learning problems in the typical classroom.[32]

Anderson conducted an experimental study to determine whether a difference existed in the amount of time it takes college students to meet minimum competence levels on two pre-stated performance objectives in beginning typewriting if one group is taught via the audio-visual tutorial method and the other group is taught via the traditional group instruction method. The results indicated students taught via the audio-visual tutorial approach spent significantly less time in attaining a typewriting speed objective than did students taught via traditional group instruction. Also, there was no difference in student knowledge of basic typewriting concepts between the two groups.[33]

Laurer evaluated the effectiveness of using prepared video tapes in teaching two quarters of intermediate collegiate typewriting. The control group received all their instruction in the conventional teacher presentation, while the experimental group received all their instruction via prepared video tapes. The experiemntal group typed significantly more gross words in letter typing than the control group during the first

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[32]Robert Grubbs and Frederick Gaskin, "The Individualizers in Typewriting Instruction," Business Education Forum (February, 1972), pp. 44-45.

[33]Marcia A. Anderson "A Comparison of Time Spent by College Students Learning Typewriting Via Audio-Visual Tutorial and Traditional Group Instruction" (unpub. Ph.D. Dissertation, Southern Illinois University, 1975).

quarter; they also achieved significantly higher scores in statistical tabulation total gross words during both quarters.[34]

Thoreson compared the effectiveness of large-group individualized multi-media instruction with traditional instruction in first-year typewriting in the secondary school. All instruction was given by means of: (1) prerecorded television presentations, (2) prerecorded audio-cassette presentations, (3) sound slide and film presentations, (4) printed materials, and (5) individualized teacher assistance. A comprehensive study of student achievement was completed for the two groups. On straight-copy tests, the experimental group typed at a significantly higher gross rate than did the control group, but the control group made significantly fewer errors. On the production tests, the experimental group typed significantly faster and more accurately than did the control group.[35]

Some advantages of programmed instruction listed by Kinder are; providing reinforcement of learning for students, permitting learners to proceed at their own pace, and informing students of the correctness of their responses at every step. All of these are essential in development of typewriting skills.[36] The purpose of Klemin's study was to compare achievement and attitudes of students who experienced two different methods of intermediate typewriting instruction. He recommended that

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[34]William Charles Laurer, "Evaluating Effectiveness of Using Business Education Prepared Video Tapes in the Teaching of Intermediate Typewriting at Utah State University" (unpub. Ed.D. Dissertation, Utah State University, 1972).

[35]Laverne Dennis Thoreson, "An Experimental Study to Determine the Validity of Individualized Large-Group Multimedia Instruction Compared with Traditional Instruction in First-Year Typewriting" (unpub. Ed.D. Dissertation, University of North Dakota, 1971).

[36]James S. Kinder, Using Audio-Visual Materials in Education (New York, 1956), pp. 154-155.

individualized instruction be considered as a viable alternative to the traditional structured-group method in all areas of intermediate typewriting achievement except on manuscript production speed development.[37]

Kline's study was conducted to compare typewriting achievement and attitudes toward typewriting of self-paced independent middle-school students with students who had been teacher directed in a conventional manner. There were no differences in typewriting speed or error-control between the two groups. Those students who had been teacher directed did, however, achieve superior techniques. There were no differences in attitudes toward typewriting between the groups. Kline concluded that the independent study approach is a viable instructional procedure through which to attain speed and error-control goals in typewriting in the middle school.[38]

Missling used programmed materials to compare straight-copy skill and production achievement of secondary students taught under a traditional scheduling plan and students taught under three flexible modular scheduling plans. No significant difference was found between the experimental and control groups in either speed or accuracy on straight-copy timed writings.[39]

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[37]Vernon W. Klemin, "Evaluating the Effectiveness of An Individualized Progress Method of Teaching Intermediate Typewriting at Utah State University" (unpub. Ed.D. Dissertation, Utah State University, 1974).

[38]Geraldine Kline, "An Analysis of the Achievement and Attitudes of Middle-School Students in a Self-Directed Typewriting Program Compared with Students in a Teacher-Directed Program" (unpub. Ed.D. Dissertation, University of Colorado, 1971).

[39]Lorraine Missling, "A Comparison of the Traditional Plan to Three Selected Flexible Modular Plans in First-Semester High School Typewriting with Straight-Copy Achievement and Production Achievement as Criteria" (unpub. Ed.D. Dissertation, University of North Dakota, 1970).

In a comparison of self-paced instruction and teacher-directed instruction in problem typewriting, Varnon concluded that the self-paced approach is as effective as teacher-directed instruction.[40]

Toy conducted a study on the effectiveness of individualized progression in beginning typewriting at the college level. She reported that the straight-copy speed and accuracy achievement, production task achievement, and overall terminal achievement were equal between the experimental and the traditional groups. Additionally, Toy reported that she found the attitude toward the method of instruction to be equal between the two groups.[41]

The three criteria studied by Lugo were straight-copy speed and accuracy, vertical and horizontal centralization, and personal letter performance. A control group, taught by a traditional teacher-directed approach, was compared with an experimental group, taught by an individualized method. No significant differences were found with any of the three criteria.[42]

The problem for McKown was to analyze the difference in the rate of speed and degree of accuracy achieved by beginning typewriting students who had learned beginning typewriting under controlled conditions. The experimental group was taught with the use of the Kee Electronic Keychart

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[40]Mary Sue Varnon, "A Comparison of Self-Paced, Programmed Instruction and Teacher-Directed, Non-Programmed Instruction in Problem Typewriting in the Beginning Secondary School Course" (unpub. Ph.D. Dissertation, Georgia State University, 1973).

[41]Sandra Yates Toy, "The Effectiveness of Individual Progression in Beginning Collegiate Typewriting" (unpub. Ed.D. Dissertation, Arizona State University, 1975).

[42]Carmen Lugo, "Effectiveness of Individualized Instruction in Teaching Elementary Typewriting in Higher Education in Puerto Rico" (unpub. Ed.D. Dissertation, Lehigh University, 1977).

teaching aid and the control group was taught with the use of the traditional keyboard. The findings showed that keyboard mastery was not significantly different under either method.[43]

Rigby analyzed the differences in production achievement between a control group taught by the traditional teacher-directed method progressing at the same rate each day and an experimental group allowed to progress at their own pace with the use of a LAP. The findings indicated that a LAP is as good as, and in some cases better than, the traditional method of instruction as measured by the student's speed and accuracy on the unit production tests. Student attitude toward the LAP was positive. She concluded that a LAP is a viable teaching tool.[44]

Rhea compared the achievement of seventh grade students taught by traditional teaching techniques and materials with students taught by individually paced instructional techniques and materials in a beginning typewriting class. Technique evaluation scores were significantly higher in the traditionally taught group. There was no difference in speed achievement between the two groups; however, the individually paced group made significantly fewer errors than the traditionally taught group.[45]

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[43]Ellen McKown, "A Comparative Study of Students' Achievement in Beginning Typewriting Using Two Methods of Instruction" (unpub. Ph.D. Dissertation, University of Oklahoma, 1979).

[44]Dorothy Sue Rigby, "The Effectiveness of Learning Activity Package Instruction Versus the Teacher-Directed Method of Teaching Intermediate College Typewriting" (unpub. Ed.D. Dissertation, University of Northern Colorado, 1973).

[45]Jeanine Newton Rhea, "A Comparison of Achievement of Students Receiving Individually Paced Instruction With Achievement of Students Receiving Traditional Instruction In Seventh Grade Beginning Typewriting" (unpub. Ed.D. Dissertation, Oklahoma State University, 1975).

Summary

The review of research and literature revealed an interest in developing keyboarding as a class apart from typewriting instruction. Keyboarding is being recognized by educators as a necessary skill for students in many curricula, but particularly in business. As computers gain acceptance throughout the workplace, keyboarding becomes a skill needed by employees in a vast number of occupations. More and more classes are requiring computer usage as a problem-solving tool, and those same applications are being extended into the business world. Students who complete their academeic training without obtaining keyboarding skills are at a definite disadvantage as they enter careers interacting with typewriterlike computer keyboards. Few businesses can afford the inefficient use of computer time as their employees hunt and peck at a terminal while utilizing the computer.

The findings of the research studies that compared computer-assisted instruction (CAI) to traditional methods of instruction suggest that CAI is a viable instruction tool. Computer-assisted instruction has been proven to be a particularly effective means of individualizing instruction. The studies indicated that although in some cases no significant differences in achievement emerged compared to a traditional delivery method, students respond favorably to such classes. They are allowed to progress at their own rate and are allowed maximum flexibility in scheduling. The students receive immediate reinforcement, and they control the pace.

Only one study indicated that the traditional method was superior to CAI. That study qualified those results by stating that a technical problem with the computer may have influenced those findings.

The literature shows that multimedia and/or self-paced instructional methods do meet the needs of learners. The results of those studies favored the multimedia methods for achievement in speed. The self-paced versus traditional teacher-directed methods of instruction indicated no significant differences between the two methods.

Finding the right combination of methods for each student is the real problem facing educators. Tonne stated:

> The common sense of most educators has always indicated that we do not know enough about the learning process to be dogmatic. There are several if not many ways of learning that will be effective depending upon the teacher, the learners, and the environment; and the same methods can be failures under other circumstances.[46]

Flexibility is the key in providing for individual differences, and the test of a learning system is the quality of instruction obtained by students. The teacher's role is to match the right methods, materials, and media to the right students at the right time.[47]

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[46]H. A. Tonne, "Informal Teaching in Business Education," Journal of Business Education, 53 (1977), p. 349.

[47]Robinson et al., Typewriting: Learning and Instruction, pp. 32-34.

CHAPTER III

DESIGN AND PROCEDURES

The design and procedures chapter is organized into three major divisions: (1) design, (2) procedures, and (3) data treatment. The first section discusses the experimental design that was used in this study. It includes the setting and population of the study. The procedures section includes: description and selection of sample, facilities and equipment, instructional materials, class procedures, and data gathering. The third section discusses the data treatment.

Design

In this study an experimental design was used to compare the achievement of typewriting students in a traditionally taught, teacher-directed class with the achievement of keyboarding students in a computer-assisted, independent learning environment. The control group in this study was taught by the traditional method, and the experimental group was taught by a computer-assisted method.

Setting and Population of the Study

The study was conducted during the 1982-83 academic year at Oklahoma State University in Stillwater, Oklahoma. The subjects who participated in this study were college students enrolled during the fall and spring semesters in the keyboarding course and the basic

typewriting course. Students were excluded from the study, however, if they had had previous instruction in keyboarding or typewriting.

Experimental Group. Students enrolled in the keyboarding course comprised the experimental group. The mode of instruction was computer-assisted instruction supplemented by audiocassette tapes.

The students progressed through self-instructional lessons without daily teacher contact. A computer-assisted mode of instruction was the delivery system. Students were allowed to progress at their own rate. Guidelines were set, however, encouraging the completion of three lessons per week.

Control Group. Students enrolled in basic typewriting comprised the control group. A traditional, teacher-directed mode of instruction was used to teach typewriting (keyboarding).

The control group completed a full semester of typewriting instruction. During the first nine weeks of the semester they received only keyboarding instruction and used the identical text as the keyboarding class.

The class met three times per week for a standard 50-minute class period (Monday, Wednesday, and Friday from 1:30 to 2:20). Three lessons per week were scheduled. Students were instructed to make up any missed material before attending the next class in order to have all class members working on the same lesson each day. Students with excessive absences (10 or more) were not included in the study.

Procedures

Description and Selection of Sample

Three sections of BUSAD 2010 (keyboarding) were offered in the 1982 fall semester, and three sections were offered in the 1983 spring semester. Students who enrolled in this course and who had no previous keyboarding/typewriting instruction comprised the experimental group. At an organizational meeting held during the first week of each semester, students completed a questionnaire (see Appendix B) to determine those who had previous instruction.

Presented in Table I are the major areas of study and the number of students in each who made up the experimental group. BUSAD 2010 was not a requirement for any of the students participating in the study.

TABLE I

MAJOR AREAS OF STUDY FOR STUDENTS IN THE EXPERIMENTAL GROUP

Major Area of Study	Number of Students
Architecture	2
Business	12
Computer Science	5
Education	1
Engineering	2
Journalism	1
Public Relations	1
Undecided	3
N = 27	

Twenty-seven of the 67 students enrolled in BUSAD 2010 were included in the experimental group, 17 from the fall semester and 10 from the spring semester. The enrollment in the experimental group was 18 males and 9 females.

One section of basic typewriting (OFFMG 1102) was offered in the 1982 fall semester, and one section was offered in the 1983 spring semester. Students who enrolled in this course and who had no previous keyboarding/typewriting instruction were included in the control group. During the first week of the semester, these students completed the same questionnaire as the keyboarding classes to determine those who had previous instruction.

Table II presents the classification for students in the control and experimental groups.

TABLE II

STUDENT CLASSIFICATIONS FOR THE CONTROL AND EXPERIMENTAL GROUP

Classification	Computer-assisted Group	Teacher-directed Group
Freshman	18	16
Sophomore	3	11
Junior	1	7
Senior	5	3
Graduate	-	2
Special	-	1
TOTAL	27	40

Forty of the 93 students enrolled in OFFMG 1102 were included in the control group, 20 from the fall semester and 20 from the spring semester. The enrollment in the control group was 21 males and 19 females.

Presented in Table III are the major areas of study and the number of students in each who made up the control group in this experiment.

TABLE III

MAJOR AREAS OF STUDY FOR STUDENTS IN THE CONTROL GROUP

Major Area of Study	Number of Students
Advertising	3
Architecture	1
Biology	1
Business	8
Business Education	3
Communications	1
Computer Science	5
Engineering	2
Executive Secretarial	1
Family Relations	1
Journalism	3
Medical Technology	1
Nursing	1
Physical & Occupational Therapy	1
Pre-med	1
Psychology	1
Studio Art	1
Undecided	5
N = 40	

Neither the experimental group nor the control group was aware that data were being collected for comparative purposes. No effort was made to place students in one group or the other, although the typewriting students were made aware that the keyboarding class was being offered. This announcement was made because keyboarding was offered for the first time during the 1982 fall semester and was not listed or described in the university catalog. Several students did elected to change from typewriting to keyboarding.

Facilities and Equipment

The experimental group met in B-004 in the College of Business Administration Building at Oklahoma State University, Stillwater, Oklahoma, for approximately one-half of their instruction where they used five Apple II microcomputers. The control group met in a typewriting classroom in the same building for all of their instruction. The room was equipped with IBM Selectric typewriters, adjustable desks and chairs, a sound system, a demonstration typewriter, and a chalkboard. The same room and equipment were used by the experimental group for the remainer of their instruction when using the audiocassette tapes and textbook.

Instruction Materials

Both groups used as a textbook Basic Information Keyboarding Skills published by South-Western Publishing Company. The experimental group also used Microcomputing Keyboarding, a series of four microcomputer diskettes designed for the Apple II Plus Microcomputer and correlated with the textbook. Audiocassette tapes designed to supplement Basic

Information Keyboarding Skills were available to both groups. The experimental group was particularly encouraged to use the tapes after completing a lesson on the microcomputer. The control group was made aware of the tapes, and suggested usage was for make up or additional practice.

Class Procedures

Prior to the start of the fall semester, the instructors for the keyboarding and the beginning typewriting class met to discuss class procedures.

Keyboarding Classes. The committee chair for this study taught the keyboarding class. During the introductory keyboarding class meeting a course syllabus (see Appendix C) was distributed, students signed up for computer time, and the instructional system was explained. The instructional system consisted of a correlated package of diskettes to be used on the computer and a text accompanied by audiocassettes to be used on the typewriter.

At the introductory meeting, the keyboarding students selected and signed up for three 30-minute sessions per week on the computer. They were instructed not to sign up for three consecutive days in an effort to space their instruction and practice through the week. They were further instructed to follow each computer session (not necessarily immediately) with a 30-minute typewriting laboratory session using the text and correlating instructional audiocassettes. The recommended sequence was to complete Lesson 1 on the computer and then to complete that same lesson on the typewriter before proceeding to Lesson 2 on the

computer, and so on. Instruction was independent of daily teacher contact.

It was estimated that the keyboarding students would need approximately 35 hours of instruction to complete the course. That estimate was based on the assigned lessons which totaled 35 (Lessons 1 through 30 and Lessons 41 through 45). Lessons 1 through 25 covered the alphabetic keyboard, and Lessons 26 through 30 covered the top-row numeric keyboard. Lessons 41 through 45 developed proficiency on the 10-key numeric keyboard. The keyboarding students were not monitored and were free to elect to complete fewer or more than the recommended three lessons per week.

During the fall semester, students who failed to complete the required lessons or failed to meet the minimum requirements were given the option of taking an incomplete for the semester and completing the class during the spring semester. Those students were not included in the study. During the spring semester, students were not allowed to take an incomplete as the class was not scheduled for the following summer or fall semester. Only one student failed to complete the necessary requirements and received a grade of 'no pass' for the course grade since the grading system was simply pass/no pass.

After students completed Lesson 25, which varied from Week 8 to Week 15, their techniques and straight-copy speed and accuracy were evaluated as described in the Data Gathering section of this chapter. The data collected at this time were used in comparing achievement of the two groups.

Communication with the keyboarding students was maintained by means of bulletin board notes in the computer and typewriting laboratories.

So that student progress could be observed, they were asked to sign in and out for each computer and typewriter sesson and identify the lesson number completed. Individual file folders were kept in the typewriting lab where all typed lessons were placed at the end of each session.

Students in the keyboarding class were allowed to exit the course after completing all requirements. These requirements included completing Lessons 1 through 30 on the computer and typewriter and Lessons 41 through 45 on the printing calculator since the microcomputers used were not equipped with a 10-key numeric pad. The straight-copy exit standard for the fall semester was 25 gross words a minute with fewer than four errors on one-minute timings of low average difficulty. This standard was raised to 30 gross words a minute for the spring semester because almost all of the fall students achieved this level upon completion of the 35 lessons.

Typewriting Classes. The researcher taught the beginning typewriting class. During the first two class meetings for OFFMG 1102 (beginning typewriting), a course syllabus (see Appendix D) was distributed and a questionnaire (see Appendix B) was completed. In addition, students received instruction on inserting paper into the machine, setting margins, and setting the line-space selector.

Beginning with the third class meeting, students progressed through the text at the rate of one lesson per day. At the beginning of each lesson any techniques presented in that lesson were demonstrated to the class by the teacher. Also, techniques presented in previous lessons were again briefly demonstrated.

With the use of transparencies and an overhead projector, new key locations and the proper finger and reach techniques were explained and

illustrated to the class. The students, following the directions given in class and in their textbooks, completed the daily lesson. If they completed the lesson prior to the end of class, they were to return to the more difficult portions of the lesson and repeat those sections.

A technique evaluation sheet (see Appendix D, page 87) was used to evaluate each student weekly on techniques. Students were advised on how to improve and kept abreast of their progress.

Timed drills were given at least twice per week after Lesson 10. All timed writings prior to Lesson 20 were of a maximum length of one minute. Three-minute timings were administered after Lesson 19 but were not used for this study.

The data for the experiment was gathered during the first nine weeks of the semester. The material covered during this period matched the requirements for the keyboarding class. The typewriting students completed the text during the last seven weeks of the semester and received additional information on basic formatting such as memorandums, personal letters, business letters, tables, and reports.

The data on the beginning typewriting classes' speed and error rates were taken after they had completed lesson 25. For both fall and spring semesters, this was during the ninth week of classes.

Data Gathering

After students completed Lesson 25, their typewriting techniques, straight-copy speed, and straight-copy errors were measured. For the control group these data were collected during the ninth week, whereas for the experimental group it occurred sometime between the eighth and the fifteenth weeks. Since the experimental group worked on an

independent basis, students completed Lesson 25 at different times during the semester. Even though it was recommended that they complete three lessons each week and exit the course within ten and one half weeks, some exercised the privilege of taking longer.

Technique evaluations were conducted by a panel of three judges who are experienced typewriting teachers. They used the observation method and a technique evaluation sheet, a copy of which is included in Appendix A, to rate the keyboarders and basic typewriting students.

> Typewriting techniques cannot be measured in a precise quantitative sense. They can and should, however, be observed and quantitatively 'rated' by the typewriting teacher as part of both the formative and summative evaluation process.[1]

The initial techniques selected by the researcher for evaluation were those commonly recommended by authorities as those needing emphasis during the first half of a typewriting course. The list of techniques was then examined by the typewriting teachers who served as judges. The final list of eleven techniques were those the judges agreed could best be observed and that were most critical to typewriting skill development.

The techniques rated were: fingers curved and upright and wrists low; correct finger alignment; forearms parallel to the slant of the keyboard; body erect and seated back in chair; feet on floor for balance; eyes on copy; quick snappy keystrokes; quick down and in motion to strike the space bar; return key struck quickly using the correct finger; uniform stroking action; hands and arms quiet.

Each judge rated each student's techniques using a scale of 1 for needs improvement, 3 for satisfactory (but could use improvement), or 5

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[1]Ibid, p. 67.

for superior. The techniques were then averaged for a composite technique score.

To obtain a performance score on straight-copy speed and straight-copy errors, students typed a series of 12 one-minute timed writings from material they had not previously practiced. These timed writings consisted of the six paragraphs on pages 50, 52, and 57 of Basic Information Keyboarding Skills, with each paragraph used twice. Copies are included in Appendix E.

Each timed writing was triple-controlled, that is, controlled for syllable intensity, average word length, and percentage of high-frequency words. These three controls are "necessary to have a real measure of copy difficulty."[2] The difficulty level of this material was low average (1.4 SI, 5.4 AWL, 85% HFW), which is commonly used for learners in the 25 to 35 gross-words-a-minute skill range.

To obtain speed and error scores for each student, the top three timings were selected and averaged. To determine the top three timings, those with fewer than four errors were identified. From this group of timings, the three having the highest gross words a minute were selected. These three speed scores were averaged for a composite straight-copy speed score, and these three error scores were averaged for a composite straight-copy error score.

For example, assume that Student A made the following speed/error scores: 28/2, 31/4, 27/0, 30/3, 31/3*, 32/3*, 33/5, 29/0, 30/0, 31/2*, 30/0, 29/1. Those having fewer than four errors were identified by underlining them. From the group of underlined scores, those three having

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[2]Ibid, p. 65.

the highest gross words a minute had an * put after them and represent Student A's top three scores. These three speed scores and three error scores were averaged for a composite straight-copy speed score of 31 and a composite straight-copy error score of 3.

If a student did not have three timings with less than four errors, then the number of additional timings needed to total three was selected on the basis of the lowest number of errors. For example, Student B's scores were: 27/4, 29/3*, 31/5, 28/4*, 30/5, 29/4*, 33/6, 31/5, 32/6, 33/7, 34/6, 32/5. Student B had only one timing with less than four errors, so the two highest timings with the fewest errors were also selected. The three scores were averaged for a composite straight-copy speed score of 29 and a composite straight-copy error score of 4.

Data Treatment

Analysis of variance was used as the statistical procedure in this experiment to test the primary hypothesis (Hypothesis 1) as stated in Chapter I. Technique evaluations, straight-copy speed, and straight-copy error scores were the dependent variables and instructional methods were the independent variables.

> ...one of the most useful techniques in statistics--the analysis of variance. This technique allows us to compare two or more means to see if there are significant differences between or among them.[3]

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[3]Albert Bartz, Basic Statistical Concepts (Minneapolis, 1981), p. 272.

Haber and Runyon stated that analysis of variance is a technique of statistical analysis which overcomes the ambiquity in assessing significant differences when more than one comparison is made.[4]

Hypotheses 2, 3, and 4 (stated in Chapter I) were statistically tested at the .05 level of significance using the Student's t-test. Guilford recommended the Student's t-test as the statistical test to be used to find the difference between groups.[5]

Summary

College students enrolled in keyboarding and basic typewriting, who had not had previous typewriting/keyboarding instruction, participated in the experimental study to determine if there was a difference in achievement between students receiving computer-assisted instruction (CAI) supplemented by audiocassettes and students receiving traditional, teacher-directed instruction.

The group receiving CAI was expected to attend three 30-minute instructional sessions on an Apple II microcomputer and to supplement that instruction by repeating each lesson on a typewriter. Instructional audiocassettes were available for use with the typewriting exercises. All of the instruction was independent of daily teacher contact. The group receiving the traditional, teacher-directed mode of instruction met 3 times a week for 50 minutes. Each group used the identical textbook.

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[4]Audrey Haber and Richard P. Runyon, General Statistics (Reading, 1977), p. 298.

[5]J. P. Guilford, Fundamental Statistics in Psychology and Education (New York, 1965), p. 167.

Both groups were evaluated at the end of nine weeks of instruction on techniques by three experienced typewriting teachers. After completing the first 25 lessons, students in both groups were also given a series of one-minute timed writings to measure achievement in straight-copy speed and straight-copy errors.

CHAPTER IV

RESULTS

The purpose of this study was to compare the effectiveness of two methods of teaching keyboarding at the college level. The two methods were: (1) computer-assisted instruction in an independent learning environment and (2) teacher-directed instruction in a traditional classroom environment.

Achievement in keyboarding was measured with the following criterion variables: technique evaluations, straight-copy speed, and straight-copy errors.

This chapter reports the findings of the study by presenting statistical evidence and relating this data to the hypothesis and by reporting additional analysis pertinent to the experiment.

Analysis of Data

Hypothesis Testing

> Hypothesis 1: There will be no significant difference in combined technique achievement, straight-copy speed achievement, and straight-copy error achievement by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

To test this hypothesis, a multivariate analysis of variance was performed to compare the two groups on the following variables simultaneously: technique evaluations, straight-copy speed, and straight-copy errors.

Three tests were applied, as shown in Table IV, to judge the significance of the multivariate analysis of variance. Each of the tests indicated a significant difference between the two groups at the .05 level of signigicance; therefore, the null hypothesis was rejected.

TABLE IV

MANOVA SIGNIFICANCE TESTS: COMPARISON OF OVERALL ACHIEVEMENT BETWEEN COMPUTER-ASSISTED AND TEACHER-DIRECTED INSTRUCTED GROUPS

Test	df	F
Hotelling-Lawley Trace	3,63	4.28*
Pillai's Trace	3,63	4.28*
Wilks' Criterion	3,63	4.28*

* Significant at the .05 level of confidence

The results of these tests indicated that there was a significant difference in overall achievement between the two groups.

To determine which achievement scores contributed to the difference in the two groups, Hypotheses 2, 3, and 4 were tested.

> Hypothesis 2: There will be no significant difference in technique evaluation scores by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

A t-test was performed on the technique evaluation scores. As shown in Table V, the t-test value was 2.63. This value indicated that the technique evaluation scores of the students receiving computer-assisted instruction were significantly different from those in the traditional, teacher-directed classroom at the .05 level of significance; therefore, the null hypothesis was rejected.

TABLE V

MEAN SCORES AND t VALUE ON TECHNIQUE EVALUATION SCORES FOR EACH GROUP

Variable	Teacher-directed Group	Computer-assisted Group	df	t
Technique Evaluations	39.93	43.89	65	2.63*

*Significant at the .05 level of confidence

The computer-assisted group scored consistently higher than the teacher-directed group on the individual items of the technique evaluation. Each technique was judged on a scale of 5 for superior, 3 for satisfactory--but could use improvement, or a 1 for needs improvement. The differences in the average scores for the two groups ranged from a difference of only .10 on the technique, eyes on copy, to .74 on the technique, quick snappy keystrokes.

Table VI presents the individual technique mean score and t value. To be significant at the .05 level of significance, the t value would need to be at least 2.00.

TABLE VI

MEAN SCORES AND t VALUES ON EVALUATED TECHNIQUES FOR EACH GROUP

Technique	Teacher-directed Group	Computer-assisted Group	t**
Fingers curved & upright; Wrists low	3.52	3.88	1.62
Correct finger alignment	3.35	3.57	.97
Forearms parallel to keyboard	3.57	3.99	1.93
Body erect, back in chair	4.20	4.73	2.66*
Feet on floor for balance	4.03	4.26	.90
Eyes on copy	4.13	4.23	.45
Quick snappy keystrokes	3.37	4.11	3.27*
Space bar--quick down and in motion	3.67	4.14	2.46*
Strikes return key quickly; proper finger	3.55	3.69	.62
Uniform striking action	2.83	3.35	1.99
Hands and arms quiet	3.72	3.94	.97

*Significant at the .05 level of confidence
**All the tests had 65 degrees of freedom.

The results of these tests indicated that the computer-assisted group scored higher on all techniques evaulated. On three of the eleven techniques evaluated, the computer-assisted group's scores were significantly different from the teacher-directed group's. These three techniques were: body erect, back in chair; feet on floor for balance; eyes on copy. Overall the scores for students receiving computer-assisted instruction were significantly different from those in the traditional, teacher-directed classroom at the .05 level of confidence.

> Hypothesis 3: There will be no significant difference in straight-copy speed by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

A t-test was performed on the straight-copy speed scores. As shown in Table VII, the t-test value was 1.61. This value indicated that the straight-copy speed scores for the computer-assisted group were not significantly different from those in the traditional, teacher-directed classroom; therefore, the null hypothesis was not rejected. To be significant at the .05 level of significance, the t value would need to be at least 2.00

TABLE VII

MEAN SCORES AND t VALUE ON STRAIGHT-COPY SPEED SCORES FOR EACH GROUP

Variable	Teacher-directed Group	Computer-assisted Group	df	t
Straight-copy Speed	29.98	33.48	65	1.61

The results indicate that although the computer-assisted group scored an additional 3.5 average words per minute on the straight-copy one-minute timings, the difference was not significant at the .05 level of significance.

> Hypothesis 4: There will be no significant difference in straight-copy errors by beginning keyboarding students taught by a computer-assisted method and students taught by a teacher-directed method.

A t-test was performed on the straight-copy error scores. As shown in Table VIII, the t-test value was 1.72. This value indicated that the straight-copy error scores for the computer-assisted group were not significantly different from those in the traditional, teacher-directed classroom; therefore, the null hypothesis was not rejected. To be significant at the .05 level of significance, the t value would need to be at least 2.00

The results indicated that although the computer-assisted group scored on the average .57 fewer errors on a one-minute straight-copy timing, the difference was not significant at the .05 level of significance.

TABLE VIII

MEAN SCORES AND t VALUE ON STRAIGHT-COPY ERROR SCORES FOR EACH GROUP

Variable	Teacher-directed Group	Computer-assisted Group	df	t
Straight-copy Errors	2.43	1.86	65	1.72

Additional Findings and Observations

In addition to the analysis made to test the stated hypothesis, a further test was performed to test for differences among the judges who conducted the technique evaluations.

All three judges rated the computer-assisted instructed groups higher than the teacher-directed groups. The analysis, however, indicated a large degree of variability among the judges. Apparently the evaluation scale on the technique check sheet (See Appendix A) was interpreted in a different manner by each judge.

Table IX shows that Judge 3 evaluated more critically than Judges 1 and 2. Based on the technique evaluations, Judge 2 found a significant difference between groups, but Judges 1 and 3 did not. To be significant at the .05 level of significance the t value would have to be at least 2.00.

TABLE IX

MEAN SCORES AND t VAULES ON TECHNIQUE EVALUATIONS BY JUDGE

	Teacher-directed Group	Computer-assisted Group	df	t
Judge 1	3.886	4.185	65	1.92
Judge 2	3.559	4.024	65	2.83*
Judge 3	3.445	3.761	65	1.59

*Significant at .05 level of confidence

A correlation analysis was performed to determine the relationship in technique evaluation among the panel of judges. This analysis provided a measure of reliability on the panel of judges.

TABLE X

CORRELATION COEFFICIENTS BY JUDGES FOR TECHNIQUE EVALUATIONS

Technique	Judges 1 and 2	Judges 1 and 3	Judges 2 and 3
Fingers curved & upright, wrists low	.182	.264*	.308*
Correct finger alignment	.315*	.261*	.301*
Forearms parallel to keyboard	.183	.306*	.463*
Body erect, back in chair	.473*	.431*	.440*
Feet on floor for balance	.417*	.340*	.510*
Eyes on copy	.246*	.252*	.174
Quick snappy keystrokes	.481*	.558*	.387*
Space bar--quick down & in motion	.161	.344*	.205
Return--quick & with proper finger	.010	.279*	.252*
Uniform striking action	.380*	.412*	.374*
Hands and arms quiet	.250*	.351*	.242*

*Significant at the .05 level of confidence

Table X demonstrates the relationship between the judges' evaluations on techniques. The closer the correlation is to 1.00, the stronger the relationship. Judge 1 and 3 consistently agreed on their evaluations. Judges 1 and 2 did not have a significant correlation on four of the techniques evaluated. Judges 2 and 3 did not have a significant correlation on two of the techniques evaluated. The only time both Judges 1 and 3 and Judges 2 and 3 did not have a significant correlation was on the evaluation of the technique, space bar--quick down and in motion. This difference may indicate that the technique in question was too difficult to evaluate or that different criteria needed to be used in judging that technique.

All students in both groups scored 3.00 or better (satisfactory--but could used improvement) on all techniques with the exception of uniform striking action in the teacher-directed group. Their score was 2.83.

All students scored 4.00 or better on the following techniques: body erect, back in chair; feet on floor for balance; eyes on copy. In general, position at the machine was above satisfactory and approached being superior after 25 lessons. Furthermore, watching a CRT rather than a text for instructions and copy to be keyboarded did not affect the computer-assisted group's ability to keep eyes on copy since they scored 4.23 on this technique.

The computer-assisted group scored 4.11, which was significantly different from the teacher-directed group, on quick snappy keystrokes.

Perhaps the fact that they worked on typewriters as well as terminals contributed to good keystroking techniques, as suggested by Robinson.[1]

Because the computer-assisted course was new at Oklahoma State University, the professor teaching the course, the researcher, and other laboratory assistants were particularly observant of student reactions and difficulties encountered.

It was noted that the students in the computer-assisted group had little difficulty switching between the computer keyboard and an electric typewriter. The students did have some initial uneasiness over the independent learning environment mode of instruction. Most were unfamiliar with an arrangement whereby they were allowed to schedule their own class time. That uneasiness was quickly overcome as students became comfortable with the operation of the microcomputers and set difinite hours for attending the keyboarding and typewriting labs.

As might be expected, some students in the computer-assisted course practiced sporatically rather than consistently each week, which probably added to their learning time. However, they apparently compensated adequately for what is considered to be a poor learning technique in typewriting/keyboarding, as noted by their achievement scores.

A formal exit interview was not held; however, an effort was made to speak to the keyboarding students on their feelings toward the course. A positive attitude was expressed by the majority of the students. They felt they had reached their speed and accuracy goals and appreciated the flexibility allowed in scheduling through the independent learning environment. Also, students learned to operate a typewriter as well as a

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[1]Robinson, Century 21 Reporter, p. 12.

computer keyboard and hence recognized an additional application of their new skill.

At the beginning of each semester there was some initial confusion over the terms computer-assisted instruction and keyboarding. Some students and advisors thought the course would include instruction on how to use a computer as well as how to keyboard. This misunderstanding was corrected by the instructor at the organizational meeting.

Summary

Data were analyzed comparing the achievement of students learning keyboarding in a teacher-directed, traditional classroom environment with those in a computer-assisted, independent learning environment class. The achievement criterion variables were: technique evaluations, straight-copy speed, and straight-copy errors. The results were:

1. There was a significant difference in overall achievement (combined technique, straight-copy speed, and straight-copy error achievement) in beginning keyboarding between students taught by a computer-assisted, independent learning environment method and students taught in a traditional, teacher-directed classroom.

2. There was a significant difference in technique evaluations between the group receiving computer-assisted instruction and the group receiving instruction in a traditional, teacher-directed classroom. Students in the computer-assisted class consistently received higher technique evaluations than the teacher-directed group.

3. Students in the computer-assisted class had a higher achievement in keyboarding speed. There was not, however, a significant difference

in straight-copy speed achievement at the .05 level of significance between the two groups.

4. Students in the computer-assisted group consistently made fewer errors than the teacher-directed class on the straight-copy one-minute timed writings. There was not, however, a significant difference at the .05 level of significance.

5. An analysis was also performed on the technique evaluations of the judges, and it appeared that the judges were in general agreement.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A summary of this experiment, conclusions drawn from the findings, and recommendations for future research are presented in this chapter.

Summary

The purpose of this experimental study was to compare the achievement of keyboarding students taught by traditional teaching techniques in a teacher-directed, group environment with students taught by computer-assisted (CAI) techniques in an independent learning environment.

The instructional method used for the control group was a traditional, teacher-directed approach. This method employed teaching techniques commonly practiced by teachers of beginning typewriting such as teacher demonstration, teacher-directed activities, teacher supervision and guidance, and class interaction. The learning activities were group-paced.

The instructional method used for the experimental group was computer-assisted and independent of daily teacher contact. In this study, each student followed the directions and instructions of a computer program and proceeded through the activities of the computer program without daily teacher contact.

For the experimental group the lessons were presented on an Apple II microcomputer. Demonstrations of keyboarding techniques were provided by animated computer graphics. After completing each computer session, students were to instructed complete the corresponding lesson from the

textbook on a typewriter. Each lesson was thereby reinforced. The students used a textbook for the typewriting sessions and had available to them audiocassettes that corresponded to the lessons presented in the text and on the microcomputer.

Data were collected from students enrolled in keyboarding (BUSAD 2010) and basic typewriting (OFFMG 1102) during the 1982-83 academic year at Oklahoma State University, Stillwater, Oklahoma. There were 40 students in the control groups and 27 in the experimental group.

Analysis of variance and the Student's t-test were the statistical techniques used to test the hypotheses, and .05 level of significance was used in all statistical analyses. The findings of this experimental study were:

1. There was a significant difference in overall achievement between the two groups.

2. There was a significant difference in achievement in technique scores. The computer-assisted group consistently scored higher on each technique evaluated.

3. There was no significant difference in achievement in straight-copy speed scores. The computer-assisted group did achieve higher average speeds than the teacher-directed group.

4. There was no significant difference in achievement in straight-copy error scores. The computer-assisted group, however, made fewer average errors per timing than the teacher-directed group.

Conclusions

In order to generalize from the results of this study, similar conditions would need to exist such as the age-level group, type of materials utilized, and the length of instruction. Numerous keyboarding software packages are available, and the following conclusions are based on the particular software and procedures used in this study.

1. Keyboarding is adaptable to the computer-assisted mode of instruction.

2. Keyboarding was taught as effectively with computer-assisted instruction in an independent learning environment as with the traditional, teacher-directed approach. Likewise, keyboarding was taught as effectively in the traditional, teacher-directed learning environment with the exception of three of the eleven techniques evaluated.

3. Straight-copy speed scores achieved by students in the computer-assisted, independent learning environment did not differ significantly from scores achieved by the students in the traditional, teacher-directed class. However, the computer-assisted group achieved an average of 3.5 gross words per minute more than the teacher-directed group.

4. Straight-copy error scores obtained by the computer-assisted, independent learning environment students did not differ significantly from the straight-copy error scores obtained by the students in the traditional, teacher-directed class. However, the computer-assisted group achieved an average of .57 fewer errors per minute than the teacher-directed group.

5. Technique evaluation scores for students in the computer-assisted, independent learning environment did differ significantly from

those in the traditional, teacher-directed class. Specifically, the three techniques were: body erect, back in chair; feet on floor for balance; eyes on copy.

6. The keyboarding portion of a beginning typewriting course is adaptable to the computer-assisted mode of instruction.

7. Students soon overcame the initial uneasiness associated with the independent, computer-assisted learning evnironment. They expressed an appreciation for the flexibility allowed in scheduling instruction and being able to progress at their own rate. Learning to operate both a typewriter and a computer terminal was a source of satisfaction and accomplishment.

Recommendations

The recommendations for further research and for application of this research results are:

1. Research should be conducted that would focus on and measure the achievement differences of students who have had previous typewriting instruction.

2. Research studies should be conducted to determine how effective computer-assisted instruction for keyboarding would be when used with a larger population.

3. A study should be conducted to evaluate the cost/effectiveness of CAI as compared to traditional instruction to determine the feasibility of implementing the CAI program at other institutions.

4. A study should be conducted to compare a totally teacher-directed method with a totally computer-assisted method and with a combination computer-assisted and teacher-directed mode of instruction.

5. Research studies should be conducted at other educational levels, from elementary to technical schools and junior colleges, to determine how effective the computer-assisted mode of instruction for keyboarding would be in other educational settings.

6. Research should be conducted to compare the effectiveness of the various software available for computer-assisted instruction.

7. Those educational institutions desiring to utilize staff and equipment more effectively should consider experimenting with computer-assisted instruction in keyboarding/typewriting classes.

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APPENDIXES

APPENDIX A

TECHNIQUE EVALUATION SHEET

Class_____

Student's Name_____

Technique Evaluation Sheet

Ratings:	Superior	5 points
	Satisfactory (But could use improvement)	3 points
	Needs Improvement	1 point

	Rating
Position at the Machine:	
1. Fingers curved and upright; wrist low	
2. Correct finger alignment	
3. Forearms are parallel to the slant of the keyboard	
4. Body is erect, seated back in chair	
5. Feet on floor for balance	
6. Eyes on copy	
Keyboard Control:	
1. Quick snappy keystrokes	
2. Quick down and in motion to strike the space bar	
3. Return key, strikes quickly and returns using the correct finger	
4. Uniform stroking action	
5. Hands and arms quiet	
Total Points	

APPENDIX B

STUDENT QUESTIONNAIRE

Name_____Year/Status_____

Major_____

Reason for enrolling in keyboarding/typewriting:

Required Yes_____No_____

If not required why are you taking this course? (Type papers, operate computer, etc.)

_____

_____

Previous Courses in Typewriting or Similar Courses:

	Course Name	No. of semesters	When	Where	Grade
Typewriting					
Similar Courses such as Office Practice, COE, Transcription					

Classes presently taking which requires typewriting/keyboarding:

Class_____Requires_____

Class_____Requires_____

Class_____Requires_____

Future classes which will require typewriting/keyboarding/key punching:

Class_____Requires_____

Class_____Requires_____

Class_____Requires_____

Class_____Requires_____

Do you have access to a typewriter/keyboard outside of class and/or lab?

Yes_____No_____

If yes, please explain. (Home electric typewriter or computer, on-the-job, etc.)

_____

_____

APPENDIX C

KEYBOARDING SYLLABUS

BUS AD 2010: KEYBOARDING

Professor: Dr. Arnola C. Ownby
Office: 335 Business Building, Ext. 5200
Office Hours: TT 1-4 p.m.

Text and Materials Purchased by Students: BASIC INFORMATION KEYBOARDING SKILLS (textbook available at bookstore) and typing paper

Materials Provided by Department: MICROCOMPUTER KEYBOARDING (diskettes)

Class Procedure: You will complete the requirements for this course by using the Apple II computers in Room B-04 and the typewriters in Room B-02 in the basement of the Business Administration Building. Most of your work will be completed on an independent basis without direct teacher instruction. Laboratory assistants will be available, though, to check out diskettes, load audiocassettes, and assist with equipment difficulties. In addition, we will meet as a group each Tuesday at 10:30 a.m. in Room B-02.

You will sign up for time on the microcomputer for three days each week. These days should be spread through the week, i.e., do not sign up for three consecutive days. Each microcomputer session will be for 30 minutes, repeat the lesson parts that you feel will be most beneficial to you.

The times for which you sign up for a computer will be reserved for you, and you should ask any other user to relinquish the machine. However, if you have not arrived by 10 minutes after your assigned time, another user may legitimately take your assigned time. Because of the heavy demand for these computers, you should make every effort to use the machine during your assigned time. A few additional hours will be available on a first-come-first-serve basis for extra practice and make-up work should it be absolutely necessary to miss a scheduled session.

After completing each lesson on the microcomputer, complete that same lesson on a typewriter (using a correlating audiocassette and your text) in B-02. That room will be available from 2:30 to 5:30 p.m. each day except Friday, and tapes will be started on the hour and half hour. Spend approximately 25 minutes on each lesson, repeating selected lesson parts as needed if the audiocassette lesson is shorter than 25 minutes. Each lesson should be completed on the typewriter before proceeding to the next lesson on the microcomputer. File all work completed on the typewriter in a file folder provided with your name. Always leave this file with your work completed to date in the bottom drawer of the file cabinet at the front of the room in B-02. Label each page by lesson number and file the most recent work in the front of the folder.

(over)

IT IS ALSO IMPORTANT THAT YOU FILL IN THE RECORD SHEETS in both B-04 and B-02 each time you come. These record sheets will be posted on the bulletin board in each room and will list the names of class members with space to fill in the date each lesson was completed. Beside your name, record the date in the column below the lesson number you completed.

PLEASE DO NOT HESITATE to come by my office or give me a call if you have any problems or questions. Also, feel free to ask the laboratory assistants for help when needed.

Grading: Pass/No Pass. You may exit this course when the lessons have been completed and when you have met the standard listed below. It should take approximately 35 hours of class and/or practice time to complete this course.

Passing Standard: 30 gross words a minute with 3 or fewer errors a minute.

Schedule for Assignments:

Jan. 10 - 14	Lesson 1
Jan. 17 - 21	Lessons 2 - 4
Jan. 24 - 28	Lessons 5 - 7
Jan 31 - Feb. 4	Lessons 8 - 10
Feb. 7 - 11	Lessons 11 - 13
Feb. 14- 18	Lessons 14 - 16
Feb. 21 - 25	Lessons 17 - 19
Feb. 28 - March 4	Lessons 20 - 22
March 14 - 18	Lessons 23 - 25
March 21 - 25	Lessons 26 - 28
March 28 - April 1	Lessons 29, 30, 41*
April 4 - 8	Lessons 42 - 45*

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*Lessons 41-45 will be completed on the printing calculators in B-04. Label the tape for each lesson and place it in your file folder in B-02.

APPENDIX D

BEGINNING TYPEWRITING SYLLABUS

OFFMG 1102 Basic Typewriting

Section 1, 2 Credits
MWF 1:30 to 2:20
Bus 002

Instructor: Heidi Perreault
Office: Morrill Room 102
Office Phone: 624-6286

Office Hours will be held in the Business Building in Room 004 on Mondays and Wednesdays from 10:00 to 12:30, Tuesdays and Thursdays from 12:30 to 1:30 or by appointment.

Prerequisites: No previous typewriting instruction. Please note that students with one semester of typewriting at the college level or one year at the high school level will not be given credit for OFFMG 1102 but must enroll in OFFMG 2313, Production typewriting. If you have any questions about your status in this regard, please seek information immediately from your departmental advisor to prevent any problems or misunderstandings at a later date.

Course cannot be counted for credit in meeting certificate or degree requirements in the College of Business Administration. See Catalog.

Text: Basic Information Keyboarding Skills (South-Western Publishing Co.) Check the bookstore under BUSAD 2010.

Supplies: Paper. 8 1/2 by 11 inch paper. (At least a 25% rag content is suggested.) You will be required to supply all of your own paper. Please do not come to class without your text or an adequate supply of paper.

Attendance: Attendance will be taken daily. It is imperative that you attend every class. If you must miss a class, attend a lab prior to the next scheduled meeting in order to catch up. Audiocassettes that correspond to the lessons in the text are available in the lab and should be used not only when it is necessary to make up material but any time additional practice is needed on a lesson. The material is designed to build upon itself. Even one missed "building block" will cause you an incredible amount of problems in later lessons. Keep up with the material. Do not fall behind or leave out a lesson.

Labs: Labs are scheduled on daily from 2:30 to 5:30 in Bus 002. These labs are not required but are designed to provide you with access to an electric typewriter outside scheduled class hours. When remedial drill work is assigned, it is expected that the work will be done outside of class on an electric typewriter. If you have such a typewriter at your disposal, fine. Otherwise, be sure to leave room for lab hours in your class schedule.

Final Grade: The final grade for the course will be based on three factors:

Speed 40% (Based on one and three minute timings.)
Accuracy 30% (Based on one and three minute timings.)
Procedures 30% (Based on the proper usage of procedures on graded assignments and on technique usage.)

UNIT I Lessons 1 to 25

Unit I is an introduction to typewriting. The objectives are:

1. To build touch control of the alphabetic keyboard.

2. To develop basic techniques upon which typewriting skill depends.

The focus for the first nine weeks will be on mastery of the alphabetic keyboard. Accuracy, speed development, and proper techniques will be stressed. The student will be measured on accuracy, speed, and technique usage during this period.

Techniques will be demonstrated in class at the beginning of each lesson. The student will find that following these techniques carefully will help in developing the speed and accuracy desired. The student will be evaluated on the proper usage of techniques through observation beginning with lesson 4. (This will probably be at the end of the second week of classes.)

A technique checksheet will be used for grading purposes on techniques. (See page 6) The student will be advised on how to improve any techniques that are not being properly implemented and kept abreast of the progress made.

For accuracy the student will type assigned drills and pass them in upon completion. Together with the instructor, each student will review the assignments to locate errors and to identify any possible problem areas. By early detection, the problems can be remedied quickly by concentrated drill work. The purpose, therefore, is early detection and corrective actions for any accuracy danger zones.

Accuracy will be measured weekly on timed assignments after lesson 10. (This will probably be at the beginning of the fourth week of classes.) A weekly grade on accuracy for lessons 10 to 25 based on one-minute timings will be recorded. The scale will be:

2 or less errors excellent
3 to 4 errors good
5 to 6 errors average
7 to 8 errors acceptable

Speed will be measured weekly after lesson 10. The timings will range from one to three minutes in length. Three-minute timings will not be given prior to lesson 20. The student will record the speed weekly. The prior week's speed will be the base speed. Each week the goal will be to raise that base speed by at least two words per minute. A grade on speed for the first 25 lessons will be recorded. The scale will be:

26 wpm excellent
22 wpm good
18 wpm average
15 wpm acceptable

UNIT II Lesson 26 to 50

Unit II continues with the mastery of the keyboard, plus it introduces arrangement concepts and procedures for commonly typed personal/business papers. The objectives are:

1. To build control of the figure/symbol keyboard.

2. To build keyboarding skills on the alphabetic keyboard.

3. To assure mastery of the procedures required to arrange personal/business papers in a basic format.

The focus of the last seven weeks of the course shifts from the alphabetic to the mastering of the figure/symbol keyboard strokes. Skill improvement on the alphabetic keyboard will continue to be stressed through technique refinement, accuracy, and speed development.

The student will be measured on both accuracy and speed on the new keys introduced in this section. Accuracy and speed improvement on the keys covered in Unit I will also be measured with an emphasis on technique improvement.

For accuracy the student will pass in assigned typing drills on the new keys. Together with the instructor, each student will review the assignment to locate errors and/or problem areas. Remedial drill work will be assigned for any trouble spots noted by the student and the instructor.

Speed will be measured weekly on the new keys. The goal will be to match the speed on these new keys with the speed attained on the alphabet keyboard. One-minute timings will be used on these exercises.

A weekly technique check sheet will continue to be used during Unit II. Any areas that need improvement will be discussed and remedial work and/or suggestions will be implemented to correct any problems.

The student will continue to be measured on speed and accuracy on the alphabetic keyboard as in Unit I. The speed goal will be to continue a steady increase of two words per minute weekly. The timed writings will be given weekly and be three minutes in length. A grade on speed for the lessons 26 to 50 will be recorded. The scale will be:

40 wpm excellent
35 wpm good
30 wpm average
25 wpm acceptable

Accuracy will be measured on the same timed writings as speed. A grade on accuracy based on three-minute timings for lessons 26 to 50 will be recorded. The scale will be:

3 or less errors	excellent
4 to 6 errors	good
7 to 8 errors	average
9 to 10 errors	acceptable

Beginning with lesson 30 students will begin to learn procedures for arranging commonly typed personal/business papers. These procedures will include setting tabs and margins, centering horizontally and vertically, word division rules, addressing envelopes, and spacing rules for reports and correspondence.

Each procedure will be explained and demonstrated in class. The student will then do at least one practice exercise using each procedure before any assignments will be graded. All assignments to be collected for a grade will be announced at the beginning of class. Each student will do a self-evaluation of the exercise and hand the evaluation in with the assignment. (See page 5.) The instructor will hand the assignments back the following class period with a comment sheet explaining the grade earned.

EVALUATION SHEET

Date_____Exercise_____Page_____

POINTS

1. Arranges the work station for efficient use of textbook and supplies._____

2. Reads all directions and begins work promptly._____

3. Adjusts machine properly (margins, spacing, etc.)_____

4. Uses the proper tools (paper, forms, etc.)_____

5. Follows directions carefully (oral and written.)_____

6. Makes an effort to reach suggested goals._____

7. Seeks and accepts help or suggestions in a positive manner._____

8. Evaluates work carefully in terms of standards specified._____

9. Arranges completed work efficiently (stapled in order, name on all sheets, etc.)_____

TOTAL_____

Rating:

4 excellent
3 good
2 average
1 acceptable
0 not acceptable

Total rating:

33 to 36 excellent
27 to 32 good
18 to 26 average
9 to 17 acceptable
0 to 8 not acceptable

TECHNIQUE CHECKSHEET

	WEEKS						
	2	3	4	5	6	7	8
Keystroking							
1. Keeps fingers curved and upright over home row keys.							
2. Makes quick, snappy keystrokes with immediate key release.							
3. Maintains uniform keystroking action (force).							
4. Keeps hands and arms quiet, wrists low.							
5. Strikes each key with proper finger.							
Space bar							
1. Keeps right thumb curved--on or close to space bar.							
2. Strikes space bar with a quick, down-and-in (toward palm) motion of right thumb.							
3. Releases space bar quickly.							
4. Does not pause before or after spacing stroke.							
Shift keys							
1. Reaches quickly with little fingers; keeps other fingers in typing (home row) position.							
2. Holds shift key all the way down as the letter key is struck.							
3. Release shift key quickly after letter is struck.							
4. Does not pause before or after shift-key stroke.							
TOTALS							

Rating scale:	4 excellent	Weekly grade:	47 to 52 excellent
	3 good		39 to 46 good
	2 average		26 to 38 average
	1 acceptable		13 to 25 acceptable
	0 not acceptable		0 to 12 not acceptable

TECHNIQUE CHECKSHEET

	WEEKS							
	9	10	11	12	13	14	15	16
Keystroking								
1. Keeps fingers curved and upright over home row keys.								
2. Makes quick, snappy keystrokes with immediate key release.								
3. Maintains uniform keystroking action (force).								
4. Keeps hands and arms quiet, wrists low.								
5. Strikes each key with proper finger.								
Space bar								
1. Keeps right thumb curved--on or close to space bar.								
2. Strikes space bar with a quick, down-and-in (toward palm) motion of right thumb.								
3. Releases space bar quickly.								
4. Does not pause before or after spacing stroke.								
Shift keys								
1. Reaches quickly with little fingers; keeps other fingers in typing (home row) position.								
2. Holds shift key all the way down as the letter key is struck.								
3. Release shift key quickly after letter is struck.								
4. Does not pause before or after shift-key stroke.								
TOTALS								

Rating scale:		Weekly grade:	
4	excellent	47 to 52	excellent
3	good	39 to 46	good
2	average	26 to 38	average
1	acceptable	13 to 25	acceptable
0	not acceptable	0 to 12	not acceptable

APPENDIX E

TIMED WRITINGS

SOUTH-WESTERN PUBLISHING CO.

5101 Madison Road, Cincinnati, OH 45227
Telephone: 513-271-8811

June 28, 1983

Ms. Heidi Perreault
701 S. Pine
Stillwater, OK 74074

Dear Ms. Perreault

Your letter of June 13 addressed to Linda Sullivan has been referred to me.

We are pleased to grant permission to duplicate the timed writings on pages 50, 52 and 57 of our INFORMATION KEYBOARDING SKILLS for inclusion in your doctoral thesis.

We would be pleased to receive a copy of the completed study when it is available.

Sincerely yours

John M. McDonough
Director Product Development

jh

30d ▶ 15 Check/improve keyboarding speed

1. A 1′ writing on each ¶; determine *gwam* on each.

2. A 2′ writing on each ¶; if you finish a ¶ before time is called, start typing the ¶ again.

3. A 3′ writing on ¶s 1–2 combined; determine *gwam*.

4. If time permits, type additional 1′ writings on each of the 2 ¶s to improve speed.

all letters used | LA | 1.4 si | 5.4 awl | 85% hfw

	gwam 2′	3′
All of you make an error now and then in performing an	5	3
act like driving a car, doing the high jump, or playing the	11	8
piano. Typing is no different. To err is human. The more	17	12
difficult the activity, the greater the opportunity to make	23	16
errors. Do not expect all your work to be correct now.	29	19
Do not infer from this, though, that the more mistakes	5	23
you make, the more human you are. A lot of your errors are	11	27
merely chance; why you make them is a real puzzle. Others,	17	32
however, are known to be due to lack of attention, improper	23	35
reading, and bad techniques. Try to reduce the latter.	29	39

gwam 2′ | 1 | 2 | 3 | 4 | 5 | 6 |
3′ | 1 | 2 | 3 | 4 |

31d ▶ 20 Improve keyboarding skill: guided writing

1. A 1′ writing on ¶ 1; determine *gwam*.

2. Add 4 *gwam* to set a new goal rate.

3. Two 1′ writings on ¶ 1, trying to maintain your goal rate each ¼ minute.

4. Type ¶ 2 in the same way.

5. A 2′ unguided writing on each ¶. If you complete a ¶ before time is called, start typing that ¶ again.

6. A 3′ writing on ¶s 1–2 combined; determine *gwam*.

gwam	¼′	½′	¾′	Time
16	4	8	12	16
20	5	10	15	20
24	6	12	18	24
28	7	14	21	28
32	8	16	24	32
36	9	18	27	36
40	10	20	30	40
44	11	22	33	44
48	12	24	36	48

all letters used | LA | 1.4 si | 5.4 awl | 85% hfw

gwam 2′ 3′

Typewriter spacing is regular; that is, each letter of 5 4

the alphabet uses the same amount of space. Most type used 11 8

by printers, though, varies in space; that is, wide letters 17 12

take more space than narrow ones. Every line of typed copy 23 16

lines up at the left side but usually not at the right. 29 19

Printers can force lines of different lengths to align 5 23

at the right side by adjusting the space between words. As 11 27

you copy from print, then, do not expect every line to stop 17 31

at quite the same point. Many students and more than a few 23 35

teachers are puzzled by this peculiar quality of print. 29 39

gwam 2′ | 1 | 2 | 3 | 4 | 5 | 6 |

3′ | 1 | 2 | 3 | 4 |

Published by South-Western Publishing Company

35d ▶ 15 Check/improve keyboarding skill

1. A 3′ writing on ¶s 1–2 combined; determine *gwam*.

2. A 1′ and a 2′ writing on each ¶; determine *gwam* on each writing.

3. If time permits, type another 3′ writing on ¶s 1–2 combined; determine *gwam*, circle errors.

all letters used | LA | 1.4 si | 5.4 awl | 85% hfw

gwam 2′ | 3′

Often it has been said that everybody should learn how to type. Although that may be stretching the truth, no one was ever penalized for knowing how. A clerk or a secretary must know how to type, of course; but typing can be quite a help in private and professional communication as well. 5 | 4 · 11 | 8 · 17 | 12 · 23 | 16 · 29 | 19

Good typists are working in private and public offices of every kind. They have a wide assortment of duties, too. Not only do they have to prepare letters of all types; they also compile and type reports, arrange and type tables, and fill in many types of forms. They also do extra jobs. 5 | 23 · 12 | 27 · 17 | 31 · 23 | 35 · 29 | 39

gwam 2′ | 1 | 2 | 3 | 4 | 5 | 6 |
3′ | 1 | 2 | 3 | 4 |

APPENDIX F

STUDENT TECHNIQUE, SPEED, AND ERROR SCORES

TYPEWRITING Fall, 1982

Technique		Student A	B	C	D	E	F	G
Fingers curved & upright, wrists low	Judge 1	3	5	3	5	1	1	1
	Judge 2	3	5	3	5	3	5	5
	Judge 3	1	5	5	5	3	3	3
Correct finger alignment	Judge 1	3	5	5	5	3	3	3
	Judge 2	3	5	5	3	5	3	3
	Judge 3	1	5	3	3	1	3	3
Forearms parallel to keyboard	Judge 1	3	5	5	5	1	3	3
	Judge 2	3	5	3	5	5	5	5
	Judge 3	1	5	3	5	3	5	3
Body erect, back in chair	Judge 1	5	5	5	5	5	5	3
	Judge 2	5	5	5	5	5	5	5
	Judge 3	3	5	3	5	3	5	5
Feet on floor for balance	Judge 1	5	5	5	3	3	3	3
	Judge 2	5	5	5	1	5	1	3
	Judge 3	3	5	5	1	3	3	5
Eyes on copy	Judge 1	5	5	5	5	1	5	1
	Judge 2	1	3	5	5	1	5	3
	Judge 3	3	5	3	5	1	5	1
Quick snappy keystrokes	Judge 1	3	5	5	5	5	5	3
	Judge 2	3	3	5	5	3	5	3
	Judge 3	1	5	5	5	1	5	1
Space bar--quick down & in motion	Judge 1	3	5	5	5	5	5	3
	Judge 2	3	5	5	5	5	3	5
	Judge 3	1	5	5	5	3	3	3
Return--quick & with proper finger	Judge 1	1	3	5	5	1	1	1
	Judge 2	3	3	5	5	5	5	3
	Judge 3	1	5	3	5	1	3	3
Uniform striking action	Judge 1	1	5	5	5	1	1	1
	Judge 2	3	5	5	5	3	3	3
	Judge 3	1	5	5	5	1	3	1
Hands and arms quiet	Judge 1	5	5	5	5	3	1	5
	Judge 2	5	5	5	5	5	3	5
	Judge 3	3	5	5	5	3	3	3
Timings		15/1	40/2	50/2	50/2	24/0	18/3	23/0
Speed/errors		16/0	44/0	49/4	58/5	24/2	22/5	22/0
		15/0	40/3	48/1	52/6	24/1	20/4	24/1
Average Speed		15.3	41.3	47.7	53.3	24.0	20.0	23.0
Average Errors		.3	1.7	4.0	4.3	1.0	4.0	.3

TYPEWRITING Fall, 1982

Technique		H	I	J	K	L	M	N
Fingers curved & upright, wrists low	Judge 1	3	3	3	5	5	3	1
	Judge 2	5	3	5	5	5	5	5
	Judge 3	5	3	5	5	5	3	3
Correct finger alignment	Judge 1	5	3	5	5	5	5	5
	Judge 2	3	5	5	5	3	3	3
	Judge 3	3	5	5	5	3	3	3
Forearms parallel to keyboard	Judge 1	5	5	5	5	3	3	3
	Judge 2	3	3	5	3	3	5	5
	Judge 3	5	3	5	5	5	3	5
Body erect, back in chair	Judge 1	5	5	3	5	5	5	5
	Judge 2	5	5	3	5	5	5	5
	Judge 3	5	5	5	5	5	3	5
Feet on floor for balance	Judge 1	5	5	1	5	5	1	5
	Judge 2	3	3	5	5	5	1	5
	Judge 3	3	5	5	5	5	1	5
Eyes on copy	Judge 1	5	5	5	5	5	5	5
	Judge 2	5	5	3	5	5	5	3
	Judge 3	3	5	3	5	5	5	5
Quick snappy keystrokes	Judge 1	3	5	3	5	5	3	5
	Judge 2	3	5	3	5	5	3	3
	Judge 3	3	5	3	3	3	3	3
Space bar--quick down & in motion	Judge 1	5	5	5	5	3	5	5
	Judge 2	5	3	5	3	5	3	3
	Judge 3	3	3	5	3	3	3	3
Return--quick & with proper finger	Judge 1	5	5	5	3	3	5	3
	Judge 2	5	3	5	3	5	3	3
	Judge 3	5	3	3	5	5	5	5
Uniform striking action	Judge 1	1	3	1	5	3	1	3
	Judge 2	3	3	3	5	3	5	3
	Judge 3	3	5	5	5	3	5	3
Hands and arms quiet	Judge 1	5	5	5	5	5	5	5
	Judge 2	3	3	5	5	3	5	5
	Judge 3	5	5	3	3	5	5	5
Timings		25/4	37/4	26/1	36/7	23/2	27/5	27/3
Speed/errors		29/6	34/4	24/0	38/6	22/2	27/3	29/6
		25/5	32/7	19/2	34/6	21/0	26/4	25/4
Average Speed		26.3	34.3	23.0	36.0	22.0	26.7	27.0
Average Errors		5.0	5.0	1.0	6.3	1.3	4.0	4.3

TYPEWRITING Fall, 1982

Technique		Student O	P	Q	R	S	T
Fingers curved & upright, wrists low	Judge 1	5	3	1	1	3	3
	Judge 2	5	5	5	5	5	3
	Judge 3	5	1	5	3	3	5
Correct finger alignment	Judge 1	3	3	3	3	5	5
	Judge 2	5	3	3	3	3	3
	Judge 3	5	1	3	3	1	3
Forearms parallel to keyboard	Judge 1	1	5	5	3	5	5
	Judge 2	5	5	3	5	5	5
	Judge 3	5	3	5	3	5	5
Body erect, back in chair	Judge 1	5	5	5	3	3	3
	Judge 2	5	5	5	5	3	5
	Judge 3	5	3	5	5	5	5
Feet on floor for balance	Judge 1	5	3	5	5	3	5
	Judge 2	3	1	5	5	3	3
	Judge 3	3	3	5	5	5	5
Eyes on copy	Judge 1	5	5	5	5	5	5
	Judge 2	5	3	5	3	3	5
	Judge 3	5	3	5	5	5	3
Quick snappy keystrokes	Judge 1	3	3	3	3	5	5
	Judge 2	5	3	5	3	5	3
	Judge 3	1	1	3	3	3	3
Space bar--quick down & in motion	Judge 1	3	3	5	3	5	5
	Judge 2	3	3	5	5	5	3
	Judge 3	3	1	3	1	5	5
Return--quick & with proper finger	Judge 1	5	1	3	1	5	5
	Judge 2	5	5	5	3	5	5
	Judge 3	3	3	3	1	3	3
Uniform striking action	Judge 1	1	3	3	1	5	3
	Judge 2	3	5	3	3	3	3
	Judge 3	3	1	1	1	3	1
Hands and arms quiet	Judge 1	5	5	1	5	5	5
	Judge 2	5	1	5	5	3	5
	Judge 3	5	3	1	3	5	5
Timings		26/2	23/2	23/3	28/0	28/2	24/2
Speed/errors		23/3	27/4	22/2	27/2	30/2	29/2
		26/0	28/3	24/3	26/2	32/2	25/1
Average Speed		25.0	26.0	23.0	27.0	30.0	26.0
Average Errors		1.7	3.0	2.7	1.3	2.0	1.7

TYPEWRITING Spring, 1983

Technique		Student A	B	C	D	E	F	G
Fingers curved & upright, wrists low	Judge 1	5	3	5	3	3	5	5
	Judge 2	5	5	3	3	3	3	3
	Judge 3	3	5	3	3	3	3	3
Correct finger alignment	Judge 1	3	3	5	5	3	5	5
	Judge 2	3	3	3	3	3	3	3
	Judge 3	3	5	1	3	1	3	3
Forearms parallel to keyboard	Judge 1	5	3	5	3	3	5	5
	Judge 2	5	3	1	3	3	3	3
	Judge 3	3	5	1	3	3	3	3
Body erect, back in chair	Judge 1	5	5	5	5	5	5	3
	Judge 2	5	3	3	3	3	3	1
	Judge 3	5	5	5	3	5	5	3
Feet on floor for balance	Judge 1	5	5	5	3	5	5	5
	Judge 2	5	5	5	1	5	3	5
	Judge 3	5	5	5	3	5	5	3
Eyes on copy	Judge 1	5	5	5	5	5	5	5
	Judge 2	3	5	5	5	3	5	3
	Judge 3	5	5	5	1	5	5	5
Quick snappy keystrokes	Judge 1	3	5	3	5	3	5	3
	Judge 2	3	3	3	3	1	3	3
	Judge 3	3	3	3	3	1	3	1
Space bar--quick down & in motion	Judge 1	3	5	3	5	3	3	3
	Judge 2	3	3	3	3	3	3	3
	Judge 3	3	5	3	3	1	5	3
Return--quick & with proper finger	Judge 1	5	5	3	5	3	5	5
	Judge 2	5	3	3	3	3	3	3
	Judge 3	1	5	3	3	3	3	5
Uniform striking action	Judge 1	5	5	3	3	3	3	3
	Judge 2	3	3	3	3	1	3	3
	Judge 3	3	3	3	3	3	5	3
Hands and arms quiet	Judge 1	5	3	3	3	3	5	5
	Judge 2	3	3	3	3	3	5	3
	Judge 3	1	3	3	5	3	5	5
Timings		29/2	51/0	28/4	40/5	25/0	37/2	28/0
Speed/errors		27/1	48/2	23/3	33/4	24/2	35/2	24/0
		26/1	41/2	21/1	32/9	21/1	31/2	22/2
Average Speed		27.3	46.7	24.0	35.0	23.3	34.3	24.7
Average Errors		1.3	1.3	2.7	6.0	1.0	2.0	0.7

TYPEWRITING Spring, 1983 — Student

Technique		H	I	J	K	L	M	N
Fingers curved & upright, wrists low	Judge 1	1	5	3	5	3	3	5
	Judge 2	3	3	1	3	1	3	5
	Judge 3	1	3	3	3	5	5	1
Correct finger alignment	Judge 1	3	3	3	3	3	3	5
	Judge 2	1	3	1	3	1	3	3
	Judge 3	1	1	3	5	5	3	1
Forearms parallel to keyboard	Judge 1	1	5	1	5	3	3	3
	Judge 2	1	3	1	3	3	3	3
	Judge 3	1	3	3	3	5	5	1
Body erect, back in chair	Judge 1	1	5	3	5	5	5	5
	Judge 2	1	5	3	3	3	3	3
	Judge 3	1	5	5	3	5	3	5
Feet on floor for balance	Judge 1	1	5	3	5	1	5	5
	Judge 2	3	5	3	5	5	3	5
	Judge 3	3	5	5	3	3	1	5
Eyes on copy	Judge 1	5	3	5	5	5	5	5
	Judge 2	3	3	5	5	5	3	3
	Judge 3	3	5	5	3	5	3	5
Quick snappy keystrokes	Judge 1	3	5	3	3	5	3	3
	Judge 2	1	3	3	3	3	3	3
	Judge 3	1	5	1	3	5	1	3
Space bar--quick down & in motion	Judge 1	3	3	5	3	5	5	5
	Judge 2	3	3	3	3	3	3	1
	Judge 3	3	3	3	3	5	3	3
Return--quick & with proper finger	Judge 1	3	5	3	3	5	5	5
	Judge 2	3	3	3	3	3	3	3
	Judge 3	3	1	1	1	3	3	3
Uniform striking action	Judge 1	3	3	1	3	3	3	1
	Judge 2	1	3	1	3	3	3	3
	Judge 3	3	3	1	3	5	1	3
Hands and arms quiet	Judge 1	5	5	3	3	3	3	3
	Judge 2	3	3	1	3	3	3	3
	Judge 3	5	1	1	1	5	1	3
Timings		36/2	42/3	30/0	24/2	34/4	32/3	34/0
Speed/errors		30/3	30/3	30/2	23/0	33/4	28/4	31/0
		28/2	37/4	28/1	20/5	32/6	26/1	30/0
Average Speed		31.3	36.3	29.3	22.3	33.0	28.7	31.7
Average Errors		2.3	3.3	1.0	2.3	4.7	2.7	0.0

TYPEWRITING Spring, 1983

Technique		Student O	P	Q	R	S	T
Fingers curved & upright, wrists low	Judge 1	1	3	1	3	3	5
	Judge 2	3	3	3	3	3	3
	Judge 3	3	3	5	3	3	3
Correct finger alignment	Judge 1	3	3	5	5	3	3
	Judge 2	3	3	3	3	3	3
	Judge 3	1	1	5	5	3	3
Forearms parallel to keyboard	Judge 1	1	5	3	3	3	5
	Judge 2	3	3	3	3	3	3
	Judge 3	1	1	3	3	3	3
Body erect, back in chair	Judge 1	5	3	3	5	3	5
	Judge 2	3	3	3	3	3	3
	Judge 3	5	1	3	5	5	5
Feet on floor for balance	Judge 1	5	5	5	5	3	5
	Judge 2	3	5	5	5	3	5
	Judge 3	5	5	3	5	5	3
Eyes on copy	Judge 1	3	5	5	5	3	5
	Judge 2	1	3	5	5	3	1
	Judge 3	5	5	1	5	1	1
Quick snappy keystrokes	Judge 1	3	5	5	5	3	3
	Judge 2	3	3	1	3	3	3
	Judge 3	3	5	1	5	1	3
Space bar--quick down & in motion	Judge 1	3	5	5	5	3	3
	Judge 2	3	3	3	3	3	3
	Judge 3	3	3	3	5	5	3
Return--quick & with proper finger	Judge 1	5	5	5	5	5	5
	Judge 2	3	3	3	3	3	3
	Judge 3	3	3	3	5	3	1
Uniform striking action	Judge 1	3	3	3	3	1	1
	Judge 2	1	3	1	1	1	1
	Judge 3	3	3	1	3	3	1
Hands and arms quiet	Judge 1	1	3	5	5	3	3
	Judge 2	3	3	3	3	3	3
	Judge 3	3	1	3	3	3	3
Timings		24/1	58/1	38/1	39/2	25/1	22/0
Speed/errors		23/3	51/1	35/0	38/3	23/1	21/4
		23/5	53/0	33/2	36/3	22/1	18/3
Average Speed		23.3	54.0	35.3	37.7	23.3	20.3
Average Errors		3.0	0.7	1.0	2.7	1.0	2.3

KEYBOARDING Fall, 1982

Technique		Student A	B	C	D	E	F	G
Fingers curved & upright, wrists low	Judge 1	3	5	1	5	5	1	5
	Judge 2	5	5	3	5	5	3	5
	Judge 3	5	5	1	5	3	1	5
Correct finger alignment	Judge 1	3	5	5	5	5	1	5
	Judge 2	5	5	3	5	3	1	3
	Judge 3	3	3	3	3	5	1	5
Forearms parallel to keyboard	Judge 1	3	5	3	5	5	1	5
	Judge 2	5	5	5	5	3	3	5
	Judge 3	5	5	3	5	3	1	5
Body erect, back in chair	Judge 1	5	5	3	5	5	5	5
	Judge 2	5	5	5	5	5	5	5
	Judge 3	5	5	3	5	5	5	5
Feet on floor for balance	Judge 1	5	5	1	3	5	5	5
	Judge 2	5	5	3	3	5	5	5
	Judge 3	5	5	3	3	5	5	5
Eyes on copy	Judge 1	5	5	1	5	5	3	3
	Judge 2	3	5	3	5	5	5	5
	Judge 3	5	3	1	1	5	5	5
Quick snappy keystrokes	Judge 1	5	5	5	5	5	5	5
	Judge 2	3	5	5	5	5	5	5
	Judge 3	3	5	5	5	3	3	5
Space bar--quick down & in motion	Judge 1	5	5	5	3	5	5	5
	Judge 2	3	5	5	5	5	5	5
	Judge 3	3	5	5	5	5	3	3
Return--quick & with proper finger	Judge 1	5	3	1	5	5	5	5
	Judge 2	3	5	3	5	5	5	3
	Judge 3	1	5	1	3	5	3	5
Uniform striking action	Judge 1	3	5	1	5	3	5	5
	Judge 2	3	5	3	3	5	5	5
	Judge 3	1	5	3	3	3	3	5
Hands and arms quiet	Judge 1	5	3	5	5	5	3	5
	Judge 2	5	3	3	3	5	5	5
	Judge 3	3	3	3	5	3	5	5
Timings		25/2	40/3	28/3	32/2	32/2	34/2	52/3
Speed/errors		25/1	40/3	27/2	32/3	31/2	33/3	49/1
		25/3	40/1	25/2	29/1	29/3	31/3	48/2
Average Speed		25.0	40.0	26.7	31.0	30.7	32.7	49.7
Average Errors		2.0	2.3	2.3	2.0	2.3	2.7	2.0

KEYBOARDING Fall, 1982 Student

Technique		H	I	J
Fingers curved & upright, wrists low	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	5	5
Correct finger alignment	Judge 1	5	5	3
	Judge 2	5	5	5
	Judge 3	5	3	1
Forearms parallel to keyboard	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	3	5
Body erect, back in chair	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	5	5
Feet on floor for balance	Judge 1	3	5	3
	Judge 2	5	3	5
	Judge 3	5	3	5
Eyes on copy	Judge 1	5	5	1
	Judge 2	5	3	5
	Judge 3	5	1	5
Quick snappy keystrokes	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	1	5
Space bar--quick down & in motion	Judge 1	5	3	5
	Judge 2	5	5	5
	Judge 3	5	1	5
Return--quick & with proper finger	Judge 1	3	1	1
	Judge 2	5	3	5
	Judge 3	5	1	5
Uniform striking action	Judge 1	3	1	3
	Judge 2	3	3	5
	Judge 3	5	1	5
Hands and arms quiet	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	1	5
Timings		28/3	26/1	46/1
Speed/errors		26/1	25/3	46/2
		26/1	25/1	44/2
Average Speed		26.7	25.3	45.3
Average Errors		1.7	1.7	1.7

KEYBOARDING Spring, 1983

Technique		Student A	B	C	D	E	F	G
Fingers curved & upright, wrists low	Judge 1	5	3	5	5	3	5	5
	Judge 2	3	3	3	3	3	3	5
	Judge 3	3	3	3	1	3	5	5
Correct finger alignment	Judge 1	5	3	5	3	1	5	5
	Judge 2	3	3	3	1	3	3	5
	Judge 3	3	3	3	1	3	5	5
Forearms parallel to keyboard	Judge 1	5	5	5	5	3	5	5
	Judge 2	3	3	3	3	3	3	5
	Judge 3	3	5	3	1	3	3	5
Body erect, back in chair	Judge 1	5	5	5	5	5	5	5
	Judge 2	5	5	5	5	5	3	5
	Judge 3	5	5	5	5	5	5	5
Feet on floor for balance	Judge 1	3	5	5	5	3	5	5
	Judge 2	5	5	5	5	5	5	5
	Judge 3	5	5	5	5	3	5	5
Eyes on copy	Judge 1	5	5	5	5	5	5	5
	Judge 2	5	5	5	5	5	5	5
	Judge 3	5	1	5	3	5	5	5
Quick snappy keystrokes	Judge 1	3	5	3	5	5	3	5
	Judge 2	3	3	3	3	3	3	5
	Judge 3	3	5	3	5	5	3	5
Space bar--quick down & in motion	Judge 1	3	5	5	5	5	3	5
	Judge 2	3	3	3	3	3	3	5
	Judge 3	3	5	3	3	5	3	5
Return--quick & with proper finger	Judge 1	5	5	5	5	5	3	5
	Judge 2	3	1	3	3	3	3	5
	Judge 3	5	3	1	3	3	5	5
Uniform striking action	Judge 1	3	3	5	5	5	3	5
	Judge 2	3	3	3	3	3	3	5
	Judge 3	5	1	3	3	3	5	5
Hands and arms quiet	Judge 1	5	3	5	5	5	5	5
	Judge 2	3	3	3	3	1	3	5
	Judge 3	5	3	5	1	3	5	3
Timings Speed/errors		31/3	40/1	31/1	42/3	33/1	32/1	56/2
		30/2	38/0	31/0	38/2	31/3	32/2	56/3
		30/3	38/3	31/3	36/2	30/0	32/2	56/1
Average Speed		30.3	38.7	31.0	38.7	31.3	32.0	56.0
Average Errors		2.7	1.3	1.3	2.3	1.3	1.7	2.0

KEYBOARDING Spring, 1983 Student

Technique		H	I	J
Fingers curved & upright, wrists low	Judge 1	5	5	3
	Judge 2	3	3	3
	Judge 3	3	5	3
Correct finger alignment	Judge 1	5	3	1
	Judge 2	1	3	1
	Judge 3	5	3	3
Forearms parallel to keyboard	Judge 1	5	5	5
	Judge 2	3	3	3
	Judge 3	5	5	3
Body erect, back in chair	Judge 1	5	3	5
	Judge 2	5	5	3
	Judge 3	5	5	5
Feet on floor for balance	Judge 1	3	5	3
	Judge 2	3	5	5
	Judge 3	5	5	3
Eyes on copy	Judge 1	5	5	5
	Judge 2	5	5	5
	Judge 3	5	5	5
Quick snappy keystrokes	Judge 1	3	3	3
	Judge 2	3	3	3
	Judge 3	3	3	3
Space bar--quick down & in motion	Judge 1	5	3	3
	Judge 2	3	3	1
	Judge 3	5	5	3
Return--quick & with proper finger	Judge 1	3	5	3
	Judge 2	3	3	1
	Judge 3	3	5	1
Uniform striking action	Judge 1	3	3	1
	Judge 2	1	3	1
	Judge 3	3	3	1
Hands and arms quiet	Judge 1	5	5	3
	Judge 2	3	3	3
	Judge 3	5	5	1
Timings		32/1	31/1	18/2
Speed/errors		33/2	32/2	17/4
		33/2	32/2	15/2
Average Speed		32.7	31.7	16.7
Average Errors		1.7	1.7	2.7

VITA

Heidi R. Perreault

Candidate for the Degree of

Doctor of Education

Thesis: A COMPARISON OF ACHIEVEMENT OF STUDENTS RECEIVING COMPUTER-ASSISTED KEYBOARDING INSTRUCTION WITH ACHIEVEMENT OF STUDENTS RECEIVING KEYBOARDING INSTRUCTION WITHIN A TRADITIONAL TYPEWRITING CLASS

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Biographical:

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Education: Graduated from Chariho Regional High School at Richmond, Rhode Island, in June, 1969; received the Bachelor of Science degree from the University of Rhode Island in May, 1975; received the Master of Science degree from the University of Rhode Island in December, 1980; completed requirements for the Doctor of Education degree at Oklahoma State University in July, 1983.

Professional Experience: Employed as a public accountant in Rhode Island from 1975 to 1976 and as an accountant for a private firm in 1977; taught at the Ocean State Business Institute, Wakefield, Rhode Island during 1978; taught half-time as a graduate assistant in the Business Education Department at the University of Rhode Island during the spring semester, 1979; taught as an instructor at the Westerly School of Business, Westerly, Rhode Island from 1979 to 1981; taught half-time as a graduate assistant in the Administrative Services and Business Education Department at Oklahoma State University from August, 1981 to May, 1983.

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