A COMPARISON OF TWO METHODS OF PRESENTING THE KEYBOARD: THE ELECTRONIC KEYCHART VERSUS THE TRADITIONAL METHOD OF KEYBOARD PRESENTATION

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ABSTRACT

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Statement of the Problem

The primary problem in this study was to determine the difference, in student achievement in the rates of speed and degrees of accuracy, between two groups of learners with one group (control) receiving conventional keyboard instruction, and the other (experimental) receiving keyboard instruction utilizing the electronic keychart teaching aid.

Secondary problems were (1) to determine whether the difference in instructor had a significant effect on the skill achievement; and (2) to determine whether the difference in the kind of typewriter had a significant effect on the skill achievement.

Procedures

The population for this study was composed of college students enrolled in two classes of beginning typewriting. Both classes met on Mondays, Wednesdays, and

Fridays; one met at 8:00 a.m., the other met at 2:10 p.m., for a period of 50 minutes. Each class was randomly divided into an experimental and a control group. Two experienced typewriting teachers each taught an experimental and a control group, which were randomly selected to learn the typewriter keyboard on the IBM Selectric, IBM Model D, and Royal manual typewriters. Identical course outlines, time schedules, basic textbooks, and homework assignments were utilized for each group.

The statistical treatment of the data utilized the multivariate analysis of variance to test the significance of difference between the control and experimental groups. The null hypothesis was used to test the significance at the .05 level of confidence.

The attitude of the students in the experimental group toward this method of teaching was ascertained by use of a questionnaire. The answers to the questionnaire indicated that the majority (approximately 87%) liked this method of keyboard presentation.

Conclusions

The following conclusions were based on an analysis of data:

1. Students using the KEE-type-trainer in this experimental study of learning the typewriter keyboard were more accurate than were the students taught by conventional teaching methods.

2. Students using the KEE-type-trainer in this experimental study of learning the typewriter keyboard typed at slower speeds than did students taught by conventional teaching methods.

3. Students in this experimental study typed equally well regardless of the kind of typewriter used.

4. No significant differences were found between the instructors in the study.

A COMPARISON OF TWO METHODS OF PRESENTING THE KEYBOARD: THE ELECTRONIC KEYCHART VERSUS THE TRADITIONAL METHOD OF KEYBOARD PRESENTATION

By

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CHAPTER I

INTRODUCTION

> Effective and efficient communication must be accomplished between employees and supervisors; between employees; and between the business and its customers, its suppliers, and the general public. Communication is necessary for evoking action, for acquiring cooperation, and for maintaining the day-to-day working equilibrium necessary for business stability. Good communication can make a friend, build goodwill, or sell a product. Poor communication can create misunderstandings and losses of business, time, and money.[1]

The typewriter provides written material that is inexpensive and easy to produce, and easily readable. Typewritten material thus becomes an integral part of the modern world in which communication between humans takes on added importance as the world seems to shrink because of inventions which allow men to travel farther and faster and to see and hear of events in remote parts of the world.

The use of the typewriter as a tool of communication has taken on added importance in this day of modern technology, data processing and the computer, and space exploration; because it is faster and easier to read than

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[1]Marie M. Stewart, Frank W. Lanham, and Kenneth Zimmer, College English and Communication (New York: McGraw-Hill Book Company, Gregg Division, 1964), p. 4.

handwritten material. The use of the typewriter, not only as a tool in the business and industrial world but also for an individual's own communication skills use out of class, has increased the importance for students to take typewriting in school to build a minimum amount of skill. With these uses in mind, teachers of typewriting are constantly considering new and improved methods for teaching the typewriter keyboard.

One of the problems faced by typewriting teachers is the effective and efficient use of learning time in the beginning typewriting classes, particularly in the introduction of the typewriter keyboard. Many methods of presenting the typewriter keyboard have been advocated, such as: Homerow Approach in which the teacher teaches the locations of the fingers on the homerow and then presents extensive drills using these keys; Vertical Approach in which all keys struck by one finger are presented at one time; Skip-Around or Word-Pattern Approach in which those key locations are presented first which are needed to prepare meaningful copy; Whole-Keyboard Approach in which the entire alphabetic keyboard is presented during the first day of typing with additional drill provided on succeeding days to enable the students to learn the key locations.

Many of these methods can be adapted to equipment-assisted introduction of the keyboard.[1]

In many typewriting classes, the method used to introduce the keyboard, regardless of which approach is used, consists of the teacher's telling the students the key to be struck, the finger to use, and the relationship of the new key to keys already learned. After this has been done, the teacher may demonstrate the reach, then call out the letter for the student to type. The student's eyes or attention may be on a chart, the text, the teacher, or the typewriter. As a result, many students find their attention wandering and become distracted from the task to be accomplished.

Methods and equipment must be developed that will utilize both student and teacher time most efficiently and effectively. These methods and equipment are under constant study and revision. It is imperative that education utilize all the time of the student and teacher to the best advantage. Therefore, teachers of typewriting and manufacturers of equipment used in teaching typewriting strive to find means that will present the keyboard to students most efficiently and effectively.

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[1]Lloyd V. Douglas, James T. Blanford, and Ruth I. Anderson, Teaching Business Subjects (2d ed.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965), pp. 127-128.

Background of the Problem

Need for the Study

Many different devices have been advocated by experts as aids to introducing the typewriter keyboard. Some of these devices are: the Controlled Reader, the Tachistoscope, the overhead projector, the chalkboard, and the Strong-Pacer. Little experimentation has been done in the area of electronic devices for the teaching of the keyboard in beginning typewriting classes. All devices that might aid in the teaching of typewriting must be tried, modified, and tested. Students need to be taught by the most efficient and effective methods for learning the keyboard that are possible. As a result, there is need for research in keyboard instruction to find the most effective and efficient methods. The electronic keychart teaching aid has not been researched to this date; therefore, this equipment needs to be studied.

Limitations

The following statements were limitations of this study:

a. Subjects. This study was limited to college students without prior formal typewriting instruction who enrolled for the beginning typewriting class during the Winter Semester, 1972, at Central Michigan University, Mount Pleasant, Michigan.

b. Meetings. Two sections of the class met Mondays, Wednesdays, and Fridays for a period of 50 minutes on each of those days.

c. Lessons. Two lessons from the text were presented each day that the classes met.

Delimitations

This study was not concerned with a student's ability to type business correspondence, tabulations, or manuscripts even though all of these formats were taught during the semester.

Purpose of the Study

The purpose of this experimental research study was to provide information concerning a comparison of methods used to introduce the typewriter keyboard to beginning typewriting students. Teachers should use the most effective and efficient methods available when introducing the keyboard. This study was an attempt to determine the effect that teaching the typewriter keyboard through the use of an electronic keychart would have on the rates of speed and degrees of accuracy as compared with teaching the keyboard by conventional methods.

Importance of the Study

This study was important because no research existed on the use of the electronic keychart teaching aid in a beginning typewriting classroom. The study was important, too, because this piece of equipment does not allow an individual to look at the keyboard while learning to type if the equipment is to be effective. Current thought and

literature, on the other hand, indicates that a typist should look at the keyboard while learning to type. If the use of the equipment in the classroom caused an improvement in the rate of speed or the degree of accuracy over conventional teaching methods, then more research should be done to determine whether looking at the keyboard produced significantly better results than the electronic keychart or if the opposite is true.

The Problem

Statement of the Problem

This study consisted of a primary problem and two subordinate problems as follows:

a. The primary problem of this study was to determine the differences, if any, in student achievement in the rates of speed and degree of accuracy, between two groups of learners under controlled conditions with one group receiving keyboard instruction utilizing the electronic keychart teaching aid and the other receiving conventional keyboard instruction with measurements being taken at various stages of keyboard introduction.

b. Secondary problems were:

    1. To determine whether the difference in instructor had a significant effect on the skill achievement at various stages of keyboard introduction.

    2. To determine whether the difference in the kind of typewriter used had a significant effect on the skill achievement at various stages of keyboard introduction.

Experimental Hypotheses

The specific research hypotheses that this study investigated were:

1. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

2. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

3. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

4. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

5. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

6. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

7. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

8. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

9. The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the experimental group during the second, third, fourth, seventh, and seventeenth weeks.

10. The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

11. The achievement on speed tests will show no significant difference among students using the Selectric IBM, Model D IBM, and Royal manual typewriters within the experimental group during the second, third, fourth, seventh, and seventeenth weeks.

12. The achievement on speed tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

For purposes of statistical analysis, these hypotheses were treated in the null form.

Assumptions

The following statements were assumed to be valid for the purpose of this study:

a. Size of Group. Group sizes of 12 to 15 subjects would provide sufficient basis for reliability.

b. Time of Day. Since one control and one experimental group met at 8 a.m. and one control and one experimental group met at 2:10 p.m., the time of day for instruction would provide no significant difference in performance between the two classes.

c. Method of Teaching. The only independent variable in the experiment would be the use of an electronic keychart typewriting teaching aid in the experimental groups.

It must be recognized that the investigator's ego involvement in the study may have caused some confounding of the data. However, the attempt to overcome this confounding was made by having each instructor teach a control group and an experimental group. The investigator tried, to the best of his ability, to be impartial in the planning and presentation of the material.

Definition of Terms

Electronic Keychart Teaching Aid

A large-group classroom aid to instruction which provides visual stimulus for students learning keyboard skills. One letter, number, or symbol is lighted at a time and the students in the classroom are instructed to type this letter, number, or symbol on their typewriters. The electronic keychart consists of a large colorful keyboard display, a tape reader, and a control panel. The punched lesson tape, when read by the tape reader, determines which letters, numbers, and symbols will light on the display. The speed with which the letters are presented is controlled by the teacher by setting a timer on the side of the keychart (See picture, page 118).

Tape Reader

A piece of equipment that will read coded pre-punched tapes and then provide electrical impulses to have the electronic equipment perform specified operations; in this case, light up particular letters on the keychart in a predetermined sequence at a specified rate of speed.

Control Panel

A piece of equipment similar to a typewriter keyboard, each letter of which is connected to a letter on the electronic keychart teaching aid display. When a letter key on the control panel is depressed, the corresponding letter key on the keychart display lights up.

Letter Keys

The keys on a typewriter keyboard containing the alphabetic letter keys for typing words.

Number Keys

The keys on a typewriter keyboard containing the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

Symbol Keys

The keys on a typewriter keyboard containing commonly used symbols in the business and consumer world of communication. Included are symbols, such as: @, #, $, %, ¢, &, *, (,), _, -, =, +, ', ".

Accuracy

Accuracy in typewriting, for the purpose of this study, means that every character was typed without error--the character itself must be correct and the spacing surrounding the character must be correct.

Timed Writing

Timed writing refers to a period of time during which a student's typing performance was measured in terms of speed and degree of accuracy. In this investigation, all timed writings were one minute in length.

GWPM

GWPM refers to gross words per minute. The term, gross words per minute, as used in this study, involves the computing of the total words and numbers typed or of the isolated numbers typed in the time interval of one minute. Five strokes were used to represent each word in the copy.

EPM

EPM refers to errors per minute. The term, errors per minute, as used in this study, involves the computing of the total errors typed in the time interval of one minute.

Organization of the Study

This study is organized into five chapters.

Chapter I contains the introduction; background; need, limitations, delimitations, purpose, and importance

of the study as well as states the problem, experimental hypotheses, assumptions and defines the terms used in this study.

Chapter II reviews other studies related to the current research and some of the literature in the field.

Chapter III presents the methods and procedures used in conducting the experiment and collecting data.

Chapter IV analyzes the data and presents the findings of the study.

Chapter V presents the conclusions drawn from the study, recommendations for further study, and the investigator's opinions regarding the use of this study for future education.

CHAPTER II

REVIEW OF RELATED LITERATURE

The purpose of this chapter is to present the reader with a summary of the research and professional literature directly related to the research study. The Business Education Indexes, the Readers Guide to Periodical Literature, The Education Indexes, the Dissertation Abstracts, and the research issues of the National Business Education Quarterly were reviewed for related studies and literature published during the last decade. The publications of the ERIC Clearinghouse for Vocational Technical Education at Ohio State University were utilized.

This chapter is divided into three parts. Part I reviews literature on teaching the typewriter keyboard. Part II reviews literature on teaching aids in presenting the typewriter keyboard. Part III summarizes the related literature.

Many of the authorities indicated similarity of thought and reported the same research studies. Therefore, the reported quotations and reviews will present only representative views.

Review of Literature on Teaching the Typewriter Keyboard

Typewriting has been taught in schools for many years and attracts a large number of students into the classes where it is taught. Many times it is felt that anyone who knows how to type is able to teach typewriting. Therefore, typewriting may be poorly taught because of lack of knowledge on the part of the teacher of the methodology to be utilized in presenting the keyboard of the typewriter. To do a good job of teaching, the teacher needs to understand the psychology and methodology of teaching the typewriter keyboard.

In their text, Teaching Business Subjects, Douglas, Blanford, and Anderson indicate that the following principles are important:

> Typewriting is a skill which is controlled more by the mind than by the hands. When a student is first learning to type, he is slow in his responses, not because he cannot move his fingers quickly enough, but because the mental stimulus required to activate the correct finger has not yet been established.
>
> Typing skill can best be learned when the student is highly motivated.
>
> The development of typing skill is often accompanied by excessive fatigue. He is afraid he will strike the wrong keys. Consequently he pushes the keys hesitantly rather than hitting them quickly with a firm stroke.
>
> The development of skill requires the elimination of waste motions and poor techniques. The student should be given enough practice on the right kind of materials to enable him to gain confidence in his skill through the development of proper techniques.

> Opportunity should always be provided for relearning in a successive practice period what has been forgotten since the previous practice period.
>
> One phase of a skill should not be built at the sacrifice of another. Students need both speed and accuracy in typing.[1]

Reinforcing the principles that teachers need to know is Lamb, who states:

> From the teaching standpoint, we may say that the method of teaching typewriting techniques is to demonstrate those techniques; to explain the demonstration and re-demonstrate for analysis; and to provide opportunity for successful student practice.[2]

Liles agrees that technique is very important.

> Therefore, the main emphasis in beginning typewriting should be on the development of correct typewriting techniques.[3]

Russon and Wanous take this philosophy a step further and become more specific in their recommendations for teaching the keyboard.

> The goal in typing is stroking continuity, not the stroking of isolated letters; rather, the student should acquire a flowing rhythmic style.
>
> A definite pattern should be followed in locating a new key. The teacher should help the students locate the new key in relation to the home-row key.

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[1] Douglas, Blanford and Anderson, Teaching Business Subjects, pp. 115-120.

[2] Marion M. Lamb, Your First Year of Teaching Typewriting (2d ed.; Cincinnati: South-Western Publishing Company, 1959), p. 62.

[3] Parker Liles, Guide for Improvement of Typewriting Instruction, ED 041-140 (Atlanta: Georgia State Department of Education, 1968), p. 38.

> After the new key has been located, the teacher should demonstrate the correct technique of stroking that key. After the stroke has been imitated a few times, the teacher should dictate the letters in the exercises while the students keep their eyes on the book and type letter-by-letter. The rate of the first typing should be not more than 10 or 15 words a minute. Emphasis should be on correct stroking only.[1]

Authors of typewriting textbooks attempt to follow these principles for teaching the keyboard, but indicate that their texts are also built around teacher preferences as Lessenberry, Crawford and Erickson point out in the teacher's manual for their typewriting textbook.

> Typewriting teachers have stated their preference for teaching no more than 2 or 3 new keys a lesson, for covering the entire letter keyboard in 2 or 3 weeks, and for providing periodic review lessons to consolidate the learning as it accumulates.
>
> It has not been proved by formal research that the order of presentation of the letter keys has any significant and lasting bearing on the ultimate skill developed, but early learning is made easier and basic skill is developed faster when the sequence for teaching the letter keys is based on a set of sound guides or principles that take into consideration ease in control and frequency of use of the letters.
>
> The principles are:
>
> 1. Ease with which the reach-stroke can be made by the beginning students so that good stroking facility can be developed at once.
>
> 2. Frequency of use of the letter so that a wide range of words can be used for practice.
>
> 3. Adjacent keys not to be taught as new reaches in the same lesson (except in the first lesson when teaching the home keys).

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[1]Allien R. Russon and S. J. Wanous, Philosophy and Psychology of Teaching Typewriting (Cincinnati: South-Western Publishing Company, 1960), p. 187.

> 4. Keys to be controlled by the same finger, opposite hand, to be taught in different lessons, if possible; and where taught in the same lesson, the sequence to be such as to require different direction for the finger movement.
>
> For most beginners, the easiest reach strokes to make are those made by the right first (index) finger, and the next easiest are those made by the left first finger. If ease of reach were the only or main consideration, the keys controlled by the right and left first fingers would be taught first. But frequency of use of a letter and avoidance of fine stroking discriminations in the early learning are of equal importance in determining the sequence of teaching the letter keys.
>
> Since learning to type is basically learning to make a series of specific and rapid finger motions for specific letters in the copy, the first concern must be to teach the right motions with as few competing claims or conflicts as possible.
>
> After the new-key location drill has been typed, direct the students to check the paper in the machine to see if correct strokes resulted from the hoped-for right movement. This is a way of getting immediate reinforcement of correct responses.[1]

This point of view is supported by authors Rowe, Lloyd, and Winger in their typewriting textbook.

> Regardless of the length of the first class period, be it 10 minutes or 45, these are imperatives:
>
> 1. Students must do some typewriting.
> 2. Emphasis is on ease, not on difficulty.
> 3. Mastery is not expected--yet.
> 4. Emphasis is on "do," not on "do not."
> 5. Everything done is done at least twice.
> 6. The names of parts are slighted.
> 7. Emphasis is on "how" and not on "why."
> 8. Action must start instantly, excitedly.

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[1] D. D. Lessenberry, T. James Crawford, and Lawrence W. Erickson, Teacher's Manual for 20th Century Typewriting (9th ed.; Cincinnati: South-Western Publishing Company, 1967), pp. 14-15.

Learning a new key reach involves three steps.

Step 1. Visual Location. Help learners locate the new key and type it with appropriate anchors kept in home-key position.

Step 2. Touch Location. Have the class type from dictation easy words and reach combinations alternately.

Step 3. Fixation.[1] Turn to the text and type the pertinent drill lines.

West takes a somewhat different approach to the method of teaching the typewriter keyboard.

> Nonsense drill of the frf variety has, fortunately, virtually disappeared as the prime vehicle for keyboard learning. Fendrick (1927) and others have shown that throughout the skill levels ordinarily reached in school training, practically all the typing is letter-by-letter, with more than nominal instances of the chaining of 2- and 3-letter combinations found only at relatively advanced stages of skill. "Word-level" typing is practically nonexistent, and the performance of novices--as Robinson's (1967) data demonstrates--is unaffected by variations in word length, as measured by average number of syllables and strokes per word. Only the expert, not the beginner, is helped by copy containing many short, common words. The beginner's needs are better satisfied by prose based on the true meaning of keyboard learning, discussed next.
>
> To "master" a letter key means to be able to strike it with facility in any context. . . . accordingly, the practice materials should contain the desired letters struck by the same hand that occur before and after the new letter in the English language. If the desired letter combinations do not occur in short, common words, then use longer or less common words.
>
> Two other incidental comments also apply. First, keyboard presentation dragged out over more than 1-3 weeks merely delays, with no discernible compensating advantage, the mastery of new reaches to old keys

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[1] John L. Rowe, Alan C. Lloyd, and Fred E. Winger, Gregg General Typing 1 (Teacher's ed.; New York: Gregg Division, McGraw-Hill Book Company, 1967), p. 11T.

> occasioned by new letters preceding the old ones. Second, the textbook photographs or line drawings showing all fingers but the one in use glued to their guide keys are ridiculous.
>
> As established for motor skills in general by Honzik (1936) and for typewriting in particular by West (1967), the novice at any motor or muscular skill has no reliable muscular sensations. They develop only after some skill has been established via vision. Insistence on strict "touch" typewriting at the outset is devastating for the learner. The teacher wise enough to act in accordance with the physiological facts about early skill learning will permit and, indeed, insist on heavy use of vision at the start and will use speed-forcing practice as a prime means of transitioning the learner to "touch" operation.[1]

The Cary Study

In an experimental study, Cary studied the wall-chart method versus the sight method of teaching the typewriter keyboard. The experimental group was instructed to look at a wall chart to find the location of the keys as they learned the keyboard. They were not to look at the keys after they once had their fingers on the homerow keys. The students took dictation from the instructor and memorized words and short sentences, which had been written on the chalk board by the instructor. Both control group and the experimental group took the same dictation and typed the same material through the entire semester. The experimental group was instructed to look at the keyboard to find the location of each key as they learned the keyboard. No

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[1]Leonard J. West, "Trends in Teaching Typewriting," Business Education Forum, Vol. 26, No. 8 (Washington: National Business Education Association, May, 1972), 21.

wall chart or text was used, so it was necessary for the students to look at the keys until they had learned the location of each.

The schedules of twelve-second, one-minute, and five-minute straight-copy timings were the same for the experimental group as for the control group. The study involved 38 students in a one-semester personal typewriting class during the fall of 1960.

The conclusion of the study was that the use of the experimental method appeared not to hinder or improve the development of speed and accuracy at the typewriter.[1]

Valenzuela, based on her experience in classroom teaching, also disagrees with West since she stresses that students should not be allowed to look at their keys.

> Be sure that your students learn to type by touch. Make it clear to them that a student who constantly looks down at his fingers, up at his paper, and back at his book will never be able to type at a high rate of speed. Lettered keyboards are not desirable for beginning students because they constitute too much of a temptation; even the good students will find themselves looking down more often than they would like to admit.[2]

Liguori would agree with West and indicates that students should be allowed to look at their keys.

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[1]Paul Russell Cary, "Wall-Chart Method Versus Sight Method of Teaching the Typewriter Keyboard" (unpublished Master's thesis, Illinois State Normal University, 1961).

[2]Ramona Valenzuela, "Memo to a Beginning Typing Teacher," Business Education World, Vol. 29, No. 1 (Philadelphia: Gregg Division, McGraw-Hill Book Company, September, 1968), 18.

> Let the student know that there is nothing sacred or mysterious about watching the keyboard or his fingers while he is learning the new key; then most likely fewer students will be afflicted with the curiosity to want to watch their fingers later on![1]

Erickson would expand this principle and indicates that a student learning the keyboard should use many senses.

> At first, this student (the beginning typewriting student) makes use of an obvious cue (sight) to check his typewriting performance. Initially, too, the student needs to make use of a variety of cues (visual, auditory, kinesthetic or muscular, tactile or touch) as he evaluates his typewriting performance.[2]

This agrees with Winger's point that looking at the keys may help the student.

> All typing teachers should honestly study and try out the current theory that perhaps students should be encouraged to look at the keyboard as long as they feel a need while it is being presented. Those advocating this approach are emphasizing the value of immediate reinforcement to the beginner. This trend is too limited, at the moment, to report on with either a positive or negative reaction.[3]

Lessenberry would modify the watching of the keys somewhat.

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[1]Frank E. Liguori, "Presenting the Keyboard," Business Education Forum, Vol. 17, No. 8 (Washington: National Business Education Association, May, 1963), 21.

[2]Lawrence W. Erickson, Contributions of Research to Business Education, ed. by Calfrey C. Calhoun and Mildred Hillestad (Washington: National Business Education Association, 1971), p. 17.

[3]Fred E. Winger, "Typewriting," in Changing Methods of Teaching Business Subjects, ed. by LeRoy Brendel and Herbert Yengel (Washington: National Business Education Association Yearbook, No. 10, 1972), p. 85.

> Follow a pattern of procedure for teaching the new reach-strokes. Economy of learning time will result from the use of a uniform pattern for teaching the new reach-strokes. Direct the students to look at the textbook illustration and note the visual cues that identify the controlling finger; then have them look at the keyboard of the typewriter and locate the key to be controlled and get an "eye picture" of the direction and the distance of the reach to the new key. Have them watch the finger make a few experimental reach-strokes. Sight effectively guides the finger in making the initial reach-stroke. This watching the finger is limited to the initial practice and discouraged in continuity typewriting.[1]

However, the recommended sight method has not been entirely supported by research done by Ruddle.

> The purpose of the study was to test the hypothesis that the students who watch their fingers in the beginning weeks of typewriting instruction will develop better techniques as shown on tests of speed and accuracy at the end of the school year than the students who watch only their copy in accordance with the conventional teaching method. . . . although the experiment failed to confirm the hypothesis in terms of gross speed, there were differences significant at the 1 percent level in terms of the net speed on the basis of errors in the timed writing in favor of both experimental groups. . . . the results of the research indicate that the sight method merits trial by teachers.[2]

West seems to sum up the current thinking in regards to teaching the keyboard in typewriting.

> . . . for the specification of optimum instructional materials and procedures, although conditioning has been identified as the process by which keyboard

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[1]D. D. Lessenberry, "Teaching the Letter Keyboard," Practices and Preferences in Teaching Typewriting, ed. by Jerry W. Robinson (Cincinnati: South-Western Publishing Company, Monograph 117, 1967), p. 22.

[2]Eleanor S. Ruddle, The Sight Method of Teaching Typewriting Technique and Keyboard, Final Report, ED 033-229 (Washington: Office of Education, Bureau of Research, 1969), abstract.

learning takes place, one also has to consider such major phenomena as individual differences, transfer effects, and others.[1]

As a term that refers to the effect of earlier learning on later performance, positive transfer is at a maximum when the Ss (stimuli) and Rs (responses) of the learning are identical to those required later. Because it is the ability to type ordinary English prose (numbers and characters being merely relatively less frequently used components of English prose) that is the objective of training in principle we should start right off with ordinary English prose.[2]

. . . increasing the variability of stimulus materials slows the rate of acquisition but has greater positive transfer value for later performance.[3]

To strengthen motivation, beginners should experience early success and should not have so much material presented to them at once that early success is unlikely.[4]

. . . a surprisingly small number of words accounts for a very large proportion of all speech and writing. Accordingly, exceptional facility at these words should be expected to make a major contribution to overall skill. . . . large-scale chaining of response sequences in general and typing by whole words in particular is characteristic of the skill levels developed in school training.[5]

Typewriting is primarily an associative-learning task. Learning the keyboard consists of forming associations between particular movements (responses)

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[1]Leonard J. West, Acquisition of Typewriting Skills (New York: Pitman Publishing Corporation, 1969), p. 147.

[2]Ibid., p. 148.

[3]Ibid., p. 152.

[4]Ibid., p. 153.

[5]Ibid., p. 154.

> and particular letters in the copy (stimuli); that is, of learning what motions go with what letters in the copy. . . .
>
> Among the various conceptualizations of the learning process, the one that applies to keyboard and to techniques learning is conditioning, which is a formal procedure for the development of associations and which requires (a) closeness in time between stimulus and response (S-R continguity), and (b) immediate knowledge of results (which reinforces correct responses).[1]
>
> Concerning materials, all evidence points to the merit for keyboard learning of the immediate use of meaningful materials in word and sentence form, rather than of nonsense sequences of the frf type.[2]

In rules 1 through 7, West states imperatives that apply to the teaching of typewriting, but do not apply specifically to the introduction of the typewriter keyboard; hence, none of those rules have been stated. But the following rules apply specifically to the teaching of the typewriter keyboard.

> Rule 8-1: Present the alphabet keys in whatever order will immediately permit the typing of real words and sentences, however simple.[3]
>
> Rule 8-2: Cover the alphabet keys in one to three weeks, preferably nearer one than three weeks. These, plus shift key, comma, and period, then permit you to open the doors wide to ordinary prose for the subsequent weeks of practice.[4]

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[1] Ibid., p. 163.

[2] Ibid., p. 164.

[3] Ibid., p. 167.

[4] Ibid., p. 169.

> Emphasis from the start on high stroking speed is required not only for fostering ballistic motions, but also for rapid and efficient keyboard learning.[1]

> External pacing (via the teacher's letter-by-letter dictation) permits the teacher to control the response rate. By keeping the time intervals between strokes neither too long nor too irregular, the teacher helps the learner to get organized for each motion.[2]

> . . . during the early keyboard-learning stages especially, . . . the focus must be on process, not product; that correctness [sic] of stroking must be temporarily played down.[3]

> . . . the body of findings on kinesthetic mechanisms in general and for typewriting in particular dictates the employment of sight techniques at the start of learning to type and tolerance of sight typing for far more than just the first few trials at each new key.[4]

Now that the principles and philosophy of introducing the keyboard in typewriting have been explored, it is time to turn to specific methods for presenting the keyboard.

Hosler presents the three popular methods of presenting the keyboard when he writes:

> . . . there are innumerable orders of presentations that have been used in the various textbooks; but there are three general categories that seem to have been rather universally accepted.
>
> 1. The Home-Row Method. This is the oldest and most traditional of all methods. With this procedure, the student is taught the keys of the home row until he has developed some degree of proficiency with these keys.

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[1] Ibid., p. 173.

[2] Ibid., p. 175.

[3] Ibid., p. 193.

[4] Ibid., pp. 86-87.

2. First-Finger-First Method. In the first-finger-first method, the student is taught first only those keys controlled by the first fingers, then in the second lesson, the keys for the second finger, then the keys for the third finger, and finally those keys reached by the fourth finger.

3. The Skip-Around Method. As the name implies, this method has no definite order of presentation--the actual order used depends upon the particular plan devised by the author.[1]

Another factor that must be kept in mind in introducing the keyboard is the motivation created by the teacher, regardless of the method used, and the response secured from the student.[2]

Whatever method or procedure the teacher used should be one with which he is comfortable, if not enthusiastic, and one that creates the classroom atmosphere or climate which is most conducive to skill development.[3]

Fields concurs in his statement.

This method (the whole word method) differs from the conventional method in that it introduces letters in sequence which will form meaningful words and the words in sequence are used to form meaningful sentences.

Because the students are typing meaningful words and sentences early in the typing course as well as seeing their results, it was observed that the sense of accomplishment greatly diminished their fears and frustrations of the typewriter keyboard.[4]

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[1]Russell J. Hosler, "Methods of Teaching the Alphabetic Keyboard," Methods of Teaching Typewriting (Somerville, N.J.: The Eastern Business Teachers Association, Somerset Press, 1965), p. 20.

[2]Ibid., p. 30.

[3]Ibid., p. 31.

[4]Marlin H. Fields, "The Whole Word Method of Teaching the Keyboard," Journal of Business Education, Vol. 40, No. 7 (Wilkes-Barre, Pa.: Robert C. Trethaway, April, 1965), p. 287.

Featheringham takes a different view of how the keyboard should be introduced. He advocates that it be introduced in its entirety right from the beginning.

> . . . the keyboard, in its entirety, is presented the very first day of the typewriting course and every day thereafter for at least a week. The figures as well as the letters must be included in the presentation. The key to success of this method, however, lies in constant review of the keyboard, and the method must be followed entirely for no less than a week and as much as two weeks if need be.[1]

A totally different approach to teaching the keyboard was tried by Hirsch in which the keyboard was arranged so that the left-hand side of the third row of keys contained the beginning of the alphabet in order, then the alphabet shifted to the second row and finally to the bottom row. However, it is interesting to note his findings.

> The conclusion drawn from these results is that the alphabetical keyboard is certainly not better than, and may not be as good as, the standard keyboard for relatively low-skilled typists (non-typists).[2]

Featheringham and Mitchell indicate the principles that should guide all teaching of number and symbol keys.

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[1]Richard D. Featheringham, "A Successful Approach to Keyboard Mastery," Journal of Business Education, Vol. 39, No. 8 (Wilkes-Barre, Pa.: Robert Trethaway, May, 1964), p. 316.

[2]Richard S. Hirsch, "Effects of Standard Versus Alphabetical Keyboard Formats on Typing Performance," Journal of Applied Psychology, Vol. 54, No. 6 (Lancaster, Pa.: American Psychological Association), p. 490.

The following principles are presented as fundamental guidelines to facilitate top-row proficiency:

1. Possess a conviction that numbers and symbols can be learned by touch.

2. Delay the presentation of numbers and symbols until the student can type the alphabetic keyboard by touch.

3. Set the stage for typing numbers and symbols.

4. Present numbers contiguously in order to promote locational security.

5. Utilize the senses of sight, sound, and touch in teaching number and symbol typing.

6. De-emphasize the interceding character in teaching the reaches from the homerow to the top row.

7. Gradually abandon the home-row system.

8. Enhance top-row proficiency by interspersing numbers and words in context after initial skill has been established.

9. Automatize top-row skill by teaching students to read digits in patterns.

10. Provide for adequate and purposeful practice in developing proficiency in typing numbers and symbols.

11. Proof reading must be taught in order to develop number and symbol proficiency.

12. Develop standards of achievement in dpm (digits per minute).[1]

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[1]Richard D. Featheringham and William M. Mitchell, "Methods of Teaching Numbers and Symbols," Methods of Teaching Typewriting, ed. by John L. Rowe (Somerville, N.J.: The Eastern Business Teachers Association, Somerset Press, 1965), p. 33.

Teachers do not agree on whether or not the kind of typewriter used makes a difference in the final results of achievement attained. As this element was a part of this study, the following experimental study is important.

The Serlo Study

A comparison of the achievement attained by beginning typewriting students on electric and manual typewriters was undertaken by Serlo. The study measured straight-copy speeds and accuracy on electrics compared with speeds and accuracy on manuals. The study also compared the production rates on electrics with production rates on manuals. Standards for the first semester included the following production areas: (1) timed writings, (2) theme writing, (3) centering, and (4) letter writing. Two senior high school classes--one using electric typewriters and the other manuals--with 19 students in each group were utilized in conducting the experiment. The investigator then proceeded to use the students' "t" distribution to determine if there were any statistically significant differences in the mean differences in the mean of each variable for each group.

The conclusions of the study indicated that: (1) neither the electric nor the manual typewriter offered an advantage to the beginning typist; (2) both groups progressed at relatively the same pace with the same quality

of work in terms of speed, errors, and production work; (3) the students did not find the service keys difficult to adjust to and to manipulate on either typewriter; (4) the manual typing students, although as comfortable at their typewriters as the electric typing students, found that errors tended to increase more noticeably over a prolonged period of time; (5) all students preferred to learn on the electric typewriters.[1]

Review of Literature on Teaching Aids in Presenting the Typewriter Keyboard

Cook and Wiper give an overview of the many devices available as teaching aids when a teacher is presenting the keyboard.

> Strictly visual devices that are currently used in the classroom for instructional purposes include old standbys such as chalkboards, opaque, filmstrip, slide, and motion picture projectors. Newer visual devices include the overhead projector, the controlled reader, simulators, and teaching machines. Many of these items can, of course, be used with auditory output attachments.
>
> Some of the auditory devices include phonograph records, dictating-transcribing machines, tape recorders, FM-radio broadcasts, and more recently small radio transmitting stations for use within the classroom.
>
> Motion pictures, sound filmstrips, and television are the most commonly used devices that utilize both pictures and sound. Some of the newer simulators

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[1]David J. Serlo, "A Comparison of the Achievement Attained by Beginning Typewriting Students on Electric and Manual Typewriters" (unpublished Master's thesis, Indiana University of Pennsylvania, 1970).

> and more sophisticated teaching machines also employ both media.[1]
>
> The typewriting teacher of the future will utilize a variety of tools that will take his place in teaching the mechanical skills of typewriting.[2]

Some of the above-mentioned devices may not be familiar to the reader. Therefore, the following quotations and reports of research will describe some of the devices and their use mentioned above, as well as some of the equipment that has been introduced into the field since the writing of Cook and Wiper's article.

> The chalkboard approach is a teacher-proved method of introducing the letter keyboard simply and effectively. No special equipment of any kind is required; the only tools needed are a chalkboard, a typing demonstration stand, a stopwatch (with a sweep second hand), and chalk. All letters and timings are placed on the chalkboard, so no textbook is required.
>
> . . . the chalkboard approach does provide the instructor with a practical, simple, yet effective method of presenting the keyboard.[3]

The Price Study

Price studied the chalkboard approach to determine whether the chalkboard approach to learning typewriting

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[1]Fred S. Cook and Robert E. Wiper, "New Media for Teaching Typewriting," New Media in Teaching the Business Subjects, ed. by Edwin A. Swanson (Washington: National Business Education Association, 1965), pp. 87-88.

[2]Ibid., p. 97.

[3]Gunder A. Myran, "Introducing Typewriting: The Chalkboard Approach," Business Education World, Vol. 46, No. 1 (Philadelphia: Gregg Division, McGraw-Hill Book Company, October, 1971), p. 26.

was more effective in introducing and learning the keyboard than the traditional textbook method in beginning typewriting. She studied two Typing I classes with a total of 57 students using thirteen matched pairs for the study from September to November, 1966. The first ten days were spent in learning the keyboard. The experimental group received all of their input for typing from the chalkboard. These ten days were followed by ten more days of techniques review and skill building for both classes. The variable was the method of presenting the keyboard--one class via the chalkboard and the other class via the textbook. Records were kept of the progress on one-minute timed writings for gross speed and accuracy for both the experimental and control groups.

The data in the study consisted of scores on separate tests as follows:

1. Written test of filling in a blank keyboard chart.

2. Three one-minute timed writings given for speed and accuracy after the first ten days, after twenty days, after seven weeks, after eight weeks, and after nine weeks of instruction. The scores were totaled and averaged.

Price concluded that when the "t-test" was applied to the data to determine if the differences in achievement of the mean gross speed scores and mean accuracy scores

of the thirteen matched pairs were statistically significant, it was found that the results seemed to indicate that the chalkboard approach to learning the keyboard produced higher gross typing speeds, with no lesser degree of accuracy, than the traditional textbook method.[1]

The Dorn Study

Dorn used a combination of the overhead projector and the chalkboard to determine if there was a difference in pupil achievement in the typewriting of numbers when special daily drills on numbers were presented with the aid of the overhead projector and chalkboard as compared with drilling on numbers using the textbook exclusively. Two junior high school typewriting classes totaling 61 students took part in the study. The control class was drilled on numbers using one of the standard junior high school typewriting textbooks. In the experimental class, the emphasis was on developing number typewriting proficiency using the overhead projector, chalkboard, and other supplementary drills as teaching aids. The control group and experimental group were rotated at the end of the first six-week period of the study.

Three one-minute timed writings were given on mixed copy and three one-minute timed writings were given

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[1]Shirley M. Price, "The Chalkboard Approach Versus the Traditional Textbook Method in Teaching Beginning Typewriting" (unpublished Master's thesis, Northern Illinois University, 1967).

on straight number copy at the beginning of the study and at the end of each six-week period. The average speed and accuracy scores were determined for each student on both tests. Test results were subjected to statistical analysis by using a critical ratio, "t" score, to test significance at the .05 level of confidence.

From the data presented in the study, it can be said that the overhead projector, chalkboard, and supplementary drills improved accuracy to a greater extent for the experimental group than the regular textbook material did for the control group on both mixed copy and straight number copy. Improvement was greater in the experimental group than in the control group on straight number copy speed in the study. The investigator concluded that the overhead projector, chalkboard, and supplementary drills were superior to simply regular textbook materials in developing straight number copy speed.[1]

> The Skill Builder is a 35 mm. filmstrip projector that projects typewriting copy at a predetermined, continuous, rhythmic pace that can be set from 8 to 108 words per minute.[2]

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[1]Brock Edward Dorn,"An Experiment to Determine if Special Drills Presented with the Aid of the Overhead Projector and the Chalkboard Improve Number Typing Speed and Accuracy" (unpublished Master's thesis, Northern Illinois University, 1966).

[2]Louis C. Nanassy, "Visual Aids in Teaching Typewriting," Methods of Teaching Typewriting, ed. by John L. Rowe (Somerville, N.J.: The Eastern Business Teachers Association, Somerset Press, 1965), p. 254.

The Johnson Study

The effects of the Skill-Builder Controlled Reader training in facilitating skill development in college typewriting was studied by Johnson. During the Spring semester of 1962, four beginning and four intermediate typewriting classes totalling 176 students were involved in the study. The experimental groups used the Skill-Builder Controlled Reader to build their skill in speed and accuracy, while the control group used the conventional methods. In the beginning typewriting groups, gross words per minute and errors were totaled from one-and five-minute timed writings. Intermediate typewriting groups used only five-minute timed writings with the gross words per minute and the errors being totaled to gather the data.

The conclusions of the study were: (1) In the beginning typewriting classes, the Controlled Reader was not particularly helpful; (2) when the intermediate typewriting classes were divided according to their ability, it was found that the Controlled Reader might be helpful; and (3) when all experimental groups were totaled together, the group performance was better for the Skill-Builder Controlled Reader group.[1]

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[1]Margaret Higgins Johnson, "The Effects of Skill-Builder Controlled Reader Training in Facilitating Skill Development in College Typewriting" (unpublished Ph.D. dissertation, North Texas State University, 1962).

> The diatype is a mechanical device that pulls a paper tape across the printing point of an electric typewriter, serves as an instrument for recording stroking patterns of typists and the amount of time used to return the carriage, capitalize, indent certain lines, space between words, and "recover" from making an error.[1]

The Shell Study

Shell studied the effectiveness of the diatype as an instructional device in first year typewriting classes. The study involved two first-year typewriting classes during 1964 and 1965. The experimental class contained 30 students while the control class conatined 28 students. A one-minute pre-test was administered after four weeks of introduction of the keyboard. The routine for the class was to do diagnostic testing on the first day of the week, followed by corrective drill the rest of the week, with evaluation on the last day of the week. During the semester, eight one-minute timed writings were given, as were eight three-minute timed writings and eight five-minute timed writings during the second semester. Gross words per minute was the measurement used to score the tests.

The findings indicated the following results: (1) The pre-test speed was the same for both the experimental and control groups; (2) the pre-test indicated that

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[1]Liles, Guide for Improvement of Typewriting Instruction, p. 174.

the experimental group attained a mean of 1.3 errors per minute, while the control group had a mean of 2.0 errors per minute. The final five-minute timed writing indicated that the experimental group attained a mean of 50.8 words per minute speed, while the control group attained a mean of 42.1 words per minute. The same five-minute final timed writing indicated that the experimental group made a mean of two errors per minute, while the control group made a mean of three errors per minute. The conclusion of the study indicated that the diatype is effective for building speed and accuracy; the teacher can use it to identify typewriting irregularities.[1]

The Decker Study

In an additional study utilizing the Controlled Reader and overhead projector, Decker studied the visual presentation of the keyboard to beginning typists. The purpose of the study was to develop or adapt instructional visual aids for use in a beginning typewriting course and to test the effectiveness of these aids by comparing speed and accuracy achievement of the experimental class with that of a control class conducted in the traditional manner.

Two classes of beginning college typewriting students totaling 35 students, with 16 actual beginners in the

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[1]Walter Lafayette Shell, "Effectiveness of the Diatype as an Instructional Device in First Year Typewriting" (unpublished Ph.D. dissertation, The Ohio State University, 1965).

experimental group and 12 in the control group, were used for the study. The experimental group used transparancies and the Controlled Reader for the presentation of the keyboard. One-minute timed writings were administered at the end of the second, fourth, and sixth weeks, while three-minute timed writings were administered at the end of the eighth and tenth weeks.

The results indicated that there was a significant difference in the faster speed level achieved by the control group. There was a widening tendency between the two groups in accuracy with the experimental group continually making fewer errors, while the control group steadily increased in errors.[1]

> . . . the recorded lesson cannot replace the teacher; but it can free the teacher to do the things that only a teacher can do--observe, correct, encourage, and coach individual students while the lesson goes on for the group as a whole.[2]

The Winger Study

In 1949-50, Winger studied the significance of tachistoscopic training in word perception as applied to beginning typewriting instruction. His study involved the

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[1]Carol Lowry Decker,"An Experiment in Audio-Visual Presentation of Beginning Typewriting" (unpublished Master's thesis, Bowling Green State University, Ohio, 1969).

[2]D. D. Lessenberry, "The Rationale for a Widely Used Sequence of Introducing the Letter Keyboard," Practices and Preferences in Teaching Typewriting, ed. by Jerry W. Robinson (Cincinnati: South-Western Publishing Company, Monograph 117, 1967), p. 23.

use of mechanical means for the exposure of materials in a manner somewhat similar to the flash card method presentation. The experiment was designed to measure the value of intensive training in the perception of words, digits, phrases, and short sentences.

The first experiment was conducted during the fall quarter and the second experiment was conducted during the winter quarter. Each study utilized an experimental and control group of beginning typewriting students both fall and winter quarters of 1949-50. The control group received instruction and used material normally used in beginning typewriting classes, while the experimental class was given the same type of training plus tachistoscopic training for about ten minutes of each class period. During this short period of tachistoscopic training, the experimental class typed from exposure material, controlled as to amount and duration of exposure, and projected on a screen in front of the group. Twenty students were used in each class in both experiments. Three- and five-minute timings were administered with gross words per minute, errors, correct words per minute, and net words per minute as the measurement. The tachistoscope was used while the room was darkened to give better visibility.

The conclusions of this study indicated that tachistoscopic training develops more rapid stroking ability in the very early stages of skill development.

This early superiority in stroking rate is then retained during the growth of skill during the remainder of the semester. As faster stroking rates were developed, more accurate strokings were being made by those trained by the flash material.

The findings showed that the tachistoscopically trained groups were able to stroke isolated words more rapidly and more accurately than the members of the control groups. Tachistoscopic training developed the ability to operate the top row of keys with greater speed and accuracy.[1]

> The darkened room brings out the point that it is possible and wise to get into the habit of operating the machine without watching the fingers manipulate the keys.[2]

> There can no longer be any skepticism about the fact that typewriting students can learn to use the typewriter efficiently from instruction given on television. Experimentation and creativity can tailor television to fit typewriting instruction and to become a most valuable and exciting part of an instructional pattern.[3]

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[1]Fred E. Winger, "The Determination of the Significance of Tachistoscopic Training in Word Perception as Applied to Beginning Typewriting Instruction" (unpublished Ph.D. dissertation, University of Oregon, 1951).

[2]Ibid., p. 193.

[3]Chester Johnston, "Teaching Typewriting Via Television," Business Education Forum, Vol. 17, No. 2 (Washington: National Business Education Association, November, 1962), p. 13.

The Smith Study

Reinforcing this point of view is an experimental study by Smith to determine whether closed circuit television could improve beginning typewriting performance. The equipment used in the experiment consisted of a television camera, a video tape recorder, and a monitor set. The control class was not exposed to the television equipment. The experimental class had their typing techniques filmed periodically; then, the students were shown the films so that they could see what they were doing incorrectly and improve their technique. The evaluation of the experiment was based upon a series of timed writings given approximately every two weeks. Records were kept of each typist's gross words and errors per minute.

The following findings and conclusions resulted: (1) The experimental group which used the closed circuit television equipment to improve techniques, was significantly better in both speed and accuracy of performance on the final two of the thirteen tests given; (2) from the first test given to the last test given, the experimental group gained significantly more total words per minute typed and more accuracy than the control group.[1]

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[1]Sherrilyn B. Smith, "An Experiment to Determine Whether Closed Circuit Television Can Improve Beginning Typewriting Performance" (unpublished Master's thesis, University of Colorado, 1969).

However, teaching typewriting by television has not gained widespread use.

> Teaching typewriting by television is not widespread in schools which belong to the National Association for Business Teacher Education.
>
> Three major reasons listed for not teaching typewriting by television were: no television facilities, excessive expense, and staff time required for other courses.
>
> There were no indications that the number will increase significantly in the future.[1]
>
> Records or tapes may be used as "assistants" to give the instructor the opportunity to observe, encourage, correct, and instruct individual students as required. Through individual instruction, the teacher will insure that each student learns the basic techniques so essential to typing speed and accuracy; through enthusiasm, he can instill the confidence in his students so necessary for them to reach their maximum potential in typewriting.[2]
>
> One of the latest electronic devices to improve typewriting skill is the Strong-Pacer. This device is used to automatically time and pace a typist taking a drill or a series of drills to improve performance in both speed and accuracy.[3]

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[1]Robert P. Poland, "The Use of Televised Instruction in Typewriting," National Business Education Quarterly, Vol. 34, No. 3 (Washington: National Business Education Association, March, 1966), p. 30.

[2]Lee R. Beaumont, "Give Beginning Typists a Head Start," Business Education Forum, Vol. 25, No. 1 (Washington: National Business Education Association, October, 1970), p. 58.

[3]Louis C. Nanassy, "Visual Aids in Teaching Typewriting," Methods of Teaching Typewriting, ed. by John L. Rowe (Somerville, N.J.: The Eastern Business Teachers Association, Somerset Press, 1965), p. 254.

The Bryson Study

The effectiveness of the Strong-Pacer was studied in college typewriting classes by Bryson. Five advanced and two intermediate college typewriting classes were utilized during the winter and spring quarters of 1965. A five-minute pre-test was administered as were five-minute post-test timed writings.

The findings indicated that there was no difference in achievement of the classes taught by the conventional methods and the classes taught by the Strong-Pacer methods in gross words per minute and net words per minute at the end of the quarters. There were no differences in achievement on accuracy tests at either mid-term or at the end of the quarter. The conclusion drawn, therefore, was that the same degree of skill may be developed with or without the use of the Strong-Pacer.[1]

> He (the typing teacher) must develop teaching devices that will motivate the students and make the learning of the basic subject matter quick, pleasant and simple.
>
> I have found that, by using this electrical device (an electric keyboard connected to a mock keyboard hung at the front of the room where all students can see it. As a key is depressed on the demonstration typewriter, that key lights up on the mock keyboard.) I can control the introduction of the keyboard and emphasize speed in learning it.

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[1]Jewell Gilbert Bryson, "Effectiveness of an Individualized Mechanical Pacing Device, the Strong-Pacer, in College Typewriting" (unpublished Ph.D. dissertation, The University of Tennessee, 1965).

> It is easy to detect lack of confidence in the knowledge of key positions, since the operator of the electric keyboard can watch the students while they work and know that they are learning the letters without looking at the typewriter keyboard.[1]

The Stephens Study

The construction and use of the illuminated typewriter keyboard chart was the topic of a master's thesis in 1966. The purpose of the investigation was to explain and illustrate the "Type-Lighter," an electrically illuminated typewriter keyboard chart. In constructing the "Type-Lighter," a box 40" x 5¼" x 19" was built from plywood with holes cut and covered with colored plastic--cloth letters were placed on them. Behind each hole was a light bulb that was connected to a typewriter wired in such a manner as to have the bulb light up when the key was depressed on the control keyboard. The approximate cost was $100.

It was recommended especially for use in teaching the letters of the keyboard, alphabetic drills, patterns of stroking, and remedial practice. It was concluded that it could be used in conjunction with educational television and that it would hold the students' attention.[2]

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[1]Richard G. Shaffer, "You Can Build an Electric Keyboard for Typing Instruction," Business Education World, Vol. 44, No. 1 (Philadelphia: Gregg Division, McGraw-Hill Book Company, September, 1963), p. 12.

[2]Daryl D. Stephens, "The Illuminated Typewriter Keyboard Chart: Its Construction and Uses" (unpublished Master's dissertation, Kansas State College of Pittsburg, 1966).

Often several media techniques are combined to teach typewriting.

> Audio tapes and slide projectors have been employed as separate instructional devices for a long time. They are not in themselves new. An exciting, new learning mix which combines the audio cassette and the slide carrousel in an individual study carrel, however, promises virtually unlimited individualization of typing instruction, practice, production typing, and testing.
>
> The individualizers include an audio source, a visual source, a rear-view projection console, a fixed-platen electric typewriter, timer switch, and instructional booklets. The hardware for this learning system may be mounted most conveniently in an individual study carrel.
>
> Experiences at the Center for Independent Learning indicate great success especially for those students who have always encountered learning problems in the typical, lockstep classroom. Their achievements have brought big smiles of satisfaction which at least partially compensate for the admitted enormous amount of work required in preparing the total program.[1]

Another example of a multimedia approach to teaching the typewriter was used in Minnesota.

> Minetonka Senior High School is currently in the second year of an experimental program of teaching beginning typewriting using video tape, films, a wireless laboratory, cassette records, and self-teaching printed materials developed at the local level. The teacher serves the students only at the individual level and never teaches the group. All other instruction is by means of the media mentioned above.
>
> The students are taught typewriting by one teacher, with the help of a clerical aide, in a

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[1]Robert L. Grubbs and Frederick J. Gaskin, "The Individualizers in Typewriting Instruction," Business Education Forum, Vol. 26, No. 5 (Washington: National Business Education Association, February, 1972), pp. 44-45.

> class of 60 to 64 learners. All instruction comes to the students by: (1) prerecorded television tapes, (2) prerecorded audio cassettes, (3) 8 mm. single-concept films, (4) self-teaching printed materials, and (5) individualized teacher assistance.
>
> An informal evaluation conducted last year indicates that the students are at least as skilled as traditionally instructed students.[1]

Another variation of the multimedia approach is described as follows.

> The multimedia system for typewriting includes a textbook, a workbook, instructor prepared tapes, and a syllabus which ties the course together. Each lesson in the textbook is placed on tape in a manner similar to actual classroom presentation. The tapes are in open storage and the student has access to the tapes every class day from eight in the morning until five in the afternoon. Each typewriting station is equipped with a typewriter and a tape recorder with earphones.
>
> The system frees the instructor to help students on an individual basis.
>
> Typing techniques can be checked by the use of a videotape recorder and the student can immediately see his technique errors through a playback of the video tape just recorded.
>
> The biggest advantages of the multimedia system are: (1) The student can progress at his own rate of speed. (2) The instructor has the time to help students individually. (3) It is an inexpensive system since only a tape playback unit is added to each student station.[2]

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[1] Vern Thoreson, "Multimedia Typewriting is Here!" Business Education Forum, Vol. 25, No. 8 (Washington: National Business Education Association, May, 1971), pp. 23-24.

[2] Charles A. Rohr, "A Multimedia System for Teaching Typewriting," Business Education Forum, Vol. 25, No. 4 (Washington: National Business Education Association, January, 1971), pp. 22-23.

Poland indicates that the electronic keychart teaching provides added stimulus for the student.

> Since learning is not something we can see, we must infer it from something a student does. The action may be overt (such as typing something) or covert (such as thinking). In either case the desired behavior is dependent upon the correct stimulus.
>
> Beginning students learn best if they can make a short response to a stimulus. Each punched-tape program was designed to provide for easy responses. The student responds to the illuminating keychart at a pace he can control. He becomes an integral part of the learning system because he determines the rate at which he learns.[1]

Etier of The University of Texas at Austin has used the electronic keychart teaching aid and believes:

> By using the electronic typewriting teaching aid, it is believed by those closely associated with its use in teaching typing that as much can be accomplished in one semester as in two semesters using the conventional method of teaching.[2]

Summary

> . . . Typewriting teachers must be interested in any new method of presenting the subject matter.[3]

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[1]Robert P. Poland, "Instructional Hardware in the Typewriting Classroom," Business Education World, Vol. 52, No. 3 (Philadelphia: Gregg Division, McGraw-Hill Book Company, January-February, 1972), p. 24.

[2]Faborn Etier, "Typewriting by Electronics," Business Education Forum, Vol. 26, No. 2 (Washington: National Business Education Association, November, 1971), p. 24.

[3]Richard D. Featheringham, "Focus on Typewriting," Business Education Forum, Vol. 26, No. 2 (Washington: National Business Education Association, November, 1971), p. 11.

The current psychology and methodology thoughts in teaching the keyboard to beginning students have been reviewed. As can readily be seen, there seems to be much agreement on many of the psychological factors used as a basis for presenting the keyboard.

There tends to be some disagreement as to the best method or methods of presenting the keyboard. One controversial issue at the present time centers around whether or not to have the students watch their fingers as they are learning the keyboard. Most authorities agree that a student should watch his fingers for locating the initial reach, but disagree as to how long the student should be allowed to watch his fingers. The present study produced results that would place it with those authorities who believe that a student should not watch his fingers beyond locating the initial reach.

The philosophy of a teacher concerning whether or not he allows the student to watch his fingers determines whether or not a particular teaching aid would be accepted by the teacher. Some aids, such as tapes and records would encourage the student to watch his fingers, while some of the aids, such as the Skill Builder, would not allow him to watch them. All of the aids have particular advantages and disadvantages depending upon the view of the typewriting teacher who is to use them.

CHAPTER III

PROCEDURES

Introduction

The data for this experimental study were gathered from two beginning typewriting classes during the Winter Semester of 1972 at Central Michigan University, Mount Pleasant, Michigan. These classes were available and arrangements could be made with the instructors and the department chairman to conduct the study in those classes. Since there had been no previous testing of the electronic keychart on any group, it was felt that this group of students would provide an effective tool for an initial study.

The purpose of the study was to determine if there would be a significant difference in the rates of speed and degree of accuracy utilizing the electronic keychart teaching aid to introduce the keyboard to students without prior typewriting instruction compared with conventional methods.

This chapter describes the methods and procedures used in the study. The chapter is divided into the following parts:

1. Selection of Materials to be Used
2. Course Outline
3. Student Selection
4. Class Routine
5. Measurement Instruments
6. Collection of Data
7. Analysis of Data

Selection of Materials Used

Materials used for the study were furnished by Gregg Division, McGraw-Hill Publishing Company. Both the experimental and control groups used the Gregg Typing 75 Basic Kit One for Colleges[1] by Lloyd, Rowe, and Winger as the basic text. The control group used only this text.

The experimental group used the Gregg Typing 75 Basic Kit One[2] and the electronic keychart with its pre-punched tapes. The pre-punched tapes and teacher's manual were also developed by Gregg Division, McGraw-Hill Publishing Company.[3] The tapes were correlated with the text.

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[1]Alan C. Lloyd, John L. Rowe, and Fred E. Winger, Typing 75 Basic (3d ed.; New York: Gregg Division, McGraw-Hill Book Company, 1970).

[2]Ibid.

[3]Alan C. Lloyd, Robert P. Poland, John L. Rowe, and Fred E. Winger, Teacher's Script for Keyboard Presentation on the Gregg/Kee 70-A (New York: Gregg Division, McGraw-Hill Book Company, 1971).

Course Outline

From these materials and the text, a course guide was developed for use on a daily basis (see Appendix B). The course outline was developed so that the two instructors would know what was to be taught on each day and also to ensure that the largest number of students possible would be in attendance particularly on days when tests were administered. The pattern for the course outline was developed before the first class meeting, so that there would be a consistency of the instruction presented. The pattern was developed through discussions between the two instructors as well as with advisors from Michigan State University, Gregg Publishing Company, Kee (Keyboard Educational Equipment) Company, and Central Michigan University.

In developing the course outline, it was necessary to constantly bear in mind that the class met only on Mondays, Wednesdays, and Fridays.

Limitations of the group selected were that of three class meetings a week, the fact that the subjects were college students, the class structure of material that was required to be covered, and the element of time; therefore, it was determined that the best approach would be to present two lessons per day except for the first lesson. This presentation of two lessons per day was a limitation of the study.

The course outline with the specific material taught each day may be found in Appendix B.

Student Selection

Two beginning typewriting classes were used for the experimental and control groups. One class met at 8:00 a.m. and one class met at 2:10 p.m. on Mondays, Wednesdays, and Fridays for a period of 50 minutes each. Each class was randomly divided into a control and an experimental group.

The names of the students enrolled in the course were randomly drawn from a box, by placing the first name drawn into the experimental group and the second name drawn into the control group. From then on, each name was alternately placed in the experimental or control group. Thus each student had an equal chance of being selected for either group. All of these students selected for the experimental and control groups had no previous typing experience. Previous experience was determined through an informational questionnaire administered to students in the classes on the first class meeting. A copy of the questionnaire is found in Appendix C.

Each experimental and control group was further randomly divided into three groups. Group 1 was to learn on Royal Manual typewriters, Group 2 was to learn on IBM electric Selectric typewriters, and Group 3 was to learn on IBM electric Model D (movable carriage) typewriters.

The same method was used to place the students in the machine groups, with the first name being placed in the Royal manual typewriter group, the second name being placed in the IBM electric Selectric typewriter group, and the third name being placed in the IBM electric Model D typewriter group. This procedure was continued until all students had been placed in one of the above-named groups.

A multivariate analysis of variance was used to determine whether or not the demographic characteristics of the randomly sampled groups were significantly different from each other. The categories on which the students were compared were: American College Testing scores, number of hours of college credit accumulated, college grade point average (cumulative), number of absences from class, number of times tardy to class, age, and sex. A schematic representation of the multivariate analysis may be found on page 60.

Students registering for these classes who had previous typewriting instruction were also evenly divided among the three groups in the experimental and control sections of the typewriting classes, but were not included in the study. This exclusion was made to prevent a disproportionate number of students with previous typing experience from being placed in one section and thus having more students, or more students who might have other problems in adjusting to the routine of the class, in any

of the sections. This procedure was followed, also, so that the beginning typists would not become too discouraged with a large number of experienced students having more speed or accuracy than the beginning typists did in the same section.

Class Routine

Each instructor taught an experimental and a control section. The flip of a coin determined that Instructor 2 would teach the experimental section at 8:00 a.m. while Instructor 1 taught the control section at that time. Therefore, in the 2:10 p.m. class, Instructor 2 taught the control section and Instructor 1 taught the experimental section. The experimental sections were taught in Grawn Hall 342, while the control sections were taught in Grawn 302. Each room was equipped with identical chairs, typing desks, and typewriters.

In the experimental group, the electronic keychart keyboard was used to introduce the letters, numbers, and symbols on the keyboard. This machine was operated from pre-punched tapes and controlled by the teacher.

Each day the students started the typewriting class period by using warmup material in the textbook which reviewed the material that had been previously presented. This warmup took five minutes, during which time, the teacher took roll and assisted individual students as they needed it.

Next, the letters of the keyboard for that day were presented. In the experimental section, the teacher told the students which finger was used to strike the key, then pointed to the keychart display panel and indicated which homerow finger was moved from its position to the key to be struck. The students were allowed to make the proper reach several times without striking the key. The letters were then presented by the electronic keychart. The keychart was used only at the beginning of the class period and only until all of the material on all of the letters to be learned that period had been presented. When a new letter was presented, the teacher called out the letters for the first line of typing as indicated in the teacher's manual. From then on through the rest of the class period, the students were given practice work from the text that reinforced the new letters learned that day and reviewed letters learned on previous days. Students were given individual help during this period of time as they needed it or indicated that they wanted the help. Students were then assigned homework over the material covered during that class period. This practice work was assigned in such a way that a student would spend about 20 to 30 minutes per hour spent in class outside of class on practice work.

In the control section, the teacher told the students which finger was used to strike the key, told

them where the key was on their typewriter, allowed the students to watch as they made the proper reach several times from the homerow to the new key without striking the key, then called out each letter to the students while the students typed from the first line of material on the new letter in the textbook. The students then practiced the material from the textbook to reinforce this new letter or letters. The rest of the class period was spent in practicing the material from the textbook. Students were given individual help during this period of time as they needed it or indicated that they wanted the help. As with the experimental group, the students were assigned homework over the material covered during that class period that would take them about 20 to 30 minutes outside of class to practice. Both groups received the same practice material in class and as homework practice.

Both teachers followed the lesson plans constructed by the investigator and were in constant contact with each other. After each class period, the various problems in teaching were discussed, so that lesson plans could be adjusted as needed from day to day; but during any one day, the same lesson plans were used by both teachers in all four groups.

During the reinforcement period following the presentation of all of the letters on the keyboard, phonograph

records were used. Along with this reinforcement, centering vertically and horizontally were taught as prescribed in the textbook.

In the experimental group, which used the electronic keychart, the speed with which letters were presented started at 5 words per minute during the first week and was increased to 7 words per minute during the following two weeks. During the remainder of the seven week period, the keys were presented at 11 words per minute. These speeds were used so that the students were challenged, but would not become discouraged from the inability to keep up with the equipment. Additional reasons for the presentation of the material at these speeds were that the letters were flashing on the display at evenly paced time intervals, but no more additional time was allowed for the return of the carriage than was available from the flashing of one letter to the next; and the tapes and softward for use in teaching were still in the developmental stage and contained several errors. For all of these reasons, it was determined that faster speeds of presenting the letters were impractical for the students to learn the letters of the keyboard effectively.

Collection of Data

The tests administered for the one-minute timed writings were selected using the following criteria: unfamiliar material, similar in difficulty, material

selected by authorities in the typewriting field, no "nonsense" letter combinations, and material must cover keys previously presented only. In this way, the material used for testing purposes would give each student a fair opportunity to perform at his best on both speed and accuracy, yet would be an indication of the student's ability at any given point in the learning of the typewriter keyboard.

As indicated by the course outline (see Appendix B), a one-minute timed writing to measure the rate of speed and accuracy was administered after all of the letters of the keyboard had been presented. This timed writing was followed by a period of three days of review and reinforcement, after which another one-minute timed writing to measure rate of speed and accuracy was administered.

Following this cycle, the numbers of the keyboard were taught; then a one-minute timing was administered to measure speed and accuracy. All of the timed writings were taken from unfamiliar material in the textbook. Symbols and characters were next presented, followed by a one-minute timing to measure speed and accuracy administered after the last character was taught. This timed writing was constructed from several sentences, putting together material from the text, because there was no material available that would include all of the symbols in a one-minute timed writing. On the last day of the experimental

study, all groups were administered a speed and accuracy one-minute timed writing on letters of the keyboard only. This timing on letters of the keyboard was taken from text material that was especially developed by the authors for timed writings and was unfamiliar to the students taking the timed writing. Following this last timed writing, the experimental and control groups within each class period were put together as one class with Instructor 2 as their teacher. The usual material was covered during the remainder of the semester using the material in the remaining portion of the textbook. On the next to the last day of the class meetings for the semester, both classes took a 1-minute timed writing administered to them to measure speed and accuracy. At the same time an attitudinal questionnaire was administered in an attempt to gather information concerning the students' feelings about participating in the study.

Analysis of Data

The data gathered was punched into IBM cards which were then processed by the University Computer Center, Michigan State University, East Lansing. A multivariate analysis of variance was used to test the significance of difference between the control and experimental groups. The following schematic representation illustrates the experimental design.

A_1			A_2		
B_1		B_2	B_1		B_2
C_1	C_2	C_3	C_1	C_2	C_3

A_1 represents the Experimental Group

A_2 represents the Control Group

B_1 represents Teacher 1

B_2 represents Teacher 2

C_1 represents those students on Royal Manual typewriters.

C_2 represents those students on IBM electric Selectric typewriters.

C_3 represents those students on IBM electric Model D typewriters (movable carriage).

Figure 1.--Schematic representation of the 2 x 2 x 3 factorial design.

However, it became necessary to analyze some of the materials on only two factors at a time instead of all three at the same time, because one of the cells had no scores in it on all variables using all measures, due to student absences. This cell was the one containing students in the experimental section with teacher 2 on the IBM electric Model D (movable carriage) typewriter.

Hence, the following analyses were used: Treatment x Machine on Measures 1, 2, 5, 6; Treatment x Instructor on Measures 1, 2, 5, 6; Treatment x Instructor on all measures;

Treatment x Machine on all measures; Three-way Analysis (Treatment x Machine x Instructor) on Measure 1; Three-way Analysis (Treatment x Machine x Instructor) on Measure 2; and Three-way Analysis (Treatment x Machine x Instructor) on Measure 6.

While the time of day of the two classes may be a factor that tends to confound the study to some degree, it was believed that the time of day would not be an important factor and thus the effect of this variable was assumed to be zero since the students elected to take the class at the time they did and both classes had vacancies in them. Because each student was randomly placed in a control or experimental group, it was felt that the time factor was controlled as much as possible within the limitations of this study.

It must be recognized that the investigator's ego involvement in the study may have caused some confounding of the data. However, the attempt to overcome this confounding was made by having each instructor teach a control group and an experimental group. The investigator tried, to the best of his ability, to be impartial in the planning and presentation of the material.

CHAPTER IV

FINDINGS

This chapter contains an analysis of the data collected during the course of the experimental study and is divided into four parts. Part I presents the statistical analysis of the collected data; Part II discusses the opinions of the students regarding the experimental method of teaching the keyboard; Part III compares the demographic characteristics of the students for equality of groups; and Part IV summarizes the analyses and findings.

I. Statistical Analysis

The performance of the experimental and control groups was analyzed using the multivariate analysis of variance to test the significance of difference between the groups.

Measurements were taken at specific times during the course of the study. Measure 1 was a one-minute timed writing to measure speed and accuracy administered immediately after all of the letters of the keyboard had been presented. Measure 2 was a one-minute timed writing to measure speed and accuracy administered immediately after a three-day reinforcement period on the letters of

the keyboard previously taught. Measure 3 was a one-minute timed writing to measure speed and accuracy administered immediately after all of the numbers had been presented. Measure 4 was a one-minute timed writing to measure speed and accuracy administered immediately after all of the symbols had been presented. Measure 5 was a one-minute timed writing to measure speed and accuracy on alphabetic material administered immediately after all symbols had been presented. Measure 6 was a one-minute timed writing to measure speed and accuracy administered during the last week of the semester.

The following analyses were used: Treatment x Machine on Measures 1, 2, 3, 4, 5, 6; Treatment x Instructor on Measures 1, 2, 3, 4, 5, 6; Treatment x Machine x Instructor on Measure 1; Treatment x Machine x Instructor on Measure 2; Treatment x Machine x Instructor on Measure 6; Treatment x Machine on Measures 1, 2, 5, 6; and Treatment x Instructor on Measures 1, 2, 5, 6.

From the data in Tables 4, 5 and 6 in Appendix A, it can be observed that there was no significant difference at the .05 level between the experimental group and the control group when all measures are used, although the treatment effect did indicate a slight difference. The difference was a result of the control group typing at a faster rate of speed (GWPM Mean: 31.6107) than the experimental group (GWPM Mean: 25.6094) when all measures were

used, but considering only the relationship of treatment and instructor.

When all measures and the relationship of treatment and machine were considered, it can be observed from the data in Tables 7, 8, and 9 in Appendix A that there was no significant difference between the experimental group and the control group using the .05 level of significance as the standard of significance.

Using only Measures 1, 2, 5, and 6, which were the letter keys of the keyboard only, and considering the relationship of treatment to machine, it can be ascertained that there was a difference that was highly significant at the .05 level of significance in the treatment effect. The data in Tables 10, 11, and 12 in Appendix A show the results of the tests of significance. This difference was a result of the control group (GWPM Mean: 32.4950) typing at a faster rate of speed than the experimental group (GWPM Mean: 24.5500) when Measures 1, 2, 5, and 6 were used.

The data in Tables 13, 14, and 15 indicated that the relationship of treatment and instructor using only Measures 1, 2, 5, and 6 produced a highly significant difference in the treatment at the .05 level. This difference was due to the treatment, showing that the control group typed more gross words per minute than the experimental group on letters of the keyboard at various

measurement points in the keyboard presentation, but only when letters of the keyboard are presented.

Three, three-way analyses were used to ascertain the relationships of all three units being tested. These analyses were used on only three of the measures because absences and withdrawals from the classes did not permit the three-way analysis to be made in other measures.

An interaction of the machine and instructor, which was highly significant at the .05 level, can be ascertained from the data in Table 1 on page 66. The difference was due to the treatment and indicated that the experimental group made significantly less errors than the control group. In addition, a highly significant difference showed up again when the treatment and instructor interaction relationship was considered. This difference was due to the experimental group making fewer errors on Measure 1 than did the control group.

The data in Table 2 shows the result when the three-way analysis was applied to Measure 6. As shown, no significant difference existed between the experimental and control groups when the three-way analysis of Treatment x Machine x Instructor was made.

Summary of Statistical Analysis

One can conclude from this experimental research that students in the control groups, those taught the

TABLE 1.--Three-way analysis: Treatment x Machine x Instructor, Measure 1.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
Machine Effect:						
	2.5300	4 and 36	.0573		31	
WPM 1				1.2817		.3006
EPM 1				5.1316		.0166*
Instructor Effect:						
	4.6399	2 and 18	.0238*		31	
WPM 1				5.0289		.0371
EPM 1				8.0175		.0107*
Treatment Effect:						
	2.5735	2 and 18	.1040		31	
WPM 1				0.8797		.3601
EPM 1				2.7846		.1116
Treatment x Machine Interaction:						
	0.6430	4 and 36	.6354		31	
WPM 1				0.6726		.5222
EPM 1				0.2756		.7622
Treatment x Instructor Interaction:						
	3.9615	2 and 18	.0376*		31	
WPM 1				0.3638		.5536
EPM 1				8.1798		.0101*
Machine x Instructor Interaction:						
	5.8112	4 and 36	.0011*		31	
WPM 1				0.5427		.5900
EPM 1				12.5411		.0004*
Treatment x Machine x Instructor Interaction:						
	2.2249	4 and 36	.0857		31	
WPM 1				0.0848		.9190
EPM 1				4.1271		.0325*

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 2.--Three-way analysis: Treatment x Machine x Instructor, Measure 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
Machine Effect:						
	0.2749	4 and 36	.8923		31	
WPM 6				0.0726		.9303
EPM 6				0.5486		.5867
Instructor Effect:						
	0.7771	2 and 18	.4746		31	
WPM 6				1.5667		.2259
EPM 6				0.0038		.9513
Treatment Effect:						
	0.3322	2 and 18	.7217		31	
WPM 6				0.0000		.9956
EPM 6				0.6807		.4196
Treatment x Machine Interaction:						
	0.8540	4 and 36	.5008		31	
WPM 6				1.0024		.3857
EPM 6				0.6726		.5222
Treatment x Instructor Interaction:						
	0.7809	2 and 18	.4729		31	
WPM 6				0.7183		.4073
EPM 6				0.6592		.4269
Machine x Instructor Interaction:						
	0.9162	4 and 36	.4651		31	
WPM 6				1.4813		.2525
EPM 6				0.8431		.4459
Machine x Instructor x Treatment Interaction:						
	1.2423	4 and 36	.3106		31	
WPM 6				1.4901		.2506
EPM 6				1.7414		.2022

*Significant at the .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

typewriter keyboard through conventional methods, tend to type at faster rates of gross speed than do students in the experimental groups, those taught through the use of the electronic keychart aid. This difference is shown by the fact that the mean average words per minute of the control group was six to eight words per minute faster on measures testing speed on letter keys of the typewriter.

However, the students in the experimental group tend to make fewer errors than the students in the control group. This difference is shown by the fact that the experimental group made significantly fewer errors per minute than did the control group.

II. Student Attitudes Toward the Electronic Keychart Method

Acceptance by the students of a teaching aid is of utmost importance if the expected learning is to result. Therefore, a questionnaire was devised to determine student opinions concerning the electronic keychart method of teaching the typewriter keyboard. Subjects in the experimental group were asked to complete the questionnaire at the time the last measurement was taken during the last week of the semester. The complete instrument and the results obtained are shown in Appendix B.

The questionnaire contained 35 questions. The first 30 questions were concerned with the attitude of the student and were answered by circling SA for Strongly Agree,

A for Agree, N for Neutral, D for Disagree, and SD for Strongly Disagree. The last five questions were open ended questions asking for specific information and for their opinions about their feelings concerning the class.

As can be seen from the data in Table 19 (see Appendix C), the students felt the method used to present the typewriter keyboard utilizing the electronic keychart was highly satisfactory and most of them favored its use. Obviously some of them had neutral feelings about the method used, but it must be kept in mind that they had no other method of typewriter keyboard presentation with which to compare. It seemed to be the feeling of most of the students in the experimental group that using the electronic keychart was an asset rather than a liability when applied to learning the typewriter keyboard.

Questionnaire Summary

From the questionnaire (see Appendix C) administered to the students in the experimental group, it can be ascertained that the large majority of the students enjoyed being in the experimental class utilizing the electronic keychart for presenting the typewriter keyboard.

The reactions of the students to the instructor were very positive. The students felt they received the help from the instructor that was wanted and expected.

Most of the students liked the typewriter they used or had no feelings one way or the other about the typewriter to which they were assigned.

The mean number of hours per student spent on homework typing outside of class was 3.1333 hours per week for the experimental group. Some students reported averaging only one hour per week while one student reported spending about eight hours per week typing outside of class on typewriting.

The students' attitude would indicate that the keychart electronic teaching aid would have acceptance among the students who might be taught through its use.

III. Demographic Characteristics

The demographic characteristics of the randomly sampled groups were analyzed to determine whether or not the groups were significantly different from each other.

It was found that there was not a significant difference between the students in the experimental and control groups in their American College Testing scores, with the mean in the experimental group being 20.25 and the mean in the scores of the control group being 22.28. There was a significant difference in the number of semester credit hours accumulated between the two groups, with the control group having a mean of 46.97 credit hours and the experimental group having a mean of 36.25 semester hours of credit. There was no significant difference between the two groups in the area of cumulative grade point average. The experimental group had a mean of 2.7 and the control group had a mean of 2.5 GPA.

There was a significant difference in the absences of students in the two groups. The mean number of times for missing a class in the experimental group was 3.67, while it was only 1.97 for the control group. With these facts on attendance records of the subjects in evidence, the possibility existed that the results of the study may have been slightly affected.

The number of times tardy to class did not indicate any significant difference with .500 mean number of times tardy for the experimental group and .425 mean for the control group. The random sampling technique produced no significant difference in age. The experimental group had a mean of 19.08 years of age and the control group had a mean of 18.78 years of age. The students were about evenly divided randomly in terms of sex. There were 10 males and 7 females in the experimental group while the control group had 8 males and 10 females.

Summary of Demographic Characteristics

From this information, it can be concluded that the experimental group and control group were more alike than they were different. There are two areas where significant differences existed--those being in the areas of total number of credit hours accumulated and in the number of absences. It was assumed that the differences in total number of credit hours accumulated and in the number of

TABLE 3.--Demographic characteristics.*

Demographic Characteristics	Experimental Group Means	Control Group Means	Significance Level
American College Testing Scores	20.25	22.28	NS
Accumulated Semester Credit Hours	36.25	46.97	.05
Cumulative Grade Point Average	2.7	2.5	NS
Number of Times Absent	3.67	1.97	.05
Number of Times Tardy	.500	.425	NS
Years of Age	19.08	18.78	NS

*Experimental Group contained 7 females and 10 males; Control Group contained 10 females and 8 males.

absences were of little import on the findings of the study.

IV. Summary of Data

The data collected and presented in this chapter indicated (1) the similarities and differences that existed on the tests of achievement in gross words per minute and errors per minute at various stages in the teaching of the typewriter keyboard as related to the treatment, machines, and instructor between the experimental and control groups; and (2) the attitudes of the students toward the experiment of presenting the typewriter keyboard as well as a comparison of the equality of the experimental and control groups on demographic characteristics.

A multivariate analysis of variance was used to test the significance of difference in performance between the control and experimental groups indicated that there was a significant difference between the two groups when the experimental treatment was used. This difference showed that students in the control group taught by the conventional method produced higher speed scores on all letters, numbers, and symbols on the typewriter keyboard than did the students in the experimental group under the experimental conditions.

There was a highly significant difference between the groups in the accuracy measurements when the two groups were compared. The difference indicated that the experimental group, when taught with the electronic keychart, was more accurate than the students taught with the conventional method.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Purpose of the Study

The purpose of this experimental research study was to provide information concerning a comparison of methods of introducing the typewriter keyboard to beginning typewriting students. Teachers need to use the most effective and efficient methods available when introducing the keyboard. This study was an attempt to determine the effect that teaching the typewriter keyboard through the use of an electronic keychart would have on the rates of speed and accuracy as compared with teaching the keyboard by conventional methods.

Statement of the Problem

The primary problem in this study was to determine the difference, if any, in student achievement in the rates of speed and degree of accuracy, between two groups of learners with one group (control) receiving conventional keyboard instruction, and the other (experimental) receiving keyboard instruction utilizing the electronic keychart teaching aid.

Secondary problems were: (1) to determine whether the difference in instructor had a significant effect on the skill achievement; and (2) to determine whether the difference in the kind of typewriter had a significant effect on the skill achievement.

Need for the Study

Little experimentation has been done in the area of electronic devices for the teaching of the keyboard in beginning typewriting classes. There is a need for students to be taught more effectively and efficiently when learning the typewriter keyboard. There is need for research in keyboard instruction to find the most efficient and effective methods.

Importance of the Study

This study was important because no research existed on the use of the electronic keychart teaching aid in a beginning typewriting classroom. It was important, too, because much of the current thought and literature indicates that a typist should look at the keyboard when learning to type; but this piece of equipment does not allow an individual to do so if the equipment is to be effective.

Experimental Hypotheses

The specific research hypotheses that this study investigated were:

1. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

2. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

3. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

4. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

5. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

6. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

7. The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

8. The achievement on speed tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

9. The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the experimental group during the second, third, fourth, seventh, and seventeenth weeks.

10. The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

11. The achievement on speed tests will show no significant difference among students using the Selectric IBM, Model D IBM, and Royal manual typewriters within the experimental group during the second, third, fourth, seventh, and seventeenth weeks.

12. The achievement on speed tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

Procedures

The population selected for this study was composed of students enrolled in two classes of beginning typewriting at Central Michigan University, Mount Pleasant, Michigan. Two class hours were used. One of the classes met at 8:00 a.m. on Monday, Wednesday, and Friday; the other class met at 2:10 p.m. on Monday, Wednesday, and Friday. Each class met for a period of 50 minutes. Each class was randomly divided into an experimental and a control group. Each of the experimental and control groups was further divided into three sections, which were randomly selected to learn the typewriter keyboard on the IBM Selectric, IBM Model D, or Royal manual typewriters. Instructor 2 taught the 8:00 a.m. experimental and 2:10 p.m. control groups. Instructor 1 taught the control group in the morning and the experimental group in the afternoon.

An identical course outline and time schedule was utilized in all four groups. The teaching procedures and lesson plans were prepared by the researcher. The same basic textbook was used by all groups. The experimental groups were taught the keyboard through the use of the electronic keychart, while the conventional method of teaching the keyboard was used for the control groups. All four groups were given identical homework practice assignments.

The data gathered was punched into IBM cards which were then processed by the University Computer Center, Michigan State University, East Lansing. The statistical treatment of the data utilized the multivariate analysis of variance to test the significance of difference between the control and experimental groups. Some of the hypotheses were stated in the positive form and some were stated in the null form. All hypotheses were stated in terms of the anticipated findings. However, the null hypothesis was used to test the significance at the .05 level of significance.

The students were compared for equality of groups in terms of American College Testing scores, number of hours of credit accumulated, grade point average (cumulative), number of absences from class, number of times tardy to class, age, and sex. It was found that the experimental and control groups were much more alike than they were different. Significant differences were found only in the

number of semester credit hours accumulated and the number of absences. The control group had accumulated a mean of 46.97 semester hours of credit and the experimental group had accumulated a mean of 36.25 semester hours of credit. The control group had a mean of 1.97 absences from class while the experimental group had a mean of 3.67 absences from class.

The attitude of the students in the experimental group toward this method of teaching was ascertained by use of a questionnaire. The answers to the questionnaire indicated that the majority (approximately 87%) liked this method of keyboard presentation.

Findings

Twelve hypotheses were presented for this experimental research. A statement of each hypothesis tested and a summary of the findings follow.

Hypothesis 1

The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

The difference found when Measures 1, 2, 5, and 6 were combined for students typing letter keys, with accuracy as the measurement was not significant at the .05 level of confidence.

However, in a three-way analysis of treatment x machine x instructor on Measure 1, there was an interaction of the machine and instructor which was highly significant. The difference was due to the treatment and indicated that the experimental group made less errors than the control group.

Therefore, this hypothesis was rejected.

Hypothesis 2

The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

When all measures were combined, there was a highly significant difference in the treatment x instructor interaction. The difference indicated that the experimental group made significantly fewer errors than the control group.

This difference showed up when all measures were combined using the treatment and machine interaction. The difference indicated that the experimental group made significantly fewer errors than the control group.

Therefore, this hypothesis was not rejected.

Hypothesis 3

The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

No significant difference was found between the experimental and control groups using Measure 4 for students typing symbol keys, with accuracy as the measurement.

Hence, this hypothesis was rejected.

Hypothesis 4

The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on letter keys during the second, third, seventh, and seventeenth weeks.

When Measures 1, 2, 5, and 6 were combined, a highly significant difference was produced. This significance resulted from the fact that the control group typed at a faster gross rate of speed than did the experimental group. Difference was also produced when the above four measures were combined with the interaction of treatment and instructor. The treatment effect produced a difference that was highly significant. The difference was a result of the fact that the control group typed at a faster gross rate of speed than did the experimental group.

Therefore, this hypothesis was rejected.

Hypothesis 5

The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on number keys at the end of the fourth week.

When all measures were combined, with the interaction of treatment and instructor, the treatment effect resulted in a highly significant difference which indicated that the control group typed at a faster rate of gross speed than did the experimental group.

A highly significant difference was indicated also when all measures were combined, with the interaction of treatment x machine, the treatment effect indicated that the control group typed at a faster rate of gross speed than did the experimental group.

Therefore, this hypothesis was rejected.

Hypothesis 6

The achievement on speed tests will be higher for those students in the experimental group than for those in the control group on symbol keys during the seventh week.

No significant difference was found between the experimental group and the control group when measured on rate of gross speed when typing symbol keys.

Therefore, this hypothesis was rejected.

Hypothesis 7

The achievement on accuracy tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

No significant difference was found on accuracy tests between the control and experimental groups after a period of reinforcement and skill building on the letter keys at the end of the third week.

Therefore, this hypothesis was rejected.

Hypothesis 8

The achievement on speed tests will be higher for those students in the experimental group than for those in the control group after a period of reinforcement and skill building on the letter keys at the end of the third week.

No significant difference was found on speed tests between the control and experimental groups after a period of reinforcement and skill building on the letter keys at the end of the third week.

Therefore, this hypothesis was rejected.

Hypothesis 9

The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM and Royal manual typewriters within the

experimental group during the second, third, fourth, seventh, and seventeenth weeks.

No significant differences were found on accuracy tests regardless of the typewriter used by the experimental group.

Hence, this hypothesis was not rejected.

Hypothesis 10

The achievement on accuracy tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

No significant differences were found on accuracy tests regardless of the typewriter used by the control group.

Hence, this hypothesis was not rejected.

Hypothesis 11

The achievement on speed tests will show no significant difference among students using the Selectric IBM, Model D IBM, and Royal manual typewriters within the experimental group during the second, third, fourth, seventh, and seventeenth weeks.

No significant differences were found on speed tests regardless of the typewriter used by the experimental group.

Therefore, this hypothesis was not rejected.

Hypothesis 12

The achievement on speed tests will show no significant difference among students using Selectric IBM, Model D IBM, and Royal manual typewriters within the control group during the second, third, fourth, seventh, and seventeenth weeks.

No significant differences were found on speed tests regardless of the typewriter used by the control group.

Therefore, this hypothesis was not rejected.

The conclusions reached from the student attitude questionnaire are listed below:

1. The students participating in the experimental group liked the method of presenting the typewriter keyboard using the electronic keychart teaching aid as indicated by the fact that approximately 87% of them responded favorably to questions concerning their reaction to the use of the equipment.

2. Approximately 49% of the students in the experimental group felt they learned what they had expected to learn through the use of the electronic keychart.

3. Good instruction was provided by the instructor in the experimental groups was indicated by approximately 65% of the students in the group.

4. The typewriter on which the students were taught the keyboard was liked by 80% of the students in the experimental group.

Conclusions

The following conclusions were based on an analysis of data:

1. Students using the KEE-type-trainer in this experimental study of learning the typewriter keyboard were more accurate than were the students taught by conventional teaching methods.

2. Students using the KEE-type-trainer in this experimental study of learning the typewriter keyboard typed at slower speeds than did students taught by conventional teaching methods.

3. Students in this experimental study typed equally well regardless of the kind of typewriter used.

4. No significant differences were found between the instructors in the study.

Recommendations

In view of the findings and conclusions of this experimental study, the following recommendations in the area of the use of the electronic keychart introduction of the typewriter keyboard are offered:

It is recommended that:

1. A replication or replications of this study be completed with high school students as subjects to determine whether or not the findings would parallel the findings for coblege students.

2. Further research be made concerning the electronic keychart to determine if faster speeds in the presentation of the keyboard would increase the rates of speed of the students using the equipment.

3. The electronic keychart be researched to determine if a change in format for presentation as fewer letters being presented in any one lesson would result in more accuracy.

4. The electronic keychart be researched using various typewriting textbook materials to determine the textbook materials' effects, when used in conjunction with the keychart, on the rates of speed and degrees of accuracy.

Implications

The following paragraphs are offered as implications this study may have for future education. Some of the statements are not necessarily supported by this experimental research study, but they are presented so that other instructors may benefit from the experience of the two instructors involved in this experimental study who taught the typewriter keyboard utilizing the electronic keychart teaching aid.

1. The feeling of this investigator is that the students utilizing the electronic keychart could be forced to faster stroking rates by increasing the number of words per minute slightly when new keys are presented if the carriage return time allotment is increased.

2. Both teachers utilizing the electronic keychart had the feeling that there was not as good a rapport with the experimental group as with the control group. The only explanation the teachers could give was that the use of the teaching aid, in some way, came between the teacher and the students in building a good relationship. Some method should be found to counteract this feeling.

3. There seemed to be less difference between the experimental and control groups at the end of the semester than at the end of the experimental study (after seven weeks) when measured by rates of speed and accuracy. The amount of difference tended to disappear the longer the students did not use the equipment in the typewriting class. The experimental students might have continued at a high degree of skill if the electronic keychart had been utilized to review, build speed and accuracy, and to introduce new chaining combinations continuously through the remainder of the semester.

4. Several aspects of the equipment and the software that accompanies it need to be improved to make the equipment more usable to the teacher. Only a few suggested improvements will be mentioned here: (1) A booklet of operating instructions for the teacher should accompany the equipment, (2) Only one shift key should light up when a letter is to be capitalized, (3) Short tapes with several letters combined onto one tape would make it easy to review the letters presented at the end of the class period, and

(4) The remote control cord is not long enough to be of real value to a teacher; perhaps a long spring cord would be more effective.

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APPENDICES

APPENDIX A

TABLE 4.--Treatment x Instructor. Treatment x Instructor Interaction, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	3.3739	12 and 4	.1253		19	
WPM 1				0.5209		.4816
EPM 1				3.9026		.0670
WPM 2				0.1326		.7209
EPM 2				0.0343		.8556
WPM 3				0.0543		.8190
EPM 3				7.2786		.0166*
WPM 4				0.4117		.5308
EPM 4				0.4144		.5295
WPM 5				0.0823		.7781
EPM 5				0.4276		.5231
WPM 6				0.1563		.6981
EPM 6				1.7077		.2110

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 5.--Treatment x Instructor. Treatment Effect, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	4.0221	12 and 4	.0951		19	
1				4.4920		.0512
EPM 1				0.3950		.5392
WPM 2				4.9252		.0424*
EPM 2				3.7045		.0735
WPM 3				7.6560		.0144*
EPM 3				7.2730		.0166*
WPM 4				1.6733		.2154
EPM 4				0.0023		.9626
WPM 5				0.2253		.6419
EPM 5				1.1327		.3041
WPM 6				4.0081		.0638
EPM 6				0.0054		.9423

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 6.--Treatment x Instructor. Instructor Effect, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	1.4207	12 and 4	.3958		19	
WPM 1				3.0318		.1022
EPM 1				2.0688		.1709
WPM 2				4.7227		.0462*
EPM 2				0.1176		.7365
WPM 3				1.4007		.2551
EPM 3				0.4835		.4975
WPM 4				2.4680		.1371
EPM 4				18.4320		.0007*
WPM 5				10.0992		.0063*
EPM 5				0.7363		.4044
WPM 6				3.7668		.0713
EPM 6				0.1044		.7512

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 7.--Treatment x Machine. Machine x Treatment Interaction, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	1.2862	24 and 4	.4493		19	
WPM 1				0.1865		.8321
EPM 1				0.0839		.9200
WPM 2				0.1202		.8878
EPM 2				0.2807		.7597
WPM 3				0.0900		.9145
EPM 3				1.0445		.3797
WPM 4				0.6179		.5542
EPM 4				0.7130		.5084
WPM 5				0.4453		.6501
EPM 5				4.0190		.0438*
WPM 6				0.0845		.9195
EPM 6				0.4705		.6350

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 8.--Treatment x Machine. Treatment Effect, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	2.3732	12 and 2	.3346		19	
WPM 1				4.3006		.0586
EPM 1				0.0867		.7731
WPM 2				5.3226		.0382*
EPM 2				2.2941		.1538
WPM 3				7.6507		.0161*
EPM 3				4.6484		.0504
WPM 4				4.0609		.0651
EPM 4				1.1468		.3037
WPM 5				1.6143		.2262
EPM 5				5.5653		.0347*
WPM 6				4.4230		.0556
EPM 6				0.0056		.9416

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 9.--Treatment x Machine. Machine Effect, All Measures.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	.8804	24 and 4	.6367		19	
WPM 1				1.7777		.2078
EPM 1				0.5915		.5678
WPM 2				1.4993		.2595
EPM 2				0.1976		.8232
WPM 3				0.8104		.4660
EPM 3				0.7459		.4936
WPM 4				1.8520		.1961
EPM 4				0.4129		.6702
WPM 5				1.8107		.2025
EPM 5				5.0161		.0243*
WPM 6				0.7284		.5014
EPM 6				0.2382		.7915

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 10.--Treatment x Machine. Machine x Treatment Interaction, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	.4550	16 and 18	.9402		22	
WPM 1				.2955		.7482
EPM 1				.1994		.8213
WPM 2				.0605		.9416
EPM 2				.4149		.6674
WPM 5				.2162		.8079
EPM 5				.4113		.6697
WPM 6				.2270		.7995
EPM 6				.5406		.5927

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 11.--Treatment x Machine. Machine Effect, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	1.1735	16 and 18	.3691		22	
WPM 1				0.8811		.4335
EPM 1				0.6342		.5432
WPM 2				1.3670		.2831
EPM 2				1.1337		.3464
WPM 5				4.4581		.0290*
EPM 5				1.5493		.2427
WPM 6				0.6846		.5185
EPM 6				0.4336		.6556

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 12.--Treatment x Machine. Treatment Effect, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	5.5664	8 and 9	.0095*		22	
WPM 1				3.8056		.0689
EPM 1				0.0064		.9374
WPM 2				4.6716		.0462*
EPM 2				4.1986		.0573
WPM 5				5.0374		.0393*
EPM 5				3.5692		.0772
WPM 6				5.4084		.0336*
EPM 6				0.1690		.6865

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 13.--Treatment x Instructor. Instructor x Treatment Interaction, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	1.6055	8 and 11	.2290		22	
WPM 1				0.0073		.9331
EPM 1				1.9042		.1846
WPM 2				0.3297		.5730
EPM 2				0.4485		.5116
WPM 5				0.1399		.7128
EPM 5				3.7909		.0674
WPM 6				0.1349		.7177
EPM 6				1.8454		.1911

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 14.--Treatment x Instructor. Instructor Effect, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	1.4508	8 and 11	.2775		22	
WPM 1				2.0607		.1683
EPM 1				3.6642		.0717
WPM 2				0.0311		.3234
EPM 2				0.0091		.9250
WPM 5				3.6311		.0729
EPM 5				1.1884		.2901
WPM 6				0.9678		.3383
EPM 6				0.0632		.8044

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 15.--Treatment x Instructor. Treatment Effect, Measures 1, 2, 5, 6.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
	4.3693	8 and 11	.0136*		22	
WPM 1				4.1612		.0564
EPM 1				0.0085		.9276
WPM 2				4.7970		.0420*
EPM 2				4.0580		.0592
WPM 5				4.3265		.0521
EPM 5				4.1170		.0576
WPM 6				5.7966		.0271*
EPM 6				0.1874		.6703

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

TABLE 16.--Three-way Analysis. Treatment x Machine x Instructor, Measure 2.

Variable Measures	Multivariate F	Multivariate df	Multivariate p	Univariate F	Number	Univariate p
Machine Effect:						
	.8777	4 and 36	.4869		31	
WPM 2				1.2804		.3009
EPM 2				0.3386		.7171
Instructor Effect:						
	2.7818	2 and 18	.0886		31	
WPM 2				3.8681		.0640
EPM 2				0.3819		.5440
Treatment Effect:						
	3.2635	2 and 18	.0618		31	
WPM 2				0.6236		.4395
EPM 2				4.2216		.0540
Treatment x Machine Interaction:						
	0.6473	4 and 36	.6325		31	
WPM 2				0.5480		.5870
EPM 2				0.5722		.5738
Treatment x Instructor Interaction:						
	0.4123	2 and 18	.6682		31	
WPM 2				0.4858		.4943
EPM 2				0.1087		.7453
Machine x Instructor Interaction:						
	0.3565	4 and 36	.8378		31	
WPM 2				0.3406		.7157
EPM 2				0.2348		.7930
Treatment x Machine x Instructor Interaction:						
	0.0899	4 and 36	.9851		31	
WPM 2				0.0314		.9692
EPM 2				0.0957		.9092

*Significant at .05 level of confidence.

WPM = Gross Words Per Minute; EPM = Errors Per Minute.

APPENDIX B

Date	Lesson	Teaching Material Covered
Jan 17		Students filled informational questionnaire
Jan 24	1	Letters a s d f j k l ;
Jan 26	2, 3	Letters e u g right shift key r h . left shift key
Jan 28	4, 7	Letters i o t c m , :
Jan 31	8, 9	Letters w y v n x p b /
Feb 2	10, 11	Letters ? z q - Review and indenting paragraphs
Feb 4	13, 14	Speed/Accuracy 1-minute timing on letters (Measure 1) Skill drills; horizontal centering; typing all capital letters
Feb 7	15, 16	Skill drills; vertical centering; paragraph centering
Feb 9	17, 18	Skill drills; block centering; spread centering.
Feb 11	19, 20	Speed/Accuracy 1-minute timing on letters (Measure 2) Numbers 1 2 3 4 and skill drills
Feb 14	21, 22	Numbers 7 8 9 0; review centering; skill drills
Feb 16	23, 24	Numbers ½ ¼ 5 6; centering review; skill drills
Feb 18	25	Number review; Speed/Accuracy 1-minute timing on numbers (Measure 3)
Feb 21	32, 33	Keys & ( ) blocked business letters
Feb 23	34, 35	Keys " ' and blocked personal letters
Feb 25	36, 37	Review and formal blocked letters
Feb 28	38, 39	Keys # % and open-style tables
Mar 1	40, 41	Keys $ ¢ @ and column-headed tables
Mar 3	42, 43	Review: letters and tables
Mar 6	44, 45	Keys ≠ ! = + * constructed symbols
Mar 8	46	Review Speed/Accuracy 1-minute timing on symbols (Measure 4) Speed/Accuracy 1-minute timing on letters (Measure 5)
May 8		Speed/Accuracy 1-minute timing on letters (Measure 6)

Figure 2.--Course outline.

Timed Writings

Measure 1: 10-H. Measure your Progress.	Words
Dear Jacqueline: Do you know the equa-	8
tion Mr. Zelt quoted? Is it a new one?	16
Dear Zoe: My family is planning for an	24
eight-day trip to Zion Park next month.	32

Measure 2: 18-B. Measure and improve your keyboard control.	Words
Dear Miss Queen:	3
	4
It was kind of you to correct the index	13
to our club handbook for us. The job needed	22
to be done. All the men realize what a fine	31
task you did and are very grateful.	38
	39
Paul J. West	44

Measure 3: 24-C. Build accuracy on the number keys.	Words
The total of 10, 28, 39, 47, and 56 is about 180.	49
Now, please total 10 and 28 and 39 and 47 and 56.	49
The sum of 10, 28, 39, 47, and 56 is exactly 180.	49

Measure 4*: Symbol and Character Timing	Words
"Write 15% to Dodd & Co. on #10 @ 866 and $1."	65
Don't vote for Jones! a + b = 25. Use an asterisk (*).	65

Measure 5: 44-C. Regain fluency on easy paragraph material. Words

All through the lunch hour, we sat there and played an old quiz game that Mike had found in a box of junk that his dad had thrown out. The game was a lot of fun, too; but we got tired of that, of course. The rain kept on. Dave came up with a game he had found in some old book; we tried this one for a while, too. We were glad to see the sun at last. 12 24 36 48 60 72

Once in a blue moon, it is good to get up at the crack of dawn and watch the world wake up. You see the sun break through the shades and mist of night and gleam on the drops of dew that weigh down the leaves and the grass; and as you look, the leaves lift up and the grass turns straight while the dew fades and dries in the first soft breath of breeze. 12 24 36 48 60 72

Measure 6:** 74-B. Growth index, all letters are used. Words

You have learned a great deal about typing in only a few months. You may not be striking all keys as rapidly or as precisely yet as you want to, but you have begun a sturdy foundation upon which you can build even more skill. Like any other skill, typing demands continued effort to be maintained or improved; so set aside daily practice time. 13 27 41 55 69

If you proceed with the typing sequence in college, your practice time will be scheduled for you. Even so, you will find that a bit of extra practice each day may be just enough to push your new skill into a prize grade category. Even if you do not continue with formal typing instruction, you can add greatly to your skill all by yourself. 13 27 41 56 68

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*Devised by investigator using sentences from text.

**D. D. Lessenberry, S. J. Wanous, and C. H. Duncan, College Typewriting (8th ed.; Cincinnati: South-Western Publishing Company, 1969), p. 129.

Figure 3.--Timed writings.

STUDENT INFORMATION SHEET

Name_____Social Security #_____
Last First Middle Initial

Local Address_____Local Phone Number_____

Home Address_____Home Phone Number_____

Date of Birth_____Age_____ Male or Female (Circle one)

Year at the University: Freshman Sophomore Junior Senior Graduate
(Circle one)

Previous typing instruction:

___Weeks self taught

___Weeks taught in Elementary School

___Weeks taught in Junior High School

___Weeks taught in Senior High School

___Semesters taught in College

___None

This typewriting class meets at: 8:00 a.m. 2:10 p.m. (Circle one)

Major_____Minor_____

Certification sought_____

Name_____ Social Security #_____
Last First Middle Initial

APPENDIX C

TABLE 17.--Treatment x Instructor. Cell Means, All Measures.

Treatment	Instructor	Measurement	Gross Words per Minute	Errors per Minute
Exper.	1	1	10.42857	1.85714
Exper.	2	1	18.50000	6.00000
Control	1	1	20.80000	2.60000
Control	2	1	22.80000	2.60000
Exper.	1	2	15.14286	1.71429
Exper.	2	2	19.00000	0.50000
Control	1	2	22.60000	3.60000
Control	2	2	29.40000	2.80000
Exper.	1	3	16.85714	0.42857
Exper.	2	3	18.50000	2.50000
Control	1	3	24.20000	3.20000
Control	2	3	24.60000	1.80000
Exper.	1	4	15.71429	1.42857
Exper.	2	4	17.00000	3.00000
Control	1	4	19.00000	1.20000
Control	2	4	25.60000	3.40000
Exper.	1	5	23.71429	1.42857
Exper.	2	5	38.00000	2.50000
Control	1	5	25.20000	2.60000
Control	2	5	42.80000	2.60000
Exper.	1	6	31.28571	1.57143
Exper.	2	6	39.00000	0.00000
Control	1	6	40.80000	0.80000
Control	2	6	.00000	1.40000

TABLE 18.--Treatment x Instructor x Machine. Cell Means, Measure 2.

Treatment	Instructor	Gross Words per Minute	Errors per Minute
Experimental	1	14.25000	1.00000
Experimental	2	22.33333	2.66667
Experimental	1	23.00000	1.33333
Experimental	2	14.00000	1.00000
Experimental	1	24.00000	0.00000
Experimental	2	28.00000	2.00000
Control	1	21.00000	4.66667
Control	2	21.33333	2.66667
Control	1	19.66667	4.33333
Control	2	24.00000	4.25000
Control	1	30.50000	2.50000
Control	2	29.33333	5.66667

TABLE 19.--Achievement Scores of Students.

No	T	I	H	M	Measurements											
					1 WPM	1 EPM	2 WPM	2 EPM	3 WPM	3 EPM	4 WPM	4 EPM	5 WPM	5 EPM	6 WPM	6 EPM
01	E	W	2	S	13	03	14	01	16	00	22	01	27	01	28	00
02	E	W	2	S	08	01	15	05	18	00	16	02	24	02	29	01
03	E	W	2	S	28	05	38	02	ab	ab	22	01	48	00	45	01
04	E	W	2	R	07	02	05	02	11	01	07	01	18	02	33	07
05	E	W	2	R	11	00	16	01	20	00	17	01	23	00	31	01
06	E	W	2	R	10	02	17	01	15	01	13	03	19	01	25	00
07	E	W	2	R	11	02	19	00	19	01	18	01	24	02	36	01
08	E	W	2	D	ab	ab	ab	ab	ab	ab	24	01	50	00	ab	ab
09	E	W	2	D	18	04	21	02	17	02	ab	ab	24	05	ab	ab
10	E	W	2	D	13	03	20	02	19	00	17	01	31	02	37	01
11	E	W	2	D	17	04	28	00	22	01	ab	ab	30	02	ab	ab
12	E	L	8	S	25	02	24	00	22	01	21	04	52	01	50	00
13	E	L	8	S	ab	ab	38	02	35	00	26	01	51	02	50	01
14	E	L	8	R	ab	ab	22	04	25	04	25	06	34	01	39	00
15	E	L	8	R	ab	ab	37	08	20	01	ab	ab	ab	ab	38	00
16	E	L	8	R	12	10	14	01	15	04	13	02	24	04	28	00
17	E	L	8	D	30	06	28	02	ab	ab	ab	ab	ab	ab	49	02
20	C	W	8	S	12	04	19	02	25	04	22	02	34	02	ab	ab
21	C	W	8	S	24	03	28	03	31	02	31	01	38	01	43	00
22	C	W	8	S	16	03	17	03	20	03	18	02	25	01	ab	ab
23	C	W	8	R	14	02	15	09	22	02	ab	ab	ab	ab	24	00
24	C	W	8	R	29	03	35	02	30	03	31	01	40	04	59	00
25	C	W	8	R	12	00	13	03	15	04	15	02	24	05	27	02
26	C	W	8	D	16	03	22	03	26	12	25	07	41	08	43	00
27	C	W	8	D	31	04	20	02	30	02	ab	ab	ab	ab	40	01
28	C	W	8	D	08	03	17	08	15	05	18	02	24	03	35	01
29	C	L	2	S	18	00	28	01	24	01	20	03	46	01	40	02
30	C	L	2	S	23	02	33	04	24	04	35	02	47	02	52	02
31	C	L	2	R	12	02	18	07	20	00	20	04	28	04	36	01
32	C	L	2	R	24	02	24	04	25	02	23	05	47	01	ab	ab
33	C	L	2	R	25	04	31	04	ab	ab	24	02	36	01	46	01
34	C		2	R	20	05	23	02	29	01	25	05	39	05	44	01
35	C	L	2	D	41	04	45	00	26	03	28	03	54	01	53	01
36	C	L	2	D	22	06	25	15	ab	ab	21	03	37	01	39	00
37	C	L	2	D	15	05	18	02	19	01	ab	ab	ab	ab	ab	ab

No = Student number
T = Treatment
I = Instructor
H = Class meeting time
M = Typewriter
WPM = Gross Words Per Minute
EPM = Errors Per Minute
E = Experimental Group

C = Control Group
W = Instructor 1
L = Instructor 2
2 = 2:10 p.m.
8 - 8:00 a.m.
S = Selectric IBM
R = Royal manual
D = Model D IBM

TABLE 20.--Summary of Students' Opinions.

Typewriting Questionnaire Name_____

This scale has been prepared so that you can indicate how you feel about this typewriting class. PLEASE RESPOND TO EVERY ITEM. In each case, draw a circle around the letter which represents your own reaction as follows:

SA if you strongly agree with the statement
A if you agree but not strongly so
N if you are neutral or undecided
D if you disagree but not strongly so
SD if you strongly disagree with the statement

Remember, the only correct answer is the one which actually represents how you feel about this class.

Statement	SA	A	N	D	SD
1. The methods used in teaching this typewriting class can be described as satisfying.	5	7	2	0	1
2. My attitude toward this typewriting class has become less favorable than it was.	0	7	0	4	3
3. More contact between teacher and students would improve this typewriting class.	4	4	4	3	0
4. I find that the method used in this typewriting class is satisfying to me.	6	6	2	2	0
5. Unimportant topics have taken too much of my time in this typewriting class.	1	1	4	7	2
6. I cannot see that this teaching method has any advantage over any other methods.	0	1	7	4	3
7. This typewriting class exceeds every expectation I had for it.	1	3	6	4	1
8. The method of teaching this typewriting class is not equally good for all students.	1	5	4	4	0
9. I have only neutral feelings about the subject matter in this typewriting class.	0	4	2	7	1
10. The presentation of this typewriting class is paced too fast.	2	4	2	5	1
11. I am glad that this method of teaching was used for this typewriting class.	3	5	6	1	0
12. This has been a disappointing typewriting class.	0	2	4	7	1
13. I find myself enthusiastic when I study typewriting.	2	3	5	2	1
14. I am forced by the method used in this typewriting class to spend too much time on material I already know.	0	1	1	9	3

TABLE 20.--Continued.

Statement	SA	A	N	D	SD
15. I feel that all typewriting classes should be taught by the method used in this class.	2	5	8	0	0
16. This typewriting class lacks student participation.	1	2	6	4	2
17. The method used to teach this typewriting class holds students back too much.	1	0	3	10	1
18. My high retention of the material in this typewriting class is due to the method used to present it.	1	2	9	3	0
19. The amount I have learned in this typewriting class exceeds my expectation.	2	5	6	5	0
20. I want to do more on my own in this typewriting class, but I can't because of the teaching method.	0	1	2	9	1
21. I am enthusiastic about the way this typewriting class is taught.	2	2	8	1	1
22. The method of instruction used in this typewriting class has many shortcomings.	0	0	11	3	0
23. I would describe this typewriting class as well organized.	5	10	0	0	0
24. Not all my hopes about this typewriting class have been fulfilled.	2	6	4	3	0
25. I have not had a chance to look back over the material when I wanted to in this typewriting class.	1	4	9	1	1
26. The content of this typewriting class is interesting.	1	6	5	2	0
27. I enjoyed being in this typewriting class.	5	4	3	2	0
28. I thought the instructor was a good teacher.	4	7	2	0	0
29. Of all hours possible, I thought this hour was the best one possible for taking typewriting.	4	2	2	4	3
30. I liked the typewriter I used.	2	6	5	1	1
31. About how much time per week did you spend on typewriting outside of class each week?	3.133 hours weekly				
32. Did you generally eat breakfast before coming to class?	3 yes; 3 no				
33. Did you generally eat lunch before coming to class?	7 yes; 1 no				

TABLE 20.--Continued.

Statement	SA	A	N	D	SD
34. Generally where were you and what were you doing before coming to the typewriting class? At home, driving to school and having coffee, sleeping, having breakfast, it was too early to have a typing class, doing drills, relaxing in my room, in a lecture class taking notes, sleeping in my room, in another class, playing around.					
35. Generally how would you describe your mood toward coming to class? Discontented, good--enjoyed the class (five students wrote this comment), didn't mind coming, tired, aggressive, undecided, enjoyed coming (six students wrote this comment), came--but had to, good--looked forward to it, I wish I could type faster, it was just another class.					

Electronic Keychart Teaching Aid with Tape Reader