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A STUDY TO DETERMINE THE EFFECTIVENESS OF THE USE OF THE SKILL-BUILDER CONTROL-LED READER AS AN INSTRUCTIONAL DEVICE IN DEVELOPING SPEED AND ACCURACY IN BEGINNING TYPEWRITING AT THE SECONDARY LEVEL.

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Education, theory and practice

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TYPOGRAPHY AT THE
SECONDARY LEVEL

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State
University

By

Randall Miller Kline, B. A., B. S. in Educ., M. A.

The Ohio State University
1961

Approved by

[Signature]
Adviser
Department of Education
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CHAPTER I

INTRODUCTION

The SKILL-BUILDER Controlled Reader, the experimental tool with which this study was concerned, is a 35mm film-strip projector with a speed control ranging from two to eighteen lines per minute, or twelve to one hundred eight typing words per minute. The instrument projects materials in either a left-to-right motion or with an open slot which presents an entire line of copy at one time.

With this instrument, material can be presented at a pre-set speed which encourages faster response or complete control as desired.

The SKILL-BUILDER Controlled Reader is a development of the Controlled Reader which in turn is a development of the tachistoscope. Both the tachistoscope and the Controlled Reader were developed initially for the teaching and improvement of reading, but they have also been effective in training for fast and accurate observation of planes and ships, in enriching vocabulary, in art education, and in teaching spelling and mathematics.

The Controlled Reader presents reading material in a continuous, smooth, left-to-right motion with only a portion of each line exposed at one time. The student is encouraged
to keep moving with the copy without stopping too long on any one word and without regressing to previous material. Due to the heightened attention and concentration fostered by the Controlled Reader, students develop the ability to read more rapidly, perceive the reading material in an orderly manner, think faster, comprehend better, and organize thought more easily.

The general, non-technical difference between the tachistoscope and the Controlled Reader is that the tachistoscope presents material for a measured length of exposure at the rate of one line per exposure and the time lapse between exposures is not automatically controlled, while the Controlled Reader automatically presents material at a predetermined continuous pace which is measured in lines a minute. Projection may be set in a left-to-right motion which covers and uncovers the print as it moves across each line.

While both the tachistoscope and the Controlled Reader, as previously stated, were developed initially for teaching reading, the SKILL-BUILDER Controlled Reader, a slow speed reader, was developed for the presentation of materials which require students to follow the reading activity with a "response." For example, while a student's reading speed may be three hundred words a minute, his typing speed may be but thirty words a minute. As this instrument may be set at speeds ranging from twelve to one
hundred eight words a minute with an increase of six words a minute with each turn of the speed control dial, the teacher can pace the material according to the level of the group or of the individual.

**Implications for the teaching of typewriting**

Conclusions have been drawn from experimental studies in typewriting that the tachistoscope promotes faster and more accurate typing (see Chapter IV). It also seems to foster concomitant learnings such as the improvement in the recognition of names and numbers, and reading skills in general. From trial uses, but not controlled experimental studies, similar results appear to be achieved with the **SKILL-BUILDER** Controlled Reader.

The similarity between the tachistoscope and the **SKILL-BUILDER** Controlled Reader, the findings from experimental studies in typewriting with the tachistoscope, and empirical data presented by users of the **SKILL-BUILDER** Controlled Reader in the classroom indicated that this instrument might be a valuable instructional aid in the teaching of typewriting. The evidence seemed to justify further investigation and experimentation.

**Statement of the problem**

The problem of this study was to determine the effectiveness of the use of the **SKILL-BUILDER** Controlled Reader
as an instructional device in developing speed and accuracy in beginning typewriting at the secondary level.

Questions which the study sought to answer

This study was directed to answering two basic questions:

1. Can the SKILL-BUILDER Controlled Reader be used effectively in conjunction with regular textbook materials and teacher instruction to develop and sustain basic skills after they have been taught by the teacher?

2. What effect does the SKILL-BUILDER Controlled Reader have on typewriting speed and accuracy?

In addition to these two basic questions, data were also sought in the study which would give answers to the following three questions:

1. Is there any evidence that the SKILL-BUILDER Controlled Reader is a more appropriate aid to any particular ability group?

2. Can the typewriting teacher successfully teach typewriting with the SKILL-BUILDER Controlled Reader without lengthy, special training?

3. Can the SKILL-BUILDER Controlled Reader be used as part of the regular typewriting equipment without interfering with the regular teaching procedures?

Ultimate objectives

The ultimate objectives of the study were twofold:

1. Can greater accuracy and speed be attained by use of this instrument?

2. Can the total time devoted to typewriting be appreciably shortened by its use?
Need for the research

Research is always needed for continuing progress in any field, but the need for research in business education at the present time is especially important.

The announcement of the successful launching of Sputnik by Russia gave impetus to a powerful thrust for the teaching of science, mathematics, and languages. With additional instruction demanded in these fields, business education finds itself with fewer units allotted in high school in which to train business students. Yet despite the reduced number of courses in business education offered by high schools, the need for well-trained business people continues to increase.

This curtailment of allotted time for the business-education subjects means that these subjects must be taught more efficiently, more effectively, and in a shorter period of time. Therefore, everything that is not necessary for initial job skill must be eliminated, and the methodology for what is to be taught must be streamlined so that it will be learned more effectively. Although one solution to the current dilemma should be a renewed attention to matters of curricula with serious thought given to a balanced program in the schools, an obvious solution does lie in improvement of teaching methods, not only in the direction of improvement of these skills, but also in saving time needed to acquire them.
Improvement in instruction in typewriting would affect the instructional programs of a large number of students. Typewriting is being taught to over three million students today in approximately twenty-three thousand schools of various types. It is estimated by typewriter manufacturers that, on the average, seven hundred thousand typewriters are used for four periods a day in these schools.

Thus, if through research it can be shown that by the use of certain instructional procedures and techniques greater accuracy and speed could be attained within the time usually allotted to the teaching of typewriting; or that the results ordinarily achieved within a given time could be reached within a shorter period of time, the research could affect a large school population.

Overview of the study

The study was limited to an experimental group and to a control group and was conducted during the school year 1960-61. The experimental group consisted of thirty-five students selected from two classes taught by the same teacher. The control group consisted of an equal number of students chosen from eleven classes in five different schools taught by six different teachers.

These experimental and control students were paired on the basis of five factors: age, sex, class rank, average of their last two years' English grades, and intelligence quotients.
The setting for the study was the Springfield City (Ohio) and the Clark County (Ohio) high schools where there were adequate facilities for conducting the experiment. The teachers were chosen for their teaching ability, their sympathy toward experimentation, and their willingness to undertake this particular experiment.

The materials used in conjunction with the SKILL-BUILDER Controlled Reader were furnished by the Educational Developmental Laboratories,\(^1\) the company that developed the SKILL-BUILDER Controlled Reader. The content of this material is described in Chapter V.

The study was started when both the experimental and the control classes had completed twenty regular class periods in typewriting. At this time the SKILL-BUILDER Controlled Reader was introduced in the experimental classes, and from that time on the experimental classes worked with this instrument approximately ten minutes during each class period; otherwise, the classes proceeded as usual.

Throughout the experiment, the control classes were taught as the individual teacher desired.

All instruction was given and all testing was done by the regular classroom teachers. The students in both the experimental and the control groups were tested at the end

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\(^{1}\)Educational Developmental Laboratories, 75 Prospect Street, Huntington, New York.
of each ten days of regular class instruction, at the end of the first semester, and three weeks before the end of the second semester. The testing materials were selected from the students' textbook, the seventh edition of *20th Century Typewriting.* This material is given in Chapter V.

The typewriting achievement was measured in terms of gross words per minute and errors, based on straight-copy tests of three-minutes duration except the follow-up test (given three weeks before the end of the second semester) which was measured on straight-copy tests of five-minutes duration. These tests were scored according to "Extracts from International Typewriting Contest Rules." These rules are given in the Appendix. From the results of these tests, conclusions were drawn for this study.

A detailed description of the procedures followed in this study is presented in Chapter VII.

The other phases of the study are given in the following chapters:

Chapter II—A history of the development of the tachistoscope and the SKILL-BUILDER Controlled Reader and a review of related research in typewriting.

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Chapter III—A review of past and present trends in the methods of skill development in typewriting and the literature pertaining to the major philosophies of the teaching of typewriting.

Chapter IV—A review of studies pertaining to prognosis of success in typewriting and their implications for the choice of equating factors in this study.

Chapter V—A description of the SKILL-BUILDER Controlled Reader, films used with the instrument, instructional and testing materials.

Chapter VI—The setting for the study, characteristics of students participating in the study, characteristics of the teachers chosen for the experiment, physical characteristics of the classrooms, and types of equipment.

Chapter VII—Procedures for conducting the study.

Chapter VIII—The results and interpretation of the data obtained from the study in the form of summary of findings, conclusions, observations, and recommendations.
CHAPTER II

THE DEVELOPMENT OF THE TACHISTOSCOPE AND THE SKILL-BUILDER
CONTROLLED READER AND RELATED RESEARCH IN TYPEWRITING

Since the development and the uses, as well as the
construction, of the tachistoscope are similar to those of
and proceeded the SKILL-BUILDER Controlled Reader, a discuss­
ion of the tachistoscope is pertinent. In many areas,
including typewriting instruction, successful and extensive
use has been made of the tachistoscope.

Good gives the following definition of the tachis­
toscope:

An attachment for, or variation of, the slide
projector, consisting of a diaphragm type shutter
for controlling illumination and duration of pro­
jected images of pictures, words, silhouettes, etc.
used in the investigation and improvement of read­
ing, spelling, and visual perception in general.1

History and Development of the Tachistoscope

The tachistoscope was originally developed as a
device for the accurate measurement of the span of appre­
hension.

Sir William Hamilton is credited with the first
experimental work done in this field. In 1859, he attempted
to ascertain the number of objects that could be perceived

1Carter V. Good, editor, Dictionary of Education
at one glance. Up to that time, this problem had been one of conjecture. Hamilton upset the existing theory of a fixed span by showing that there were variations that depended on individual differences.\(^2\)

The first step toward experimental control was taken by Jevons in 1871. This experiment consisted of throwing a number of beans into a small box. As soon as the beans came to rest, the subject was to estimate their number. Jevon’s results showed a steadily declining curve in apprehension span as the number of objects was increased.\(^3\)

In 1895, a tachistoscopic apparatus was adapted by Cattell to use in span and reading experiments. It was Cattell who laid the groundwork for experimentation and training in the field of reading. Dodge, Kutzner, Fernberger, Glanville, and Dallenbach all contributed experimentation in this reading field.\(^4\)

**Development of tachistoscopic training in reading and in other fields**

The first reported experiment on the use of the tachistoscope in teaching reading was done in the Harding School of Erie, Pennsylvania, in 1938-39, by Dr. Robert P. Carroll who was acting as adviser to the Keystone View Company in the


\(^3\)Ibid.  \(^4\)Ibid.
development of an instrument for practical tachistoscopic use in schools.\textsuperscript{5} It remained, however, for Dr. Samuel Renshaw, of the Ohio State University to bring attention to the great potentiality of this instrument. In 1942, he initiated a tachistoscopic training program in recognition of planes and ships in the Army and the Navy. Doctor Renshaw's program greatly stimulated interest in tachistoscopic training, especially in the field of reading.\textsuperscript{6}

This instrument has also been used in other fields: to enrich vocabulary,\textsuperscript{7} to teach spelling,\textsuperscript{8} to teach mathematics;\textsuperscript{9} in art education,\textsuperscript{10} in orthoptics,\textsuperscript{11} in physical education for rapid recognition of football formations\textsuperscript{12} and in other subject areas.

\textsuperscript{5}Ibid. \textsuperscript{6}Ibid., p. 2.


\textsuperscript{12}C. F. Damron, "Two and Three Dimensional Slide Images Used with Tachistoscope Training Technique in Instructing High-School Football Players in Defenses," \textit{Research Quarterly}, Vol. XXVI (March, 1955), pp. 36-42.
Such extensive and successful uses of the tachistoscope would seem to indicate its value as an instructional instrument.

**Summary of values of tachistoscopic training**

Winger summarized the values of tachistoscopic training based on the findings of Renshaw, Sherman, and others.

1. It develops unitary seeing through practice in perceiving an object as a whole without reference to its parts.
2. It develops increased power of peripheral interpretation and results in an increased visual span or increased span of recognition.
3. It develops particular skill in the formal process which will provide an improvement in functions of different content.
4. It develops the ability of the trained perceive to see more accurately in shorter exposures than in longer ones.
5. It develops increased speed of reading and increased comprehension.
6. It develops increased form fields, both vertical and horizontal.
7. It develops one's visual acuity to such an extent that myopia will be reduced as far-point training progresses.
8. It develops the ability to reduce the prevalence of letter reversal habits in reading and reproducing what is read.
9. It develops increased ability to concentrate through the necessity to look actively in order to see what us exposed.
10. It develops increased interest on the part of the observer in whatever task is at hand and allows for personal expression of certain talents.
11. It develops increased grouping skill and promotes greater coherence and unity in the visual perception of forms.
12. It develops the ability to convert visual reactions into kinesthetic reactions.
13. It develops relaxed motor response through elimination of the unnecessary attention to techniques.
14. It develops a better organized and more flexible type of thinking.

Tachistoscopic Studies in Typewriting Instruction

Winger, 1949

In 1949-50 Winger\(^{14}\) used the tachistoscope in a study in typewriting instruction. The tachistoscope used in his study was a Keystone Overhead Projector with a Keystone Flashmeter or timing device permitting timed exposures from one second to \(1/100\) of a second. The slides used for the study were prepared by the experimenter.

Background of the study.—In two experiments, conducted in successive terms, Winger used two experimental and two control groups each composed of twenty college students in beginning typewriting. The groups were equated as nearly as possible on the basis of I. Q. (American Council of Education Psychological Test), reading ability (Nelson Denny Reading Test), manual dexterity (Purdue Pegboard); and in the second experiment another factor, speed of stroking, was added. This speed of stroking was determined by having the students type a line of common two- and three-syllable words for a period of two minutes.


\(^{14}\)Ibid.
Measurement.—The results of the experiments were measured by straight-copy timings of three- and five-minutes duration, timings on number combinations, and timings on isolated words.

Results.—Both experiments showed that higher stroking rates were attained by the groups receiving tachistoscopic training, yet fewer errors were made on every measurement. The experimental classes combined (forty students) scored an average of 4.77 gross words per minute more than the control classes combined. When a penalty of one word per error was evoked, this superiority increased to 5.14 correct words per minute. When this penalty was increased to ten words for each error, this superiority increased to 7.35 net words per minute. At the same time, the experimental classes combined made 1.36 fewer errors per five-minute timings on the average than did the two control classes combined.

Conclusions.—Winger is of the opinion that tachistoscopic training is especially valuable to the students at the bottom of the scale. He states:

Of particular interest, is the fact that the method seems to help the students at the bottom of the scale in spite of the fact that they may not reach a stage of development which might be classified as one in which there is definite automatization of serial-letter groups or patterns. The fact that the slowest student in the experimental group was always faster than the slowest student in the control group indicates that the training leads to a quickened response even though it might be on a letter-by-letter basis.15

15Ibid., p. 135
Recommendations.—One of the suggestions made by Winger was that a study similar to his be made in the secondary schools. He felt that if this technique proved successful it would mean a new classroom procedure that would reach a much larger number of students than would be reached in college typewriting classes.

Palmer, 1955

Palmer conducted a study similar to Winger's during the school year of 1952-53, in a secondary school. The tachistoscope used was similar to that used by Winger, and the slides were those prepared by him. There were fifty of these slides consisting of numbers, words, phrases, and sentences.

Background of the study.—The study was conducted with 124 beginning typewriting students in a high school in Klamouth Falls, Oregon. The school was a four-year high school with an enrollment of approximately 1,300 students. There were sixty-three students in the control group and sixty-one in the experimental group. No attempt was made to equate the two groups as the experimenter concluded that research had not shown enough valid criteria for matching groups. However, Part I of the Iowa Silent Reading Test Form A and the Minnesota Clerical Test were administered to the groups before tachistoscopic training was started.

The tachistoscopic training was started about a month after the typewriting classes had begun. The keyboard had been presented. The flash work was usually planned for the last ten minutes of the class period. This experiment extended through the first semester and into the first six weeks of the second semester.

**Measurement.**—Achievement was measured on 15 five-minute straight-copy writings, 2 five-minute writings on number combinations, and five business letters timed for five minutes each.

Approximately two months after the tachistoscopic training was concluded, follow-up timings were given to determine whether the experimental group had maintained, gained, or lost any superiority in speed and accuracy.

**Results.**—This follow-up showed the superiority of the averages of the experimental group over the averages of the control group to be 8.5 gross words per minute, 9.3 correct words per minute, 14.6 net words per minute, and 3.1 fewer errors. Thus the group receiving tachistoscopic training not only maintained a superiority from the previous timing, but after tachistoscopic training had ceased made slight gains, while the control classes lost on each of the measurements.

Averages on follow-up letter timings also showed that the experimental group was superior to the control group on all measurements. The stroking rate and accuracy superiority
of the experimental group over the control group was evident in increases of 4.3 gross words per minute, 4.9 correct words per minute, 10.7 net words per minute, and 3.3 fewer errors.

**Conclusions.**—Palmer concluded, therefore, that tachistoscopic training develops more rapid and accurate stroking on straight-copy writing throughout all stages of the experiment. He also concluded that when this speed and accuracy are combined into production type activities such as letters, the superiority is still apparent. The results of the follow-up tests on straight-copy and letters indicated that the gains were of a permanent nature.

This study showed, too, that tachistoscopic training has merit in improving skills necessary in the recognition of numbers and names, as shown by the follow-up test on the Minnesota Clerical Test. Reading skills were also improved, as indicated by the follow-up test on both the rate and comprehension sections of the Iowa Silent Reading Test.

**Nixon. 1957-58**

In 1957, Nixon\(^1\) used the tachistoscope ten minutes a day on an average of four days a week, starting in the latter part of the first semester. The purpose of this practice was to increase reading speed and comprehension and thus presumably to increase typewriting speed. No definite conclusions

were evident from this study, although a tendency toward increased speed was noted in about 40 per cent of the class.

**Suggestions.**—Although Nixon presented no definite conclusions from his study, he made the following suggestions: Begin work earlier in the year; complete fifty slides; have one control group and three experimental groups which should be equated; keep more accurate and detailed records of the results of each class; and administer the Iowa Silent Reading Test before and after the experiment.

In 1958, Nixon continued to use the tachistoscope. It was used for ten minutes of each class period in two typewriting classes.

**Results.**—The results of this experiment showed that 58.82 per cent of the control group passed the thirty-word official timing as compared with the experimental group of 75.75 per cent; 2.94 per cent of the control group passed the forty-word official timing, compared to 18.18 per cent of the experimental group. In addition, 3 per cent of the experimental group passed the fifty-word official timing.

**Conclusions.**—The general conclusions drawn were that tachistoscopic training promotes concentration, makes for faster and more accurate typing, and tends to make for relatively greater progress with the slow student than with the good student.

There have been no other reported studies of the use of the tachistoscope in typewriting instruction.
The SKILL-BUILDER Controlled Reader
and Related Research

A brief description of the SKILL-BUILDER Controlled Reader was given in Chapter I, and this instrument will be treated more extensively in Chapter V. Similarities and differences, however, between the tachistoscope and the SKILL-BUILDER Controlled Reader will be reviewed here. These similarities and differences are summarized by Ruegg:

The tachistoscope is an instrument which presents material for a measured length of exposure. Projection is made with an open frame at the rate of one line per exposure. The time lapse between exposures is not automatically controlled.

The purpose of the tachistoscope is to increase visual aggressiveness and attention on the part of the student as he attempts to grasp greater amounts of material in a shorter period of time and retain more accurately what has been seen. The tachistoscope is used to improve the seeing process. Its use in reading training and in clerical applications is most valuable.

The SKILL-BUILDER Controlled Reader is an instrument which automatically presents material at a predetermined, continuous, rhythmic pace which is measured in lines a minute. Projection may be set in a left-to-right moving slot motion which covers and uncovers print as it moves across each line. Left-to-right movement develops the directional attack of the respondent while substantially reducing regressions. Projection may also be set in an open slot motion which exposes an entire line of print at one time. With either motion setting, new lines of material move into view at a continuous, pre-set pace.

Both the tachistoscope and the SKILL-BUILDER Controlled Reader require the student to participate actively by responding to the projected material. The tachistoscope develops accurate seeing responses through a series of short exposures while the
SKILL-BUILDER Controlled Reader develops the ability to respond rapidly, accurately, and regularly through presentation of material at a variety of continuous speeds.\textsuperscript{18}

There have been no experimental studies reported in which the SKILL-BUILDER Controlled Reader was used as the experimental factor. There have been, however, reported cases where the SKILL-BUILDER Controlled Reader has been used in typewriting instruction.

Initial use

The first use of the SKILL-BUILDER Controlled Reader as an instrument in typewriting instruction took place at the Walt Whitman High School, Huntington Station, New York, in the fall of 1958. Filmstrip material was prepared by the Educational Developmental Laboratories to correlate with the current typewriting text being used in that school.

This seems to have been a pilot study to serve as a guide for later studies. The investigators appeared to think that the most important fact to emerge from this use of the machine was the need to take care of the individual differences of the students, as student differences were highly magnified during the instrument-training sessions.\textsuperscript{19}

\textsuperscript{18} Robert J. Ruegg, "Skill Development through Reading Instruments," EDL Reprint 10 (undated), p. 2.

Fedorczyk, 1960

Background of the study.--During the summer of 1960, Fedorczyk20 used the SKILL-BUILDER Controlled Reader at the Edwin O. Smith School of the University of Connecticut. The main purposes of the use of the machine were to determine the effect on skill development when the typewriter keyboard was presented in small segments, with high speed and accuracy demanded on the part of the learner before an additional segment of the keyboard was introduced; to determine the effect of the instrument training in helping students reach their goals in a shorter period of time; and to determine the effect of instrument training in helping the teacher observe and analyze student progress, problems, and reactions.

The group of thirty-two students comprising the class was heterogeneous—the age range was from thirteen to fifty-five years; the educational background was from the eighth grade through college. The class met daily from 8:00 a.m. until 10:00 a.m. from July 5 until August 12. The double-period class averaged fifty minutes per period. The thirty-two students were placed in four groups according to the results of teacher observation of student technique and the result of one-minute writings. The teacher taught additional

keys to the fast group and gave additional oral instruction on the previously learned keys to the other groups. All groups had daily practice with the SKILL-BUILDER Controlled Reader, which paced the work at speeds equal to and slightly above the level of the ability of the group.

**Measurement, results, and conclusions**

Fedorczyk gives the following statement concerning her use of the SKILL-BUILDER Controlled Reader:

The SKILL-BUILDER Controlled Reader was an aid to skill development in that its left-to-right projection of words forced correct eye movement. The initiation of grouping allowed the teacher to control the rates at which pupils typed and helped to develop speed through projection equal to and above their ability levels. At the end of six weeks of instruction, the pupils' speeds ranged from seventeen to sixty-three gross words a minute, and with three or less stroke errors on a one-minute timed writing. A stroke error differs from a word error in that in the former every typing mistake is considered an error; thus "hte" for "the" counts as two stroke errors.21

No use of a control group was made with these classes, hence no comparison was made with a group not participating in the instrument training.

**Indicated Assumptions for Typewriting Instruction**

From the empirical data that have been reported, favorable results have been obtained with the SKILL-BUILDER Controlled Reader in the classroom and in industry. These results might lead to the following assumptions relative to

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21Ibid., p. 33.
the use of the SKILL-BUILDER Controlled Reader in typewriting instruction:

1. That SKILL-BUILDER Controlled Reader training is conducive to rapid perception of words or word-recognition groups, and that the converting of these visual reactions into kinesthetic reactions will be conducive to the development of speed and accuracy.

2. That SKILL-BUILDER Controlled Reader training will facilitate relaxation by allowing the student less time to think of how the word is to be typed and will result in automatization.

3. That SKILL-BUILDER Controlled Reader training will increase the ability to concentrate, thus reducing errors due to carelessness.

4. That SKILL-BUILDER Controlled Reader training will lend itself to individual differences as the speed can be controlled.

5. That SKILL-BUILDER Controlled Reader training will be an effective speed-forcing device, as well as a control-building device, because of the variable speeds.

The validity of these assumptions remains to be proved. The study reported in this dissertation is the first in what is hoped will be a series of experimental studies designed to determine the value of the SKILL-BUILDER Controlled Reader as an instructional device in the typewriting classroom.
Chapter III will deal with past and present trends in the methods of skill development in typewriting and the literature pertaining to the major philosophies of the teaching of typewriting.
CHAPTER III

PAST AND PRESENT TRENDS IN METHODS OF SKILL DEVELOPMENT IN TYPEWRITING

Method is the translation of psychological principles and their concomitant laws of learning into the why and how of teaching. It is the procedure whereby the teacher and the learner meet on common ground; and, starting with the learner's interests, his problems, and his level of achievement, proceed to reach set goals in the most effective way and in the shortest time possible.

This chapter is concerned with that aspect of skill-building which is especially applicable to typewriting and with the methodology which develops techniques, speed, and accuracy.

Psychological Background of Methods of Skill Development in Typewriting

In order to understand the trends in methods of skill development in typewriting, a brief review of the principles underlying the learning process seems pertinent.

Learning defined

Definitions of learning frequently contain psychological and physiological concepts which are difficult for those other than psychologists to understand. A definition which
seems to be comprehensible is given by Gates:

Learning may be defined as the progressive change in behavior which is associated on the one hand with successive presentations of a situation, and on the other, with repeated efforts of the individual to react to it effectively. Learning may also be thought of as the acquisition of ways of satisfying motives or attaining goals. It often takes the form of problem solving. Learning occurs when old ways of acting are incapable of overcoming obstacles or meeting new conditions.¹

When learning takes place it involves change. This change may be categorized in many ways, but the following serves to point up the four major kinds of changes:

1. Learning as a change in cognitive structure (knowledge)
2. Learning as a change in motivation (learning to like or dislike)
3. Learning as a change in group belongingness or ideology (this is one important aspect of growing into a culture)
4. Learning in the meaning of voluntary control of the body musculature (this is one important aspect of acquiring skill...).

In order that this change may take place, however, certain conditions must prevail. Russon and Wanous summarize these conditions as principles that underlie the learning process.


Principles underlying the learning process

1. There must be a student who is ready to learn. Because all students are not similarly ready, the teacher must diversify and individualize his work to the point that every student can learn within a wide range of basic skills.

2. If a student is to learn, he must want to learn. Purpose, motivation, incentive, and mind-set are as important in learning as is the suitability of the material for the learner. The competent teacher must provide for these factors with the same care that he uses in selecting subject matter units. The critical test of teaching lies in stimulating interest in learning.

3. The task to be learned must be easy enough to accomplish, difficult enough to stimulate. In adjusting the difficulty level to the learning level of the class, the teacher must make adjustments for each individual as well as for the class as a whole.

4. The student learns through what he does, not through what he sees the teacher or others doing. In problem-solving, for example, the learner must learn to state the problem for himself, suggest ways of solving it, do his own testing and exploring, and finally decide whether or not he has found a satisfactory solution. Training in reasoning comes from finding solutions in problems and evaluating the steps by which decisions are reached. In demonstration teaching, the student must imitate the actions of the teacher. He must, himself, experience the feeling of correct reaches to keys, and through practice, learn to make desired finger movements.

5. The materials and resources for solving the problem must be available in the learner's environment.

6. The teacher must stand by as the student learns, ready to lend emotional as well as intellectual support if the going gets rough. A word of praise, a question about what the student is doing or learning, expressing confidence in the ability of the student—these are ways the teacher uses to lend emotional support.
7. Finally, the learner must reach a conclusion that is satisfying to him. The student must understand the meaning of what he has learned. He must gain this understanding over and beyond the particular thing he has done.  

How people learn best

Learning takes place by grasping relationships in a situation—it originates in a challenge, in the sensing of a problem whose solution is desired. Mursell states, "The more insight into the problem that can be evoked from the very start, the better the learning will go, and the faster the solution will arrive."

While learning is often considered to be an entirely mental process, actually learning is accompanied by, and influenced by physiological factors both within and outside the learner. Psychologists generally agree that the contrast between motor and intellectual learning is more apparent than real, thus the learning of typewriting is not just a matter of repetitive drill. As in other forms of learning, the student must develop understanding and concepts along with the development of skill.

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While learning takes place by grasping relationships in a situation, it is essentially the process of discovering a technique. In typewriting this is a matter of discovering the proper path to a key and, later, when the student is past the basic stage, the using of this basic skill in the solving of a problem.

It is generally agreed by psychologists that typewriting involves both the sensory-motor and the perceptual-motor skill. Typewriting is thus more than an automatic skill. Basic skill, however, is usually considered as a sensory-motor skill because the physical responses, especially in the initial learning, become more important. On the other hand, learning a skill is not to be looked upon as an entirely physical thing for when this new skill is put to use in solving typewriting problems, it is no longer strictly sensory-motor but must be coupled with understanding and problem solving and so becomes perceptual-motor as well.

From the viewpoint of the learner, skill learning is more complicated and difficult than the acquisition of knowledge and understanding. In skill learning, in addition to acquiring knowledge and understanding, there is also the necessity for devoting much time and effort to purposeful and controlled practice. Mursell quotes Gopalaswami as stating

"A motor skill is really intelligence expressing itself in physical action.\(^6\)

Learning in the sense of voluntary control of the body musculature is the one with which this study is particularly concerned, recognizing, nevertheless, that all the laws of learning contribute to the learning of typewriting. Douglas stresses this when he states that he believes there are two concepts that are very important to the skill teacher. One is that so-called "skill development" also has in it an important basis of mental learning, of knowledges and understandings, and so is influenced by all the factors and motivations that influence any other type of learning. The other important concept, he feels, is that the development of an expert skill carries the learner beyond this mental learning and into a status of automatization.\(^7\)

Fundamental principles of learning have been developed over the years and interpreted by educators as the principles applied to the various fields of learning. Douglas gives a condensation of these principles as they apply specifically to the learning of typewriting.

\(^6\)Mursell, \textit{op. cit.}, p. 244.

\(^7\)Douglas, \textit{op. cit.}, p. 72.
Psychological principles pertaining to the teaching of typewriting

1. All unnecessary stages that do not serve a useful purpose in the act as performed on the expert level should be entirely eliminated.

2. Possibilities for the development and exercise of all or as many as possible of the elements to be perfected in the entire learning process should be included in the set-up of the learning situation from the beginning.

3. Possibilities for each learner to progress at his own learning rate should be included in the learning situation at all times.

4. When practice is given on any phase of the learning process, the element being practiced should be presented in a natural rather than an artificial situation.

5. The teacher should regulate the intensity of the effort being made by the learner.

6. The learner should be working toward a goal that is reasonably easy of attainment.

7. As the learner approaches the goal toward which he has been striving, a new goal should be set up so that he still has an incentive to work carefully. This should, however, in no way detract from the satisfaction obtained from achieving the first goal.

8. The repetition necessary for the acquisition of skill should be discontinued as soon as it ceases to be effective.

9. Ample opportunity should be provided by the learning set-up for re-learning in a successive practice period what has been forgotten since the previous practice period.

10. Learners should not be required, or in fact allowed, to practice when they are disgusted with their practice.

11. The learning period should be broken up into short units, since shorter learning periods are more effective than longer ones.\(^8\)

These psychological principles as applied to skill building seem to fall into two categories—motivation and practice. It should again be pointed out, however, that it

\(^8\)Douglas, op. cit., pp. 122-125.
is difficult to separate these two components of skill-building as they are so closely interwoven.

**Skill-building—Motivation**

**Individual differences**

It is generally agreed that the speed of learning varies greatly among any group of students within a class, as well as between classes. Within a class there may well be as many individual learning situations as there are students. These individual responses of the students have been conditioned over the lifetime of the students. Due to home environment, associates, previous school situation, illnesses, and other factors, these responses are bound to be different.

Incorporated into a learning situation, this means that an approach that will achieve success with one student will not do so with another. Were it not for the various approaches that must be made to get results because of these individual differences one set of procedures would obtain results for all students. Since one set of procedures does not obtain desirable results, individual motivation plays a major role in the teaching of typewriting.

Ryans defines motivation as follows:

Motivation has to do with the why of behavior. It relates to the more remote causal factors.
Conditions within the organism which produce increased activity and which give direction to behavior are motivating conditions.\(^9\)

McConnel says, "Motivation is the direction and regulation of behavior toward a goal."\(^10\)

Psychologists and educators agree that learning is more rapid when motivation is intense and that constant motivation is important. The factors that contribute to the learning process in the form of motivational forces are many and varied. Johnson summarizes the numerous ways to motivate students in typewriting as: complimenting or praising work, keeping students moving from one thing to another rapidly, instilling confidence in the student, offering easy material for practice, teacher demonstration, creating a good classroom atmosphere, goal setting, and competition.\(^11\)

It is generally conceded that we learn well only that which we want to learn well. If one wants badly enough to learn something, he is very likely to do so; barring, of course,


mental or physical handicaps which definitely preclude his being able to learn. This desire to learn is a motivational force which must be present for efficient and effective learning.

Intrinsic and extrinsic motivation

Broadly speaking, all motivation may be classed either as intrinsic or extrinsic. Intrinsic motivation is made within the subject itself; extrinsic motivation is made by the offering of pins, certificates, and so on. While intrinsic motivation is to be preferred, extrinsic motivation is effective, not only with students but with adults as well. The evident pleasure and pride evinced by persons receiving awards of any kind is irrefutable witness to this fact.

Concerning these two types of motivation, Harms states:

The author [Harms] suggests that the teacher use any device that gets the best results, that makes the class interesting, and that does not take away from the job at hand. All other things being equal, if more and better learning results because of the device, then the device is legitimate.12

Praise and encouragement, goals and sub-goals, knowledge of results, and rivalry and competition are primary motivational factors.

Praise and encouragement

Both reward and punishment are potential means of motivating learning, but praise seems to be a more powerful incentive. While criticism is essential at times, human beings seem to respond better and to secure greater motivation from praise than from punishment. As most students have a great desire to be recognized, the sincere use of commenting upon improvement made is usually highly motivating. This type of motivation is especially effective when self-competition is encouraged and each student has an individual goal toward which he is working.

Goals and sub-goals

Goals are targets at which a student aims. When the goal has been reached, the target is extended. Students must be made aware of goals, and immediate or short-range goals are more effective than long-range ones. Goals should be possible of attainment in the not-too-distant future. The goal of two more words per minute is more of an incentive than dwelling on the fact that fifty-five words a minute is the goal for the year.

In order to reach the goal of fifty-five words at the end of the year, there should be many goals and sub-goals along the way. Students must be aware of the immediate goals, and positive rather than negative incentives should be used—joy of making the goal, rather than fear of not
making it. With goals set, the student knows at what target he is aiming.

**Knowledge of results**

The student has a right to know how he is progressing toward these goals. All teachers are familiar with the question, how am I doing? Douglas states that a student achieves more when he knows how he is doing, so keeping him well informed concerning the results of his efforts is an important psychological factor in motivation. Douglas also thinks that when a student knows he is progressing, learning becomes an individualized thing, and thus the student has the feeling that the learning being conducted is a very personal thing to him. This knowledge of how he is doing also materially retards the feeling of fatigue, even though the student is increasing his efforts to reach his goal. Knowing he has attained his goal, even though it is a sub-goal, he feels confident and satisfied and looks forward with anticipation to his next one. Thus through his knowledge of how he is progressing, he can enjoy again and again the many motivational advantages of nearing or achieving a new goal.13

Rivalry and competition

Rivalry and competition are powerful boosters to reaching goals. Some educators think this highly motivating force is linked with group approval, as everyone admires a winner. While psychologists recognize that contest and competition are effectively motivating forces, they also point that too much competition, or the wrong kind of competition, may help some students while it will injure others. It may be equally bad for the poor student who can never win and for the exceptional student who always wins.

It would seem that a much healthier type of competition is obtained when self-competition is stimulated, and each student is competing with himself and striving to improve his own achievement. In this type of competition there is no danger of only one student's being the winner, as each is a winner in his own right.

Doubtless many variations of the motivational forces of praise and encouragement, goals and sub-goals, knowledge of results, and rivalry and competition, as well as others not touched upon, are important forces in learning typewriting. As has been pointed out before, motivational forces are closely interwoven with other skill-building procedures. Additional skill-building procedures are

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considered under the second major classification of skill-building, practice.

**Skill-building—Practice**

Additional elements which seem to be significant in skill-building will be discussed under **relaxation; learning by wholes or by parts; pattern of stroking; rhythm; speed; length, and distribution of practice periods; plateaux; and attention to errors.**

Practice or drill is often thought of as mere repetition. Such drill, of itself, is of little or no value. Psychologists and educators seem to be unanimous in their thinking that unless attention is given to its specific purpose, drill tends to be wasteful. Lessenberry states that the completed drill is of little importance; the significant thing is what takes place as the drill work is being done. He thinks that less attention should be paid to what the students do to the practice materials and more to what the practice materials do to the student.\(^1\)^ Lewin thinks that if mere repetition is carried on frequently enough, it leads to disorganization, and the meaningful will become meaningless, and what has been learned may be unlearned.\(^2\)


Drill is multipurpose, and if there is to be gain from the drill, the particular purpose toward which the drill is pointed must be known to the student. Russon and Wanous give the following as the purposes of drill if one is to gain from repetition:

There must be a new result or a new outcome. There must be improvement—in control, in speed, or in perfection of technique—each time an exercise is typed. What is gained in one attempt must be transferred to the second. Each try must carry with it at least a little insight as to the pattern of movement or understanding that the student is seeking; it must be one more step toward the solution of the problem. Therefore, repetition without purpose or progress fails to contribute to learning. Without a purpose that is understood, there cannot be effective learning. There should be repetition, but it should be for a purpose, such as perfecting certain reaches, obtaining control, or the use of the parts of the machine, finding patterns that will attain higher speed and permit greater control, acquiring understanding patterns that permit the solving of a problem . . . .

In order for a drill to be effective, then, it should be meaningful, motivated, individualized, and give satisfaction in its execution.

So that this effectiveness may be attained with the greatest economy of time and effort, certain factors and techniques must be taken into consideration. One of these factors is relaxation.

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17Russon and Wanous, op. cit., p. 152.
Relaxation

Most educators believe that relaxation is a prerequisite in learning typewriting. MacGregor says:

At the very outset, the achievement of typing requires control of the nerves. The first thing a typing teacher should encourage is a feeling of relaxation in the class. A tense, uneasy student makes little progress. 18

Lessenberry points out that relaxation is of two kinds, mental and physical. The mental relaxation seems to be brought about by absence of fear or tension on the part of the student. The other is the physical relaxation of the body; that is, the relaxation of the muscles not directly concerned with the act of typing; and the relaxation, part of the time, of those muscles being used in the typing process. The overly intent student, the worried or hurried student, one who is fearful of making an error, will be handicapped by tension. 19

The teacher's sympathetic attitude and general classroom atmosphere will have much to do with relieving harmful tension.

Tension may be built up by forcing the student to take too large segments of learning at one time. This brings


19 Lessenberry, op. cit., p. 6.
in the element of learning by wholes or by parts which at one
time was a controversial subject among psychologists.

Learning by wholes or
by parts

It is now rather generally agreed that neither learn­
ing by wholes nor learning by parts is a superior method, but
that each method has its important place. Hartman states:

Parts and wholes are never absolutes, for every
whole is a part of some larger whole and every part
is a whole to some smaller part.20

As applied to typewriting, obviously there is no such
thing as learning the keyboard by the whole method, as it
would be an impossibility for the student to acquire control
of all the keys on the keyboard at one time. The individual
reaches must be learned separately, but each reach must be
related quickly to other keys to form an integrated movement
pattern. These responses are first on the stroke level and
later on the word, phrase, and even sentence level. The
introduction of too many keys at once would confuse the stu­
dent and retard him in his early learning. For this reason
it is doubtful whether the whole method should ever be
emphasized too strongly in beginning typewriting skill.21

20George W. Hartman, "The Field Theory of Learning
and Educational Consequences," Psychology of Learning, Forty­
first Yearbook of the National Society for the Study of
Education, Part II (Bloomington: Public School Publishing

21Editorial Staff, Psychology of Teaching Typewriting
(Cincinnati: South-Western Publishing Company, undated),
p. 2.
Douglas believes that all good teachers make use of the principle of teaching parts in proper relation to the whole to which they belong. He thinks that without an understanding of the whole process and the relation of its parts to each other, the learner is frustrated, confused, and can have no clear goal toward which to work. This may result in his becoming completely discouraged.

In the early stages of skill development, the unit or part of the whole may vary considerably with the individual. The part should be as large as seems possible for the individual to handle. The part of the whole becomes larger as the student progresses; a letter is a part of a word, a word is part of a phrase, and a phrase may be part of a sentence.22 The emphasis on the unit of the whole which is being learned determines, then, the pattern of stroking.

Pattern of stroking

Concerning pattern stroking, Winger says:

There is quite universal agreement that the student should be encouraged to type in patterns of letters, syllables, words, and phrases just as soon as possible. At the same time, it is known that on certain combinations, it will be necessary to revert to an individual letter-by-letter stroking pattern. It becomes obvious, then, that certain combinations may be typed as a complete pattern of serial response, others may require individual letter responses, and still others may involve a combination of the two responses.23

This pattern stroking develops a rhythm in typewriting which is in direct opposition to what is commonly known as metronomic rhythm.

Rhythm

Some years ago, much emphasis was given to metronomic rhythm in typewriting. The use of this rhythm meant that all stroking must be slowed down to the speed of the slowest stroke or the longest and most awkward reach. Easy strokes were made slowly, the difficult ones rapidly, in order to keep to this even stroking pattern. Metronomic rhythm devices force all students in a classroom to adjust to the same stroking pattern. This does away with any attempt to adjust to individual differences as some can type at a faster rate than at the pace set, while others cannot reach it.

A new concept of rhythm, however, has developed. This is based on the expert level of typewriting which is a serial pattern of writing. This rhythm is not an even beat rhythm but a sequence in which the timing of individual strokes varies. It is known by various terms—fluent rhythm, variable rhythm, rippling rhythm, continuity flowing rhythm, serial pattern rhythm, and others.

This rhythm is one in which easy combinations of letters, words, or phrases are typed faster than the hard combinations. This actually means adjusting speed to the difficulty level of the material being typed, and the molding of all levels of typewriting into a rhythmic pattern.
This pattern will not have a metronomic rhythm, but it will have a rhythm in which unnecessary pauses and spasmodic stroking have been eliminated.

This serial pattern stroking is influenced by such factors as context, familiarity of the material, location of the keys used, and the skill level of the typist. Also, this rhythm is usually the outgrowth of the underlying philosophy of the basic teaching. The speed and techniques—speed approaches are usually accompanied by this rhythm; the accuracy first approach is ordinarily accompanied by the metronomic rhythm.

Along with the pattern of stroking, a factor of vital importance is the speed, length, and distribution of practice periods.

**Speed, length, and distribution of practice periods**

The speeds at which practice periods are conducted are governed by the teacher's thoughts on speed and accuracy. Tonne, Popham, and Freeman think that in drill:

Students should work at the speed just below that at which confusions begin to appear and just above that which is characterized by labored, detailed movements.24

There seems to be general agreement among educators that drill periods must be short and intense rather than

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of great length. Tonne, Popham, and Freeman state that ten short drill periods are of much greater worth than one period ten times as long as the short period. They add that research studies have shown that in high schools results achieved in a double period of typewriting are not commensurate with the extra time spent. Educators also agree that drill must be varied before the law of diminishing returns begins to operate. If a single type of drill is continued too long, attention begins to wander and boredom sets in.25

When this occurs, dissatisfaction with the work being done causes the student to lose his motivation for achievement. Such loss of attention, boredom, and dissatisfaction with his results may, in turn, be a contributing cause of the student's reaching a plateau.

The plateau

Occasionally the student in typewriting gets to a hurdle in speed or accuracy which seemingly he cannot get over. This plateau, or stalled level of skill, may be caused by a number of factors such as fatigue, boredom, emotional disturbances, wrong techniques, and so on. Harms states that a plateau represents a stage of learning when the organism is

trying to change from one level of reacting to a higher and better organized level. Psychologists and educators maintain that if the skill is presented in such a way that the higher level of characteristics are embodied in the beginning techniques, then the organism will not have to unlearn one set of patterns to form another. It is during this period of readjustment that the drag of the new modes of action counteract the natural tendencies to rise in the old. The results of these two warring forces neutralize each other and the stalled level of performance, or the plateau, results.26

An attempt to avoid this necessity for unlearning one set of techniques and re-learning another set of a higher order is made by the advocates of the speed and the techniques-speed approaches. In these approaches to teaching typewriting, the pattern of the expert is taught from the start hence no readjustment is necessary in the stroking pattern.

It is generally agreed that the plateau calls for active interference on the part of the teacher. It requires an understanding of what causes the difficulty and a concentration on new integration of movement patterns, new methods of attack, and the development of confidence by means of experiences that will show the student that he can get over this hurdle and move on to new levels. If a student can gain an increase in speed even on a very short writing, it may

26Harms, op. cit., pp. 49-50.
encourage him and make him realize he can reach new levels. From this new experience he can then go on to longer writings at higher speeds and then perfect his new gains.27

Attention to errors

While psychologists are in agreement that if a student is allowed to develop a skill in which he forms incorrect habits it is difficult to break these and to form the correct ones, they do find that momentary mistakes may be ignored when the student is reaching out into new levels of speed and is trying to move up to a new level of performance. The techniques which cause these errors must be corrected so the error will not become permanent.28

Harms thinks that in order to avoid tension and to engender enthusiasm for the subject, errors should not be considered too seriously in the beginning typewriting classes.29 Russon and Wanous believe that when the purpose of the drill is speed forcing, the entire attention should be on the purpose of the drill and errors should be ignored. To call attention to the errors minimizes the effectiveness of the drill.30

27Editorial Staff, Psychology of Teaching Typewriting, op. cit., p. 10.
28Ibid., p. 8.
29Harms, op. cit., p. 48.
The early attention to errors is strongly linked to the accuracy-first approach in typewriting; whereas, the ignoring of errors in the early stages of learning is linked to the speed-first and the techniques-speed approaches.

Despite the many tools in the form of skill-building principles and suggested ways to use these in actual practice given us by psychologists and educators, there appears to be no one best combination of these factors that can be cited to get the best results. There seems to be a delicate balance among all the elements of motivation and practice that produces the desired results. Due to individual differences in students, however, this balance is a difficult thing to achieve.

Gates sums up the evasive quality of this balance:

... successive efforts to learn may vary greatly in their effectiveness. There are important principles of economy related to such critical factors as the selective and directive effect of motives, particularly the influence of clearly perceived goals, the discernment of means-end relations, and the meaningful organization of experience. By controlling motivation, by aiding the learner to evaluate his trials, by applying rewards and punishments judiciously, by arranging the length and distribution of practice periods in optimum fashion, by assisting the learner to adopt a scheme of organization, by giving instruction concerning useful methods of procedure, and by other types of supervision, it is possible to guide the individual's efforts toward successful results. Moreover, by making the student aware of efficient methods of learning, one gives him the means of managing his learning independently.31

31 Arthur I. Gates et al., op. cit., p. 349.
The Accuracy, the Speed, and the Techniques-Speed Approaches

The actual application of the psychological principles pertinent to typewriting instruction may be influenced greatly by the philosophy behind the goals to be reached. Agreement on the final goals in typewriting—speed and accuracy—is universal, but their order of initial emphasis is a question of continuing debate. The three major approaches to reaching the final goals of speed and accuracy are the accuracy approach, the speed approach, and the techniques-speed approach.

Rahe believes:

The permanent writing habits of typists, and the ultimate skill they attain may be affected by the early typewriting instruction they received; that is, whether the emphasis was on accurate typewriting, on rapid writing, or on both. It is, therefore, an important problem to determine where the emphasis should be placed in the elementary learning stages of typewriting.32

The accuracy approach

The accuracy-first approach to typewriting skill was at its height through the early part of the 1930's. It was characterized by much drill upon individual letter combinations in the beginning stages of learning, and the serial response patterns of stroking were developed very slowly.

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Emphasis was upon slow, accurate strokings, and this emphasis lent itself well to rhythmic devices such as music and the metronome.

What is meant by accuracy? Russon and Wanous define it: "Historically, accuracy has been considered to be the errorless typing of a page, a paragraph, or a line of copy." 33

Book believed that accuracy should precede speed, and for many years teachers followed this principle in their teaching. This meant perfect copy and was usually accompanied by letter level of response and metronomic rhythm. 34

DuFrain gives a resume of Book's philosophy and the majority of adherents to this accuracy-first approach:

The interpretation of Book's theory of habit-formation in typewriting led teachers and textbook writers to emphasize the mastery of single strokes, with stress on an accuracy of key locations rather than technique of movements and a fast rate. While quick stroking received some attention, the speed rate in continuity writing was slow in order to permit the beginner to make accurate key reaches. This concept of the correct beginning was emphasized to such an extent that the learner was virtually placed in a straight-jacket of procedures involving correct position before the machine, correct manner of reading copy, and correct manner of stroking. The learning situation was so guarded that the beginner was prevented from initial errors and thus permitted to make "perfect copy" typescripts. Habits were assumed to be set up by a few trials, hence, the need for restricting the habits to those which were desirable.

33 Russon and Wanous, op. cit., p. 97.
The learning exercises were characterized by repetition of small learning units, with warning that the student must practice slowly and with conscious effort toward perfection of responses. Since habits were assumed to be fixed only after weeks and weeks of attentive repetitive practice, this kind of learning exercise was continued for several weeks.35

While many teachers still believe in the accuracy approach, their conception is the typing of all copy well within the control range of each student. Many accuracy-minded teachers, however, still feel that if one takes care of the accuracy, the speed will take care of itself. This feeling is manifested in the using of net words a minute from the very beginning in figuring typewriting speeds.

The speed approach

The accuracy-first approach was supplanted by the speed-first approach which emphasized speed of stroking in the beginning stages of learning typewriting. This new emphasis was the outgrowth of the applied motion studies and the experimental work in the speed of stroking done by Frank B. and Lillian Gilbreth.

In contrast to the philosophy of the accuracy-first approach, they maintained that when learning motor skills in which speed is a vital part of the standard method of the expert, the learner should be taught speed first, regardless of the quality of the output. The Gilbreths were the first

to point out the much-quoted theory that fast motions (the motions of the expert) are not merely slow motions (the motions of the beginner) speeded up but require a different type of skill development from the beginning.36

As applied to the teaching of typewriting, this means that facility is emphasized first and that stroking rates are pushed up to certain standards before attention is given to the number of errors made. This approach stresses fluid rhythm and pattern stroking as opposed to metronomic rhythm and letter-level response typified by the accuracy approach.

The advocates of the speed-first approach claim that it is in line with sound psychological principles in that it encourages the learner to imitate expert motion patterns, reduces tension by ignoring errors in the early learning stages, and prevents slow motion habits which have to be broken later.

The speed-first approach was followed by the techniques-speed approach, the newest of the typewriting approaches.

The techniques-speed approach

The techniques-speed approach appears to be a variation of the speed-approach; in fact, if the speed-first approach were taught without its having as its basis an emphasis on techniques, surely confusion would be its outcome.

The techniques-speed approach stresses form and techniques and emphasizes the drive for speed before accuracy. The advocates of this approach believe that both speed and accuracy will be achieved to a greater extent if the building of correct techniques comes first.37

In this approach relative speed of stroking receives initial emphasis and errors in beginning typewriting are considered to be of lesser importance. The followers of this method feel that with the development of proper techniques, most of the early errors will tend to disappear and thus it is unnecessary to go through a laborious analysis of these errors.

As in the speed approach, the emphasis is based on the theory that fast motions are not merely slow motions speeded up but require a different type of skill development from the very first. Every act should be performed from the beginning in the way it is to be used on the skill level.

Tonne, Popham, and Freeman think that concentration should first be on techniques, then on speed and accuracy. These authors feel that the learner must develop in himself the motion pattern of the expert. Before he can develop this pattern in himself, however, he must have a concept of it.

This concept may be brought to him in many ways, but probably the best ways are through demonstration made by the teacher and through visual aids.

Unless the teacher is able to recognize the factors comprising the pattern of the expert and thus be able not only to recognize the things that are aiding the student but also those that are impeding his progress, the student may flounder around in a trial-and-error fashion that will cause much loss of time and even prevent ultimate mastery. The teacher, of course, must be able to demonstrate the expert pattern.  

Review of Literature Pertaining Emphasis on Accuracy, Speed, and Techniques

The accuracy approach

Despite the fact that many teachers, in practice, are proponents of the accuracy-first approach in teaching typing, few can be found in the professional literature who are bold enough to defend this view. Some of the techniques advocates, however, may lean somewhat in this direction. A review of the literature may point to this deduction.

The speed approach

Burkhart, in a review of research related to typing, reports a study made by Ervin I. Hayes, in which the

latter conducted an experiment on the relative merits of a speed and accuracy approach in teaching beginning typewriting.

Hayes used two classes with about the same I. Q. and for thirty-six weeks taught one class on the perfect copy basis, and the other on a speed basis in that they were told to complete a given exercise in an allotted time. Tests were given at four-week intervals after eight weeks of instruction. The control group (the perfect copy adherents) surpassed the experimental group (those pushed for speed) on the first five tests. On the sixth test, the experimental group surpassed the control on both speed and accuracy. The investigator concluded that these results supported the contention that the beginning student can be taught to write at a high speed from the initial practice without sacrificing accuracy in the end.39

DuFrain seems to be a speed-first advocate. She based her convictions on ten years of scientific experimental studies. She maintains that emphasizing speed first is sound psychology of learning for the majority of students but qualifies this by saying that there is likely no one best method for all students. She says:

By teaching speed first, I mean, in the main introducing the time-writing on continuous copy

for five or ten minutes as early as the seventh lesson. 40

Nelson in an experiment used twenty students in one ninth-grade typing class as an experimental class, and an equal number in another class as a control group. These students were paired on the basis of sex and the scores made on a finger dexterity test. In one class the students were urged to try for accuracy from the beginning, those making the fewest errors receiving the highest grades. In the experimental class nothing was mentioned about perfect copy; but a rapid stroking rate was demonstrated to them, and they were urged to copy this form in their practice. This procedure was followed for fourteen weeks, after which a gradual emphasis on accuracy was begun in the speed group. This experiment was continued for thirty-two weeks.

The results showed that the accuracy group wrote with more errors than the speed group at the end of the first semester—.74 as against 1.47 errors per 100 strokes. In speed of stroking, the speed group far excelled the accuracy group—155.4 as against 128.3 strokes per minute. In the second semester, the speed group proved itself able to write just as accurately as the accuracy group. The accuracy group (179.9 strokes per minute) was never able to attain the same

speed of stroking as the speed group (197.1 strokes per minute). In the last timed writing of the experiment, the speed exceeded the accuracy group by six net words per minute or by 4.4 correct words per minute.

The experimenter concluded from these results that the use of the speed approach will produce typists whose stroking rate is higher than, and is never matched by that of students trained in the accuracy approach. He feels that because students are allowed to ignore errors in the first weeks of practice does not mean that they will continue to be inaccurate writers.41

Ussel, in a comparative study of the speed and the accuracy approaches to the teaching of typewriting, used thirty-eight beginning typewriting students. He found that students who were taught with the speed approach averaged from eight to ten net words a minute more than those taught with the accuracy approach; that the best students in the experimental speed-approach group averaged about fifteen more net words a minute than did the best students in the control group; that the slowest students in the experimental group averaged about six net words more a minute than did the slowest students in the control group; and that although speed was stressed in the experimental group, and accuracy in

the control group, there were no significant differences in
the number of errors made by the two groups.42

Of three typing experts, Hossfield, Dilmore, and
Wigard, only one indicated that the speed emphasis has merit,
and this expert qualified his statement. Hossfield believes
that a speed emphasis is not detrimental, but that it should
be made carefully.43

Anderson reported that research findings emphasize
that rapid, fluent writing should be developed from the begin­
ing of the typewriting course. Alternate drilling for speed
and accuracy, lasting perhaps a week or ten days each, seems
to result in rapid development of skill in typewriting. Until
the last few years, the speed approach was recommended;
recently, considerable emphasis has been placed upon the build­
ing of speed and accuracy concurrently. Several typewriting
studies completed during the past two or three years, however,
again indicate that the speed approach is superior to other
methods.

From research, Anderson also notes that speed seems
to be a more stable factor than accuracy in typewriting.

42Paul John Ussel, "A Comparative Study of the Speed
and Accuracy Approaches to the Teaching of Typewriting,"-
National Business Education Quarterly, Vol. XXIV, No. 2
(Fall, 1955), pp. 89-90.

43G. L. Hossfield, "Learning to be a Typing Champion,"
The patterns of stroking become stabilized early in the learning process. This would seem to indicate that the speed of stroking should be developed early.

In his review of research in typewriting learning, West has this to say concerning the speed versus the accuracy emphasis:

At the beginning of training there is no option but to work for fast stroking and to ignore errors. This is true for three reasons:

1. It helps make motions ballistic.
2. Through greater contiguity between stimulus and response it more quickly strengthens the associations of which the task consists.
3. Fast motions have maximum transfer value for subsequent performance.

Maximum transfer to final performance demands, from the start, the use of the same modes of stroking behavior that will ultimately be used—or the closest possible approximation to them. It is known that sequence of motions made at slow rates follow different paths from those made at fast rates. Forty words per minute is not simply twice as fast as twenty words per minute. The learner trained at slow rates employs working techniques which cannot be used at higher rates and these have to be unlearned in order for progress to take place. These require that motions be made as fast as possible short of the point at which muscular tensions set in. The easiest way to insure that a stroke will be made rapidly is obviously to crowd another stroke close on its heels. Learners can simply be told to type rapidly, particular speed goals can be set on an individual basis, or the instructor can set a pace at a pre-determined rate. In the last instance great care is necessary, for no one pace will be right for all learners at any one time.

Forcing speed at a rapid rate will speed the learning of what motion goes with what letter in the copy. It will also sooner lead to reaching the next higher level in the hierarchy of stroking habits. We know that anything that brings a response closer in time to the stimulus will speed the formation of the associations which are at the heart of the skill development in the beginning, between a particular motion and a particular letter; later between a particular series of motions and some sequence of letters. When the learner is forced to stroking rapidly, he cannot dawdle between seeing a letter in the copy (or hearing it) and making a response to it. Fast stroking makes for this contiguity.

Since the factors which underlie accuracy appear to be different from, more numerous, and probably more complex than those that underlie speed, efforts to be both faster and more accurate (or even as accurate) will meet with limited success. Thus when working for speed, errors must be ignored.\(^\text{45}\)

Along with Anderson and others, he feels that accuracy is highly unstable because it depends on a wide variety of conditions which shift from moment to moment. He believes that accuracy is an extremely complex factor and that little is known of what lies behind accurate typewriting. He is of the opinion that it depends more on appropriate "set" for the work and the sense of the need for slight changes in rate according to the difficulty of the particular sequence typed than on any particular training materials and procedures for using them.\(^\text{46}\)


\(^{46}\)Ibid., p. 28.
West thinks the discovery of better work methods is through forcing the rate. He says:

Since the paths of motions are different at different stroking rates, the only way to discover new paths for motions—new work methods—is to change the stroking rate. The only way to learn to type faster is to type faster. Faster typing simply sets the stage for "discovery" of better stroking patterns. During faster typing, the learner simply places himself in a situation in which he can accidentally stumble on new motion patterns. With sufficient practice under these conditions, these new patterns become his usual mode of behavior.47

Atz, in an annotated bibliography and review of professional literature states that while developing speed before accuracy is still being debated, the tendency seems to be toward the speed-first development. He says:

The stroking patterns the students should develop from the beginning are in terms of fast motions. With this technique of developing fast motions from the start, the speed first, accuracy second tendency is very strong.48

Jelinek seems to think that there may not be such a difference in the various approaches as might appear:

Like many new developments, this new thought does not necessarily represent a departure radically different from traditional ones, but perhaps a modification of conventional procedure. Development of speed before accuracy implies less severity in the matter of insistence on letter-perfect work

47Ibid., p. 25.

in the beginning, and a more tolerant and reasonable approach to the teaching and learning of the keyboard.49

He believes that the beginning typist is unable to respond correctly until newly used muscles have been trained. He feels that accuracy is impossible at this stage; that it is a matter of development, and to demand accuracy in this early stage is not only an impossible demand but is discouraging to the student. He is convinced that accuracy should not be stressed at the start but should be developed as muscular control develops.

Croft in his teaching of speed and accuracy in typewriting seems to be of the same mind as Lessenberry in that he believes the art of typewriting is more important than the material typed. He thinks it is better to hit the wrong keys in the right way than the right keys the wrong way. Thus from the very beginning every effort should be made to emphasize movement on the expert level. He feels that expert typing is not a slow, letter-by-letter process. Rapid typewriting is emphasized from the beginning. He is convinced that practice effort must be oriented toward speed from the very start.50


From some of the literature, it is difficult to discern which of the two approaches the authors and experimenters are defending. For this reason it is debatable under which heading some of them should be listed.

The techniques-speed approach

Stolurow states that he agrees with West\textsuperscript{51} in his emphasis on speed during the keyboard learning stage in spite of its apparent contradiction with logic. He claims:

The paradox from typing comes from the fact that when teachers emphasize accuracy, they encourage the student to use a different response, a response which has to be eliminated when greater speed is sought. The appropriate principle regarding accuracy and speed is that practice from the start should promote accuracy of the responses required at higher levels of skill. Once the rapid response is being made, then additional speed increases can be stressed. A beginning typist should make only ballistic motions. These are the responses. A beginning typist who uses a slow, cautious movement rather than a ballistic movement is learning to perform a different skill from that which will be demanded when moved to a more advanced stage. The criterion of accuracy should not be just hitting a particular key, but rather hitting a particular key in a specific way. To some extent, increases in speed will come about naturally as a consequence of the elimination of irrelevant responses and as a result of shortening the interval between stimulus and response.\textsuperscript{52}

\textsuperscript{51}West, op. cit.

Hayden expresses his belief in the techniques theory:

From the very first day, emphasis should be upon technique rather than upon speed or accuracy. Speed and accuracy will be achieved through the use of good techniques. In teaching for techniques, we should not be concerned with how fast the student is typing or how many errors he is making, but we should be concerned with the speed with which the student strokes the keys as one of the basic techniques in typewriting. 53

Cherry made a study with two elementary typewriting classes in which he compared the speed and the accuracy approaches. The enrollment in the accuracy class was eleven and in the speed class, fourteen.

For the speed class, timed writings were graded in gross words per minute with no penalty for errors. The keyboard was introduced in five lessons. The accuracy class was not penalized for slow speed, and the writings were graded for accuracy. The keyboard was introduced in fifteen lessons with this group, and accuracy of stroking was stressed before additional reaches were taken up. These separate emphases were stressed during the first five six-week periods. During the sixth six-week period, both accuracy and speed were emphasized. Evaluation of the students' achievement was made through a series of tests.

Cherry reports that there was no appreciable difference between the two classes in speed and accuracy. He is of the opinion that if speed is emphasized, the class will

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achieve a higher degree of typing speed; and if a class is taught with an accuracy approach, it is probable that the students will achieve a higher degree of accuracy. The author then adds:

The writer feels that the stressing of the right techniques in typewriting, and the methods in which they are presented, plays a greater part in guiding the student to his highest attainment in speed and accuracy rather than the approach (speed or accuracy) that is followed.\(^{54}\)

Dilmore, one of the expert typists whose opinions are cited in this study, gives the following as her beliefs concerning speed and accuracy:

It is my belief that in the learning phases of typewriting an extreme push for speed might be dangerous, unless the student has a proper foundation for it. The emphasis should be on the importance of forming and fixing the correct habit of making finger strokes accurately. . . . Gaining speed comes to most of us when we are ready for it. The most difficult problem I found in typing, was not gaining speed, but gaining control. Speed should be a natural outgrowth resulting from the basic fundamentals of good typing techniques. These techniques give us the solid foundation so that the growth of speed becomes a natural development.\(^{55}\)

Wigard, the third expert typist says:

Speed and accuracy seem to go hand in hand—not that speed comes with accuracy, but that you should not attempt to push speed beyond the ability to control it. . . . That is, set a speed or goal

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\(^{54}\)Cherry, op. cit., p. 27.

(beyond the present rate which can be reached and then control this speed through repetitive practice)... To push far beyond one's ability of practice presents a morale problem to control speed over a reasonable period, and discouragement.56

Summary

Although opinions vary among researchers concerning the initial approach to the teaching of typewriting, there seems to be general agreement, as indicated by the studies reviewed for this study, on the following:

Rapid stroking should be emphasized from the first, as this stroking typifies the pattern of the expert, and that pattern should be established from the start. This rapid stroking should be emphasized, of course, in conjunction with the use of the proper techniques which are necessary to build this expert pattern. This rapid stroking develops serial pattern rhythm which is the fluent, continuous, flowing rhythm of the expert.

Practice material should be motivated, meaningful, adjusted to the individual ability of the student, and give satisfaction in its accomplishment. Practice should be done under conditions which promote a feeling of ease and relaxation.

The student should not only be made aware of the goal of each writing, but also of the results of his efforts in

working toward that goal. Emphasis should be placed on one aspect of writing at a time. A goal may be speed or accuracy but not both simultaneously. Drill periods should be short and intensive with frequent periods for rest; otherwise, the student becomes fatigued or bored.

As a teaching tool, the SKILL-BUILDER Controlled Reader should aid the teacher in emphasizing certain of these principles. It is purported to contribute to the development of these skill-building principles:

1. **The building of the pattern of the expert.** Since the SKILL-BUILDER is designed to develop rapid perception of words or word-recognition groups, it should result in the attainment of rapid stroking. The rapidity with which this rapid perception can be converted into kinesthetic reactions can be regulated by the speed control dial. By using this instrument as a speed-forcing device, in conjunction with teacher demonstration of the pattern of the expert, and the insistence upon good techniques, serial pattern rhythm should be developed.

2. **Motivation.** The SKILL-BUILDER Controlled Reader can be used for only short drill periods, and the drill periods are intensive. Because of these short and intensive drill periods, the instrument should be highly motivating.

3. **Provision for individual differences.** Since the speed at which material is to be typed can be adjusted, the
SKILL-BUILDER Controlled Reader should make it possible to provide for individual differences both in speed forcing and in control building.

4. Development of concentration. The instrument itself appears to be such that it would increase the ability to concentrate as the student is intent upon watching the moving slot and peripheral distractions are minimized.

5. Development of both speed and accuracy. The SKILL-BUILDER Controlled Reader through its adaptability and versatility should be an aid to the teacher in working for speed and accuracy.

Since these five principles are essential factors in the development of skill, and since this study will measure the effectiveness of the SKILL-BUILDER Controlled Reader in developing typewriting skill, the study, therefore, is indirectly measuring whether or not the SKILL-BUILDER Controlled Reader actually does contribute to the development of these five principles.

The following chapter, Chapter IV, deals with a review of available literature pertaining to prognosis of success in typewriting.
CHAPTER IV

PROGNOSIS OF SUCCESS IN TYPEWRITING

In order to carry out this study, it was thought necessary to equate the experimental and the control students. In preparation for this pairing, a review of the literature pertaining to the factors of prognosis of success in typewriting was pertinent.

Good defines prognosis of success as:

The prediction of probably accomplishment in general or in a particular area through the aid of standardized tests, inventories, personal histories, anecdotal records, etc.¹

As many students who attempt to learn typewriting do not become expert typists, and some do not even become good copyists, it is understandable why so many researchers have endeavored to find ways of predicting students' probable achievement in typewriting. In fact, the importance of prognosis in typewriting from 1915-1950, especially in the decades of the twenties and thirties, is evidenced by the fact that of 500 research studies completed during that time, in the area of typewriting, about 14 per cent, or seventy-one studies, dealt with this subject. In the years from 1925-1940, fifty-two studies, almost 25 per cent of all studies

success in typewriting: general intelligence scores; correct use of the English language; reading rate and comprehension; manual dexterity; such traits of character as determination, aggressiveness, self-confidence, and carefulness; interest; and grades previously earned in other subjects. The answers that some of these researchers obtained to these questions may be noted from their studies.

These studies will be classified according to the variables used and then chronologically within the area. It was not possible to keep the areas intact in all cases as the researcher often used a number of variables in one study. Where a number of variables were used, the study will be put in the classification which seems to be most pertinent. The major areas into which the studies reviewed will be classified are (1) Scholastic Aptitude and Achievement which will include general intelligence, reading speed and comprehension, and achievement in various academic fields, (2) Personality and Interest Inventories, and (3) Vocational Aptitude which will include mechanical ability, motor reaction, substitution, and tapping.

**Scholastic Aptitude and Achievement**

**General intelligence**

The intelligence quotient has been used extensively as a factor in studies attempting to predict success in learning to typewrite.
Johnson thought that reading, spelling, general mentality, mental alertness, and motor responses were significant factors in predicting such success. In her study conducted with 124 high-school students over a three-year period, she administered the Monroe Silent Reading Test for rate and comprehension; the Iowa Spelling Letter and Spelling List (Iowa Grade VIII); the Greene Organization Test for mental alertness; and the Pressey Mental Test, Schedule "D" for predicting school success in general. Three motor tests were used: The first test consisted of tapping the letter "j" for fifteen seconds, and resting for fifteen seconds. This was repeated three times. The second test consisted of alternating "j" and "f" for thirty seconds and resting fifteen seconds. This was repeated twice.

At the end of three semesters of instruction, she gave five forms of the Blackstone Stenographic Proficiency Tests in Typing and correlated them with the tapping test. She found a low correlation between spelling ability and typewriting ability; high mentality did not seem to insure typewriting ability and conversely low mentality did not seem to stand in the way of the attainment of typewriting success. Nor was quick motor reaction essential as measured by key tapping tests. She concluded that the tests have no prognostic value, but that ambition, health, time for extra
practice, and personal inclination should be considered as discriminating factors.\(^3\)

Stedman attempted to determine aptitude for typewriting by use of the Thurston Employment Examination in Clerical Work; the Terman Group Test for mental ability; the MacQuarrie Test for Mechanical Ability; Fundamentals of Arithmetic and Spelling; and a physical examination.

She tested sixty-five tenth grade pupils, and the results were correlated with Blackstone's Stenographic Proficiency Tests in Typing. She concluded that these tests did not have high enough correlations to use for predictive purposes. She thought that the student with high or average I. Q. has a better chance of success, but that the difference is so slight that for individual cases it cannot be said that the student with the low I. Q. will fail nor that the one with the high I. Q. will succeed.\(^4\)

Bradford also endeavored to ascertain whether or not the I. Q. could be used to predict success. She gave the Terman group Test of Mental Ability to 297 students. In the first-semester typewriting classes the students were given six lines to type and checked for accuracy, average time, average accuracy.

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\(^3\)Clara Louise Johnson, "The Validity of Certain Tests to Prognosticate Typewriting Ability" (unpublished Master's thesis, University of Iowa, 1925), 35 pages.

and average errors. They were given a percentage grade based on the Wiese-Coover's Scale for Typing I. (This test was taken from Wiese-Coover's *kinesthetic Method of Learning Touch typewriting.*) Students in advanced classes were given fifteen-minute tests on unfamiliar material. Scores for both the beginning students and the advanced students were correlated with the Terman Group Test for Mental Ability.

Bradford concluded that there is no relationship between typewriting ability and the I. Q. as measured by the Terman Group test.5

Korngold used the National Intelligence Test Scale A—Form 2; an original substitution test; Burgess Silent Reading Scales 1, 2, 3, 4; Sixteen Spelling Scales for Secondary Schools, lists 5, 10, 15; the MacQuarrie Test of Mechanical Ability; a copying test in longhand based on Blackstone's Stenographic Proficiency Test, Forms A and C; and a tapping test on the typewriter, in an effort to discover whether or not these factors were significant in predicting success in typewriting. These factors were correlated with the student's typewriting success as evidenced by his scores on Blackstone's Stenographic Proficiency Tests.

She concluded that of the two types of capacities (mental and motor) as indicated by these tests, the mental seemed of greater significance. She felt, however, that a

test in which interest would be revealed might do more towards predicting success in typewriting than could the tests used in her study.  

White made a study under the Carnegie Foundation Grant for Advancement of Teaching in 1933-34 with 542 students to determine factors affecting the acquisition of typewriting skill. He examined traits which he thought might contribute to typewriting success. These traits he put into the following categories: mental traits, or native capacities, such as general intelligence; mental skills, such as reading, code learning, and substitution; motor abilities, such as tapping speed, eye-hand coordination and reaction time; and personal factors, such as age, school-grade placement, vocational interests, and purposes in learning to typewrite.

The relationships of these various traits and characteristics were correlated with straight-copy typewriting tests. General intelligence (I. Q.) had a correlation of .38 with typing gross words; .31 with typing net words; and .14 with per cent of errors.

White concluded that intelligence is more related to speed than to accuracy. The Whipple Reading Test showed a correlation of .41 to net typing scores. He also concluded from his study that intelligence, reading skill, age, and

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performance on serial motor response tests are significant factors in typewriting achievement. Of these, general intelligence and serial motor response ability seem to be more closely related to typewriting speed than to typewriting accuracy, while reading ability shows greatest correlation with typewriting net scores.  

Curtis made a study encompassing six years and 1,298 students in a state college. Most of these students were in the technical two-year commercial course although there were a number of academic students in the typewriting classes surveyed. The Thurston Psychological Examination and the MacQuarrie Test for Mechanical Ability were given to these students. The typing rates were compared with the I. O. scores, the mechanical scores, and the College Predictive Index. The College Predictive Index was made up of the I. Q. percentile, high-school content scores, the number of recommended units the student had earned, and his reading and achievement test scores.

The fiftieth percentile is considered average in the Thurston Psychological Examination; the sixty-fifth percentile, on the MacQuarrie Test of Mechanical Ability; and the one hundredth percentile on the Predictive Index.

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7Bruce White, "Tangible Results of the Use of Typewriting by College Students and Factors in the Acquisition of Typewriting Skill" (unpublished Ph. D. dissertation, University of Washington, Seattle, 1935), 211 pages.
While more than half of the students in the study were below average in I. Q. and mechanical ability as measured by the tests, only 10 per cent failed to do acceptable work in typewriting; and these were not necessarily the ones whose test scores indicated a lack of ability. While there were only fifteen cases of failure in typewriting involved in the study, the college prediction of success indicated that all of these cases were below average.\(^8\)

From the results of this study Curtis concluded:

From the data it would appear that a person below the fiftieth percentile as measured by these tests has the same chance to succeed as a typist as has a person with a higher rating. It is possible, however, that the pupils with the higher test scores are not sufficiently interested in typing to devote the time necessary to attain a high degree of skill while the pupils with lower scores may have realized that they stand a chance if they put forth maximum effort. It is likely that a necessary factor of success is determination to succeed.\(^9\)

Kirk administered the Otis Group Intelligence Scale Advanced Examination, Form B to 110 first-year typewriting students, and the Ohio State Psychological Test, Form 21 to 100 second-year typewriting students. These he correlated with ten- and fifteen-minute straight-copy timed writings. With the Otis test he obtained a coefficient of correlation of .276; with the Ohio State test, .040. From this study he


\(^9\)Ibid., p. 15.
concluded that these intelligence tests are of little value in predicting success in typewriting.\textsuperscript{10}

Dodson came to a conclusion similar to that of Kirk. She gave the Henmon-Nelson Test of Mental Ability and the American Council Examination for College Freshmen to forty-two college students. She compared these scores with grades earned in typewriting. Her coefficients of correlation ranged from .09 to .55. From these coefficients of correlation she concluded that these two tests cannot be used reliably in prognosis of typewriting success.\textsuperscript{11}

Stroop in her review of a number of studies dealing with prognosis of typewriting success states the following: Five of the eight studies reviewed by her indicated the I. Q. is helpful, three said not; that there was no significance in age; that in testing for reading one might profitably measure eye-span. She also concluded that all pupils who are anxious to learn to type should be allowed to do so; and that those with the best grades in other subjects, high intelligence scores, and a superior eye-span should be expected to do better work in typewriting than pupils who do not have these assets.

\textsuperscript{10} Harry A. Kirk, "The Relation between Intelligence Rating and Achievement in Shorthand and Typing" (unpublished Master's thesis, Kent State University, 1942), 68 pages.

\textsuperscript{11} Mary Helen Dodson, "A Study in Shorthand and Typewriting Prognosis," \textit{Modern Business Education}, Vol. XX (November, 1943), p. 47.
She did not list in footnotes nor bibliography the studies she had reviewed; nor did she specify whether her conclusions were based on qualifications which she thought necessary for beginning or advanced typewriting. If she were referring to qualifications for elementary typewriting, her conclusions would be contrary to those drawn by many other researchers. It is because of these seemingly contrary conclusions that the study is listed here.\textsuperscript{12}

Reading

One of the factors used frequently in studies for prognosticating typewriting success is reading. Unique terms which apply to reading for typewriting are fixations, regressions, and eye-hand span. Fixations are normal pauses of the eyes when reading, as when the eyes rest momentarily on a word or part of a word. Regressions are the movements of the eyes backward along the line of material being read. Eye-hand span refers to the distance between the words being read and the word which is being typed.

Butsch in his study concerning speed and comprehension in relation to reading for typewriting found that the general tendency among all but the most rapid typists is to keep the eyes one word ahead of the hand; and among the most rapid typists the eye may be, on the average, about 1.5 words

ahead of the hand. He found, too, that when reading copy for typewriting, the subjects make many more and longer fixations per line than they do in ordinary reading.

In this study, the eye movements of eighteen typewriting students typing at rates varying from forty to seventy words a minute, and one former world's champion typist writing at a rate of one hundred words a minute were photographed as they wrote a six-line selection of straight copy. These moving pictures showed the number of fixations, regressions, and the eye-hand span.13, 14

Fuller in his very comprehensive study of reading factors in typewriting used two former world-champion typists and one hundred subjects drawn by lot from secretarial classes in five Greater Boston high schools. He administered by Traxler Reading Test to establish the reading rate of the persons in his study. The students' eye movements were photographed as they were typing ten lines of ordinary straight copy, and as they read silently for thought seven lines of ordinary prose. The eye movements of two former world-champion typists, George Hossfield and Stella Willens, were photographed as they wrote


the same ten lines written by the high-school students, plus a difficult scientific selection and a French passage.

Each subject was given a fifteen minute, straight-copy typewriting test. The test scores of all the subjects were compared with their eye-movement patterns. Fuller found that approximately 3.6 times more fixations and regressions are made when reading for typewriting than when reading ordinary prose for thought, and that pauses for each fixation and regression average 1.6 times longer in reading for typewriting than in ordinary reading. The study of eye-span in reading for typewriting shows that only parts of words are absorbed at each glance, and that the eye-span in ordinary reading is about 3.4 times as long as in reading for typewriting.

He also found that silent reading is not typical of reading for typewriting in that, rather than reading by word wholes, the typist tends to read by word-recognition patterns or parts of words. So long as reading for typewriting requires only a very small span of recognition and a slow rate of reading, he concluded that even the slowest reader could read over twice as fast as was necessary for the fastest typist. He would substitute "perception for typewriting" instead of "reading for typewriting" as the typist is not really reading
for meaning. For this reason he relegated comprehension to a minor role in typewriting.\textsuperscript{15}

Cobb also attempted to discover whether or not there was a sufficiently high correlation between reading tests and typewriting success so that the reading tests could be used as a predictive factor in typewriting. She gave the Chapman-Cook Speed of Reading Test Form B to 140 beginning typewriting students in three high schools. The results of this test were correlated with scores on three 5-minute, straight-copy tests given toward the end of one semester of instruction in typewriting. She obtained a range of .005 to .437 in her coefficients of correlation. The highest, .437, between reading speed and gross words a minute, was on the first typewriting test given in one of the high schools.

She concluded, therefore, that the relationship between reading speed and comprehension and typewriting as indicated in her study is not great enough to be used to predict typewriting ability.\textsuperscript{16}

Rundle came to a similar conclusion; that is, that reading rates are of little value in predicting success in

\textsuperscript{15}Donald Coldwell Fuller, "Reading Factors in Typewriting" (unpublished Ed. D. dissertation, Harvard University, 1943), 212 pages.

typewriting. She based her conclusions on a study made with twenty-nine second-year typewriting students. She used the Traxler High-School Reading Test, Form B, and correlated it with scores on a ten-minute, straight-copy typewriting test. The coefficient of correlation between reading speed and net typewriting speed as shown in this study was .004; between reading speed and gross typewriting speed, .026.17

Sorrell, in 1959, made a study to determine the relationship between typewriting and reading scores. Seventy-eight high-school students were given intelligence and reading tests at the end of their freshman year. Sixty-one of these students took typewriting. At the end of the term, these seventy-eight students were again given a reading test of the same series as the previous one. The grade level gains in reading were determined. The gains in reading of the typists and those who did not take typewriting were compared. The correlations between I. Q. and reading; I. Q. and typewriting; and reading and typewriting were determined. Gross words a minute on five-minute writings with no more than 5 per cent of gross words in errors were used as a criterion of typewriting achievement.

The following information was obtained from the study: The correlation between I. Q. and reading was .70; the correlation between reading and typewriting was .45; the correlation

between I. Q. and typewriting was .40; the typists gained on
the average of .2 of a grade level more than the seventeen
who did not take typewriting, but this group was too small
to make a statistically significant comparison. When com­
pared on the basis of low, average, and high groups, very few
who were low in either I. Q. or reading reached the high level
in typewriting; very few of those who were high in I. Q. or
reading were among the poorest typists.18

Grades and tests in academic fields

In attempting to find out if there were a meaningful
coefficient of correlation between a student's ability in
various academic areas and his ability to typewrite, re­
searchers have conducted a number of studies.

Davis administered an intelligence test to 1,000
typewriting students and correlated these tests with scores
determined by the Blackstone Stenographic Proficiency Tests
in Typewriting; chronological age, mental age, and scholastic
rank in the eighth grade.

The coefficients of correlation ranged from -.07
(chronological age) to +.14 (scholastic rank in grade eight).

18 Helen H. Sorrell, "A Study of Typewriting and Read­
ing Scores," National Business Education Quarterly, Vol. XXVIII
He concluded that the instruments used in this study cannot be used to predict success in typewriting.19

The typewriting grades earned by twenty high-school students in typewriting during the first six weeks of their instruction were compared with their English and history grades for the same period of time. A second comparison of typewriting grades with the average of all their other grades and with their intelligence quotients was made at the end of the fourth sixth-week grading period.

The researcher found a coefficient of correlation for the first six-weeks between typewriting grades and the English grades for the same period of .512; between typewriting grades and history grades, .464.

The coefficients of correlation for the fourth six-weeks grading period were the following: between typewriting grades and the intelligence quotients, .678; between typewriting grades and the average of all the other grades, .426.20

He says:

The greater mental capacity a student has, the better work he can do in typewriting....If this experiment, carried on, of course, on a small scale can be used as a basis of facts, it has proved that grades given in typewriting have a close correlation


with the intelligence quotient, and that grades given in typewriting are representative of the student's ability and are pretty well on a level with the grades given in the other subjects in the course of study. 21

Chapman, in an attempt to predict typewriting success, used in her study first-semester typewriting grades, based on daily quizzes and final tests; grades in high-school subjects previously taken; personality and character-trait ratings which were based on an average of the ratings made by four teachers; and intelligence test scores based on the Otis Self-Administering Test of Mental Ability.

This study was made with 307 first-semester typewriting students—239 business majors, 42 college preparatory students, and 26 general course pupils.

She found the following coefficients of correlation between typewriting grades and intelligence quotients and other grades: intelligence quotients, .20; English grades, .48; history grades, .38; and mathematics grades, .47; between typewriting grades and trait ratings, .41; between typewriting grades and the two-year grade averages, business majors, .46; college preparatory majors, .62; and general majors, .19; between typewriting grades and the trait-rating averages, business majors, .29; college preparatory majors, .53; and general majors, -.13; and between typewriting grades and I. Q.'s, business majors, .12; college preparatory majors, .22; and general majors, .11.

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21 Ibid., p. 264.
She concluded that the coefficients of correlation in this study were too low to be used to predict typewriting success.\textsuperscript{22}

Aldredge conducted a similar study in his attempt to answer the same question--whether or not grades previously earned would indicate success in typewriting. He compared grades earned by 1,019 secondary-school freshmen with grades made in their first-year typewriting course. The highest coefficient of correlation was .380. This represented the relationship between first-year typewriting grades and average grades earned in English, algebra, and Spanish. He concluded that the relationship between grades in first-year typewriting and grades earned in English, algebra, and Spanish is not strong enough to be valid as a measure of prognosis of grades to be earned in typewriting.\textsuperscript{23}

Stroker used three tests in her study--the A.C.E. Cooperative English Test, Lower Level, Form T., the Detroit Clerical Aptitudes Examination; and the MacQuarrie Test for Mechanical Ability. These were given to seventy-nine eleventh- and twelfth-grade first-year typewriting students of the Senior High School, Pittsburg, Kansas. At the end of the semester,


six 5-minute typewriting speed tests were administered to the students. These were correlated with the three tests listed above, which were chosen by the researcher because they seemed to encompass a number of activities which might prove significant in prognosis. 24

In her conclusions she states:

1. The A. C. E. Cooperative English Test alone cannot reliably be used for individual prediction in typewriting. However, the Mechanics of Expression Scale of this test might possibly be used in conjunction with other tests.

2. The data seem to indicate that for predicting probably typewriting success, the MacQuarrie Test for Mechanical Ability alone cannot be used reliably. Through further research, however, it is possible that the test might be changed into a more valuable device for use in determining success in typewriting.

3. Multiple correlations obtained between combinations of the tests and typewriting are not appreciably higher than that between the Detroit Clerical Aptitudes Examination and typewriting. The difference is so small that the Detroit Clerical Aptitudes Examination seems to give as good an indication as the three tests combined.

4. The Detroit Clerical Aptitudes Examination approaches the point where it might be used for individual prediction, but it is somewhat low. It could be considered along with other factors, such as interests and motivation, which have proved significant in typewriting. 25


25 Ibid.
Personality and Interest Inventories

A number of researchers intimated in their conclusions that in addition to the factors they investigated, interests, desire, and various traits of character seem to be significant in attaining typewriting success. The following studies were made with these specific factors in mind.

Ohmann gave the following tests to 225 high-school students: motility tests, language, directions, memory span, substitution, vocabulary, intelligence, spelling, handwriting, and character traits.

All of these factors were correlated with typewriting scores as determined by the Blackstone Stenographic Proficiency Tests, Typewriting. He obtained the following correlations: motility, .04; language, .22; directions, .07; memory span, -.14; substitution, .04; vocabulary, .06; intelligence, -.02; spelling, .36; handwriting, .23; and character traits, .22.

He concluded that the prognostic tests used in this study do not predict typewriting ability, thus character traits are not significant factors in typewriting prognosis.26

MacQuarrie gave the Downey Group Will-Temperament Test to 135 first-year high-school typewriting students in three different high schools. This test presumably tests for carefulness, self-confidence, aggressiveness, and determination.

Near the end of the first year, she gave these students three 5-minute, straight-copy tests on three successive days. The ten lowest and the ten highest scores in each high school were correlated with their Downey Group Will-Temperament scores. The coefficients of correlation obtained for the ten highest students in each school were: +.19; -.76; -.73. For the ten lowest students in each school, the correlations were: +.02; +.05; and -.02.

From these correlations she concluded that the Downey Group Will-Temperament Test does not contribute to the prediction of typewriting ability.27

Limp made a study that encompassed a number of tests. He gave the following tests to 107 beginning typewriting students: The Terman Group Test of Mental Ability, the Hoke Prognosis Test of Stenographic Ability, the Downey Group Will-Temperament Test, the Woodworth and Wells Easy Directions Test, the Whipple Cancellation Test, the Clapp Correct English Test, the Pressey Vocabulary Test, and the Courtis Arithmetic Test.

He correlated the tests with scores on weekly straight-copy timed writings and grades at the end of one semester of typewriting instruction. The highest coefficient of correlation was +.49 between the Hoke Prognostic Test of Stenographic

Ability. From the low correlations it would seem that these tests would not be of value in predicting typewriting success, thus the Downey Group Will-Temperament Test cannot be reliably used as a prognostic instrument.28

Barksdale attempted to answer the question whether the interests of prospective typewriting students can be used reliably to predict success in typewriting. She gave the Occupational Interest Inventory, Lee and Thorpe, to 129 first-year typewriting students. She then compared these scores with those obtained on three 10-minute, straight-copy typewriting tests given at the end of the school year. The coefficients of correlation ranged from -.157 to +.116, hence she concluded that the interests of students as revealed by this test cannot be used for predicting success in typewriting.29

**Vocational Aptitude**

**Mechanical ability and motor reaction**

Book and Orner sought to find out whether or not motor traits *per se* were of more importance in prognosis of


29 Anne Barksdale, "Comparison of Achievement in Typewriting and Interests as Measured by an Occupational Interest Inventory" (unpublished Master's thesis, University of North Carolina, Chapel Hill, 1947), 71 pages.
typewriting ability than were mental traits.

The many studies conducted with the I. Q., as well as tests and grades in academic fields seemingly had not given a reliable answer as predictive instruments.

Book believed that there was certain voluntary muscular control or general motor ability necessary for attaining a high degree of skill in typewriting, so he attempted to determine what some of these abilities other than those measured by intelligence were.

By means of a telegraph key connected electrically with a Hollerith Electric Speed Counter, he recorded the number of movements made in five seconds by forty-eight winners in more than eighty state and district contests throughout the world. These champions were assembled in New York for the Nineteenth Annual Typewriting Contest. In addition to these subjects, he had five ex-world champions and sixty-five students.

Four definite types of movements were measured for each: the rate per second the subjects could move their forefinger when the arm and hand were held in a definite and uniform way; the rate at which they could move the hand with the wrist as a hinge; the rate and regularity with which they could move the forearm from the elbow joint by moving the wrist; and the rate at which they could move the upper arm by the muscles of the shoulder and upper arm.
He found that the most skilled typist scored highest on the motor ability tests. He also found that the best scores on motor ability correlated highly with teacher ratings and grades. He stated:

We must conclude that the type of voluntary motor control called for by the motor ability tests used in these experiments is an essential characteristic for attaining the highest levels of skill in typewriting.\(^{30}\)

He found that the superior voluntary motor control possessed by these experts was not developed by practice in typewriting because the group of beginning typewriting students possessed as much voluntary motor control as the experienced typists. He stated, however, that there were other characteristics that were helpful and even necessary, such as the I. Q.\(^{31}\)

The same thinking as that expressed by Book seems to have given rise to a number of experiments stressing such factors as quickness of muscular reaction involved in various serial motor, substitution, and tapping tests.

One of the most complicated types of diagnostic tests of the motor reaction ones reviewed for this study was developed by Brewington. This test consisted of two serial-reaction tests.


\(^{31}\)Ibid., pp. 283-308.
The first test was to measure the rapidity and the degree of accuracy with which a student could react to the appearance of a series of numbers by pressing the typewriter keys with the fingers designated by those numbers. The numbers appeared through a slot in the top of a screen attached to a typewriter. As soon as one key was pressed, the next number appeared. Eight fingers with eight home-row keys were used. Speed and accuracy were weighted equally.

The second test was one of rhythm. It consisted of timing the regularity with which a student could strike a different key with each of the fingers of the right hand. The carriage of the typewriter was locked in the center and a drum of adding machine paper was electrically drawn over the platen as the subject wrote. She gave this test to forty-two beginning typewriting students.

The test scores were compared with the typewriting accomplishments of the subjects. Achievement was measured by the quantity and quality of class work and by performance on straight-copy tests.

These serial reaction tests involved a great deal of time and labor. Brewington concluded that the results were not sufficiently significant to justify their use.32

Berner also gave the Brewington test. He correlated it with the Blackstone Stenographic Proficiency tests, and

seven straight-copy tests administered at various times during the second semester of typewriting instruction. This study had 238 students as subjects. His correlations were such that he concluded the main use of the test would be to divide pupils into classes on the basis of their ability to learn typewriting, but not to predict the rank of a student in a given class.\textsuperscript{33}

Marcum also made an experiment with the Revised Brewington Prognostic Typewriting Test to determine the effect on the reliability and validity of a serial typewriting reaction test if the testees wrote two minutes of warm-up practice before writing the test. Blackstone's Stenographic Proficiency Tests, Typewriting, Form E were given to 380 beginning typewriting students, and Teden's Dictaphone Typewriting Tests, given at the end of the semester, were used as criteria of typewriting achievement. She concluded that the warm-up does raise the reliability of the prognostic test but does not affect the validity. As did the first Brewington test, the speed scores on the test are more valid and reliable than the error scores. The reliability coefficients, based on speed scores, ranged from .71 to .96; the validity coefficients, based on speed scores, ranged from .32 to .91. The reliability coefficients based on error scores, ranged from .36

to .82; the validity coefficients, based on error scores, ranged from .00 to .56.  

Yet another experiment with the Revised Brewington Test was made by Johnson with 140 beginning typewriting students. This was given during the fourth week of the typewriting instruction. The Blackstone Stenographic Proficiency Test was given during the twelfth week of instruction; and straight-copy timed tests were given during the eighteenth week of instruction. The coefficients of reliability based on the speed scores ranged from .54 to .87; coefficients of validity based on the speed scores ranged from .49 to .55. The coefficients of reliability based on error scores, ranged from .39 to .65; the coefficients of validity based on error scores ranged from .41 to .48.

She, too, concluded that the speed scores are more reliable than the error scores in this test. 

Walker investigated a number of motor tests to see whether they could be used as predictive measures in typewriting.

He selected the Stanford Motor Skills Unit which consists of six tests of motor ability. These tests were (1) Koerth Pursuit Rotor, measuring ability to keep a pointer on

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a moving object; (2) Motor Rhythm, measuring ability to tap exactly in time with a telegraph sounder; (3) Serial Discriminator, measuring ability to depress one of four keys as rapidly as possible after seeing a signal; (4) Brown Spool Packer, measuring ability to pack spools in a box, using both hands; (5) Speed of Tapping, measuring ability to tap a telegraph key rapidly for five seconds; and (6) Miles Motility Rotor, measuring ability to turn the handle of a drill as rapidly as possible. These tests were correlated with two 10-minute straight-copy typewriting tests which were given after seven months of typewriting instruction.

The coefficients of correlation ranged from .07 to .35 on the first six tests. The correlation between gross typewriting speed and total scores on the six motor tests was .36; between net typewriting speed and the six motor tests, the range was .00 to .62; between net typewriting speed and total scores on the six tests, the correlation was .15. The researcher concluded that there is no significance in the relationship between the motor tests given and the proficiency attained in typewriting.36

Substitution

Tuttle took as the point of departure for his study, the question whether those who become good typists have certain

types of native ability, and whether this ability can be measured. The traits that he considered native and essential were quick motor reaction, a keen sense of rhythm, the ability to pay attention and to be accurate, a well-developed memory span, ability to follow directions, and the ability to carry on the process of substitution.

He used twenty beginning typewriting students as subjects for his experiment. His tapping test for quick motor reaction consisted of tapping any key on the typewriter with any finger as rapidly as possible. Students were given five trials with each hand, each trial lasting for five seconds. The average number of taps was used as the score.

Tuttle used Seashore's test for sense of time as the basis for determining a keen sense of rhythm. In this test, the students listened to records on which different time intervals were designated by clicks. The students were required to indicate the length of the intervals.

The attention and accuracy test was a two-part timed test. The first part consisted of nine horizontal lines of sixty-one figures each in which there were 100 combinations of two consecutive figures whose sum was nine. All combinations of consecutive figures whose sum was nine were to be underscored. Five minutes were allowed for this portion of the test. The second part consisted of eleven horizontal lines of fifty-seven letters each, in which occurred 100 combinations of "x" and "n." All consecutive combinations of
"x" and "n" were to be underlined. Three minutes were allowed for this part of the test.

The memory span test was also divided into two parts. In the first part, there were six horizontal lines with a total of forty-five abstract words. The first line contained five words, and each consecutive line increased by one word until a total of ten words per line was reached. These words were read to the group a line at a time with an interval of one minute between readings. At the end of the minute, the group wrote as nearly as they could recall the lines of words in the order they had been read. The second part consisted of six horizontal lines with forty-five concrete words arranged as in the first part of the test.

The ability to carry on the process of substitution was another of the tests constructed by Tuttle. This consisted of nine combinations, each comprising one digit and a symbol which represented it. These symbols were arranged in twenty-five equal lines. Using a key as a guide, the student wrote the corresponding figures opposite the symbols. This test was of five-minutes' duration.

These tests for the various traits were correlated with a typewriting test. The following coefficients of correlation were found: Quick motor reaction, tapping test, .54; sense of rhythm, .10; attention and accuracy, part 1, .41.
part 2, .68; memory span, part 1, .30, part 2, .11; ability to follow directions, .17; ability to carry on the process of substitution, .52.

Tuttle concluded that the number of students used in the experiment was not large enough to make the results reliable.37

Despite the experimenter's conclusions, the study was described in order to illustrate one of the first attempts to use tapping and substitution tests as instruments of prognosis.

Gronert, Vavra and Easterbrook conducted experiments using a substitution type of test constructed by Gronert for which they claimed high predictive value.

In this test, the students wrote beneath a list of letters the number that appeared under that letter in a key. There were 100 occurrences of the seven letters chosen in the key. Gronert in her study, conducted in two St. Louis high schools, claimed that 87 per cent of those who failed in typing made a score below 50 in the substitution test. In other words, 100 per cent of the "E's" went to those who scored above 50 in the prognostic test, and the percentage of "F's" was more than six times as great in the group below as in that

above, while the high grades were 13 per cent more times as frequent in the group above 50.\textsuperscript{38}

Vavra and Easterbrook conducted this same test in conjunction with the Terman Group Test to 332 students at the Grover Cleveland High School in St. Louis. They state:

The substitution test indicates the presence of those qualities that make for success in typewriting, and in 85 per cent of the cases tested, its predictions of success or failure in typewriting were fulfilled. Therefore, this substitution test gives a fairly good prognosis of ability to learn typewriting.

Intelligence quotients furnish a good indication of ability to acquire typewriting skill.

Taken together, the substitution scores and intelligence quotients form an almost perfect prognosis, only five cases out of 332, or less than 2 per cent, failed to bear out indications.\textsuperscript{39}

Despite the high validity claimed for this combination for prognosis, no further evidence of its use was found by this researcher.

Barrett administered the following tests to ninety-six college students in beginning typewriting: Bennett's Stenographic Aptitude Test, Kuder Preference Record, MacQuarrie Test for Mechanical Ability, Minnesota Vocation Test for Clerical Workers, Strong's Vocational Interest Blank for


Women, Thurstone's Vocational Interest Schedule, and the Turse Shorthand Aptitude Test. The researcher compared these scores with typewriting grades earned by the students at the end of the term.

The chances in one hundred of earning a particular grade were computed and an attempt was made to increase the effectiveness of the predictions by combining the results of several of the tests.

She found that the number and name comparison scores on the Minnesota Vocational Test for Clerical Workers; the tracing, dotting, and pursuit scores on the MacQuarrie Test for Mechanical Ability; and the total scores on the Turse Shorthand Aptitude Test differentiated between good and poor typists. The other test scores showed no relationship to typewriting grades.40

Overholtzer, in his study, gave tests to seventy typewriting students—one group of fifty retarded junior-high pupils and another group of twenty senior-high students. The first group was given the Terman Group Test of Mental Ability, Form B, and the MacQuarrie Test for Mechanical Ability. The second group was given tests in substitution, immediate memory, concentration and accuracy, tapping, and following directions.

The coefficients of correlation between net typewriting rates and prognostic test scores for the junior-high school pupils were mental ability, .39; mechanical ability, .55. The coefficients of correlation between net typewriting rates and prognostic test scores for the senior-high pupils ranged from .08 (following directions) to .48 (substitution).

Despite these low correlations, he concluded that intelligence seemed to be an important factor. He did add, however, that there were other factors as yet unmeasurable, such as interest, and desire to learn, that were apparently of great importance.\textsuperscript{41}

**Tapping**

A prognostic test of the tapping type for which the author claims high predictive value was developed by Ashby. He thought that as the Air Force had been successful in training the men by use of equipment in situations similar to those actually encountered in flying a plane, this apparatus-testing technique might be effective in prognosis in typewriting.

In developing the test, Ashby was influenced by the fact that in the normal operation of the typewriter, 40 keys are stroked frequently, 24 of which are under the control of the middle and index fingers. These fingers carry the load in typewriting, and in most people are the most facile. Of

\textsuperscript{41}John Mathias Overholtzer, "A Study of the Possibilities of Predicting Success in Typewriting" (unpublished Master's thesis, University of Southern California, 1928), 45 pages.
these 24 letters he chose "d," "f," "j," and "k," because these are usually considered to be the guide keys of the middle and index fingers; he chose "e," "r," "u," and "i," because the test was to be projected upon a screen, and the natural movement of the head and hands is upward.

Only three operations of the typewriter were taught—returning the carriage, operation of the space bar with the right thumb, and stroking the keys with the middle and index fingers. The instructions for these operations took about five minutes. The test itself took about thirty minutes which included ten minutes for presenting information concerning the testing procedure.

The test consisted of one, two, or three letters flashed on a screen by means of a tachistoscope. Each of the single-letter units was to be typed ten times; the double-letter units seven times; and the triple-letter units five times. The various units were flashed several times to permit the slowest individual to achieve at least some degree of success. The proper reproduction of each unit whether of one, two, or three letters was valued at one point. This made possible a score of 312. The range proved to be from 93 to 312.

The study itself was carried out at the Air Force Clerk-typist School at the University of Oklahoma. The subjects covered in this school were English and correspondence, filing, and typewriting. Each class, composed of twenty-five
men, met two hours a day, five days a week, for twelve weeks. This made a total of 120 hours of instruction in each subject. The population of the study was composed of 1,198 airmen which the researcher classified into Base and Predictive Groups. There were 851 in the Base Group, and 247 in the Predictive Group. Ashby used as his selective factors formal education, age, prognosis test, Air Force Qualifying Test, clerical aptitude, and the final grade in typewriting which was designed as the criterion for achievement in typewriting.

He found a coefficient of correlation between the prognosis test and achievement in typewriting of .614.42

He states the following:

With the 247 airmen in the Predictive Group, approximately 75 per cent of the final grades in typewriting were predicted to within a ± .5 of the grade actually achieved.43

He further comments:

It is commonly recognized by statisticians that in most cases a single factor used in prognosis is less significant than a combination of associated factors. In this statistical study the highly significant factor of prognosis test (the correlation between the prognosis test and achievement in typewriting was .614) was combined with one or more of the other factors when the achievement of the airmen was to be prognosticated. The extensive predictive calculations involved in this study indicate that, when factors associated


43Ibid., p. 112.
with achievement in typewriting are combined in the prognosis procedure, predictions within narrow limits can be made in two-thirds or more of the cases.\textsuperscript{44}

Douglas constructed a tapping test which could be given to beginning students after two, seven, or fifteen hours of typewriting instruction. It was based on the writing of simple exercises involving home keys, space bar, and carriage return lever.

This study was conducted with 513 students over a three-year period. On the basis of the test scores, the students were divided into superior, average, or below average groups. Weekly five- and ten-minute timed-writing scores in both net and gross words per minute were collected. In addition to these, test scores on the UBEA Students' Typewriting Tests, Volume XIII, Test 2 were used as criteria of success.

Product moment coefficients of correlation between the prognostic tapping test scores and the net speed ranged from .35 to .77; between prognostic test scores and gross speed, .53 to .78; and between prognostic test scores and achievement test scores, .42 to .68. The correlation between prognostic test scores made by the same pupils when the test was repeated after a five-day interval was .88. Douglas felt that the test was reliable and valid enough to be used for guidance purposes. He maintained that from the data charts

\textsuperscript{44}Ibid., p. 113.
prepared from the tapping test scores, it was possible to predict typewriting rates for a pupil in any of the three groups (superior, average, below average) and for any group from the sixth week through the thirty-sixth week.45,46

Another test which the author claims to be highly predictive is a tapping test constructed by Flannigan. He maintains that the test is formulated on a systematic analysis of the aptitudes involved in typewriting. It is based on two job elements—the ability to tap with one finger at a time by controlling each finger separately and independently; and the ability to respond with a particular finger on perceiving a letter, number, or other type of symbol.

This test uses small adhesive-backed circles made of felt. One is attached to each finger. Each circle is moistened with a different color of ink which provides identification of each finger used for tapping. A letter is assigned to each of the fingers. The test consists of nine separately timed sections, arranged in order of increasing complexity, in which the student taps on circles which designate specific letters.

Coefficients obtained by correlating the scores on separately timed halves of the test were computed for nine


typing classes from four separate high schools. Measures of the predictive value of the tapping test were obtained by comparing the scores on the test with numerical equivalents of grades in typing courses and typing tests scored in terms of words per minute. \(^{47}\)

Flannigan found the following coefficients of correlation:

The coefficients between first semester grades and scores from the Tapping Test given at the end of the first semester range from 0.44 to 0.66, with an average of .53. Predictive validity coefficients were obtained by correlating grades and typing test scores given at the end of the semester with the results from the Tapping Test administered at the beginning of that semester (or at the end of the preceding semester). The respective coefficients with grades at the end of one semester are 0.49 and 0.56, and for grades at the end of the second semester they are 0.56 and 0.43. \(^{48}\)

He goes on to say:

One other consideration seemed important in evaluating this new test. This related to the question of whether the test is measuring something different from the usual intelligence test, and whether it will provide predictions superior to those available from such scores. The data . . . indicates the correlation of the Tapping Test scores with intelligence test scores is only moderate and that the predictive validity of the intelligence test scores is practically negligible, the coefficient ranging from 0.08 to 0.19. The particular intelligence test which was used in this study was not mentioned. It therefore appears that the test is measuring unique job elements which have a useful amount of predictive value with respect


\(^{48}\) Ibid., p. 357.
to acquiring skill as a typist or operator of other keyboard machines.\textsuperscript{49}

\textbf{Conclusions}

It would seem, then, after a review of available literature concerning various factors used to predict success in typewriting, that while a few researchers claimed high predictive value for certain of these factors, the consensus was that on the whole these various factors, individually used, and even used in combinations, were not reliable.

Opinions of a number of educators bear out this same conclusion. Seemingly, this view has not changed over a period of years.

In 1937 Lessenberry stated:

\begin{quote}
A summary of attempts to find a reliable means of predicting ability to learn typewriting must inevitably conclude with the statement that no single measure or combination of measures have been proved reliable. Research must be continued. Perhaps the first step will be the discovery of the factors that must be present for successful typing. This discovery may call for case studies of outstandingly successful classroom typists as well as conspicuously unsuccessful ones. Then, too, much work should be done on the problem of interest, for this is probably the chief factor that must be present for successful learning.\textsuperscript{50}
\end{quote}

In 1940, Orner stated:

\begin{quote}
The process of learning to typewrite is composed of many complex factors. It is difficult, therefore, to segregate any one factor and set
\end{quote}

\textsuperscript{49}Ibid.

\textsuperscript{50}Daniel D. Lessenberry, "Predicting Ability to Learn Typewriting," \textit{The Balance Sheet}, Vol. XVIII, No. 9 (1937), P. 432.
it apart as being more important than some other
one. This being the case, it is evident, that
probably no one factor is of itself solely re-
sponsible for typing achievement.  

In 1941, Selby maintained:

Typewriting success and established I. Q. is
close to zero; there is no relation between hand
size, or finger length, or hand span; seemingly
no relation between finger dexterity; and no
relation between blood pulsation. Some phleg-
matic people are successful and some aren't.
Sex, stature, weight, age, and race are not de-
termining factors in typewriting success.  

In 1954, the Sub-Committee, Joint Committee on Co-
ordination and Integration of Research in Business Education
came to this conclusion:

No single test or device has been found that
can be used with confidence for the purpose of pre-
dicting success in learning typewriting. The
coefficient of correlation between combined scores
of certain batteries of tests and a criterion of
success in typewriting show a high degree of re-
relationship between the general intelligence ratings
of pupils and their ability to learn to type straight
copy with speed and accuracy is very slight. How-
ever, the relationship is greater between general
intelligence ratings and the ability to perform
the duties of a typist and to produce usable copy
of high quality in all kinds of practical type-
written work.

51 Louise Jackman Orner, "Factors Relating to Success
or Failure in Learning to Typewrite" (unpublished Master's

52 P. O. Selby, "Are Predictive Tests Reliable," The
Journal of Business Education, Vol. XVII (October, 1941),

53 Joint Committee of UBEA, NABTTI, DPE, "What We Know
about Typewriting--from Research," Business Education Forum,
Vol. VIII, No. 6 (March, 1954), p. 32.
In 1955, Palmer stated in his study:

Many and varied studies have been made to predict ability to do straight copy typing. Tests for motor ability, reading, spelling, reaction time, eye span, and intelligence have resulted in little or no correlation.\(^{54}\)

In 1957, Turse says:

Because "success" is a relative term, and because incentive, industriousness, personality, and many chance factors, as well as pure ability or capacity, may condition success, the best modern aptitude tests are fallible and the problem of prediction is still a baffling one in most areas of educational and vocational effort, including business education.\(^{55}\)

Rahe reports that the conclusions of the majority of the studies he reviewed indicated that there was no single test or other measurement which can be used reliably to predict success in typewriting. A few researchers obtained high coefficients of correlation and concluded that their tests could be used satisfactorily for predictive value, but these writers were in the minority.

The findings, he thinks, indicate that the use of a battery of predictive tests is more reliable than the use of a single test. Most of the investigators found that the following used individually were not reliable as predictive instruments: intelligence quotients, average of all grades


earned previously, personality and character-trait ratings, reading speed and comprehension test scores, clerical aptitude test scores, interests of typewriting pupils, vocational aptitude test scores, and eye movements.

When, however, two or more of the test scores or other measurements are combined, a predictive index may be obtained that has some value for prognosticating success in typewriting.56

Equating Factors Used in this Experiment

Seemingly, there is no one factor which can be used reliably for the prognosis of typewriting success. A number of factors, however, while not infallible, are at least more reliable than one.

For this study the factors chosen for equating the students in the experimental and the control groups were the intelligence quotient, the average of the student's last two years English grades, age, grade placement, and sex.

The intelligence quotient as a factor of success in typewriting has the support of some of the researchers cited in this study. Stedman, Korngold, Sorrell, Gronert, Vavra, Easterbrook, and Book thought the intelligence quotient was at least helpful in prognosis of typewriting success.

The Puckett study indicated that grades in other subjects had some significance in relation to grades in typing. The average of the student's English grades for the past two years was chosen as an equating factor because English is comprehensive, including as it does, grammar, spelling, punctuation, reading, etc; and English is included in the curricula of all students.

Age and class rank were chosen as equating factors as these two together should eliminate the very slow student as indicated by over age for a particular class rank, and the very precocious student as evidenced by under age. Sex was added as the fifth factor in order to get additional homogeneity in the equated pairs.

Chapter V describes the setting for the study.
CHAPTER V

THE SETTING FOR THE STUDY

The setting for the study was the Springfield City (Ohio) and the Clark County (Ohio) high schools where there were adequate facilities and teaching staff for conducting the study. The study involved six schools. In these six schools, thirteen classes, seven teachers, and three hundred ten students in elementary typewriting participated in the study.

The schools

Of the six schools participating in the study, four were county schools and two were city schools. The total enrollments in these schools ranged from 251 to 1350. The enrollments in the business curriculum ranged from 50 to 443; and in elementary typing classes ranged from 2 to 7 comprising 44 to 210 students.

The number of periods in the day ranged from 6 to 8, and the length of the periods ranged from 40 to 55 minutes. The school having the 55-minute period used 15 minutes of each period for counseling or supervised study, so this period for typewriting was actually a 40-minute period.
The total number of teachers staffing these schools ranged from 17 to 75; the number of teachers in business, from 1 1/2 to 8.

The teachers

Of the two men and the five women who participated in the study, two had Master's degrees, one with eight semester hours beyond that degree; two were well along in their work toward the Master's degree; one had eight semester hours toward the Master's degree; and two had no additional training beyond the Baccalaureate degree. (See Table 1 for data concerning schools, teachers, and equipment)

The teaching experience of these teachers ranged from 4 to 34 years, and their experience as typing teachers ranged from 2 to 25 years.

The classrooms and the equipment

The classrooms in which the typing classes were held were all well lighted and well ventilated. The typing tables and chairs were adequate; some tables and chairs were adjustable; where the tables and chairs were not adjustable, they were of varied heights. All rooms had ample chalkboard and bulletin board space. As some of the schools were much newer than others, some of the equipment was much newer in some than in others; all facilities, however, seemed to be adequate.
<table>
<thead>
<tr>
<th>School</th>
<th>Classification</th>
<th>Enrollment</th>
<th>Business</th>
<th>Classes in Experiment</th>
<th>Enrollment Each Class</th>
<th>Teachers Total Bus.</th>
<th>Periods in day</th>
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<td>255</td>
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<td>28</td>
<td>75</td>
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<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>Length of period</td>
<td>Adequate lighting and ventilation</td>
<td>Acceptable type tables and chairs</td>
<td>Adequate chalkboard and bulletin board space</td>
<td>Demonstration timer, stands</td>
<td>Charts, clock, etc.</td>
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<tr>
<td>---------------------</td>
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<td>---------------------------------------------</td>
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<td></td>
</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
<tr>
<td>(experimental)</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(counseling)</td>
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<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td></td>
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<td>School</td>
<td>Age range of typewriters</td>
<td>Total years taught by participating teachers</td>
<td>Total years taught typewriting</td>
<td>Highest degree held by participating teacher</td>
<td>Semester hours beyond degree held</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
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<td></td>
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<tr>
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<td>3-7</td>
<td>10</td>
<td>10</td>
<td>A. B.</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwestern (experimental)</td>
<td>1-15</td>
<td>10</td>
<td>10</td>
<td>B. S.</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shawnee</td>
<td>1-3</td>
<td>15</td>
<td>15</td>
<td>A. B.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1-22</td>
<td>3</td>
<td>2</td>
<td>B. S.</td>
<td>0</td>
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<td></td>
</tr>
<tr>
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<td>All new</td>
<td>13</td>
<td>13</td>
<td>A. B.</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>13</td>
<td>M. B. E.</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
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<td>1-3</td>
<td>34</td>
<td>25</td>
<td>M. A.</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There was quite a range in the age of the typewriters, but there was no school that had its newest machines older than two years. One school, a new high school just opened in the fall of 1960, had all new equipment. All classrooms had demonstration stands, wall charts, clocks, and interval timers.

From the information obtained concerning the schools participating in this study, it would appear that the study embraced a comprehensive range of schools in size, age of equipment, teaching staff, and pupil personnel.

The instructional and testing materials used in the study will be described in the following chapter, Chapter VI.
CHAPTER VI

INSTRUCTIONAL AND TESTING MATERIALS

The SKILL-BUILDER Controlled Reader which was used in this study is a 35mm filstrip projector with a speed control ranging from two to eighteen lines per minute, or twelve to one hundred eight typing words per minute. This instrument projects materials in either a left-to-right motion, or the reader may be stopped to permit viewing through an open slot which presents an entire line of copy at one time. Thus material can be presented at a pre-set speed which encourages faster response or complete control, or the material may be arrested for instructions or typewriter manipulation.

Variable speeds may be set on the SPEED-BUILDER Controlled Reader by each turn of the control dial as each turn increases the speed by six words a minute. By these variable speeds the material may be paced according to the level of the group or the individual.

Filmstrips used with the SKILL-BUILDER Controlled Reader

Twenty-five 35mm black and white filmstrips, comprising seventy-five lessons, were used with the SKILL-BUILDER
Controlled Reader. These filmstrips were produced by the Educational Developmental Laboratories. They cover exercises in alphabetic keyboard reviews, stroking, double-letter words, one-hand and alternate-hand words, word recognition, carriage return, numbers and symbols, machine manipulations, phrases, sentences, alphabetic paragraphs, vocabulary previews, and one- two- three- five- and ten-minute timed writings. These films were developed for use after the students had covered the keyboard.

Thirty strokes (six typing words) appear on each filmstrip frame. This allows for accurate control of projection speeds from the twelve to one hundred eight words per minute, at six words per minute intervals.

Filmstrip No. 1 is representative of the various types of drills presented. Each of the filmstrips is divided into three lessons. The following material is contained in Filmstrip No. 1:

Lesson 1

a: Alphabetic Keyboard Review—Letter A

a ask jam air ago aim ark axe lay away aqua zany able
avail Adam Alice Astor Allan Allied Avis Alden Agnes
Adler Alpine ay say day may pray slay play ar arm
art arc are army arrow an and ant any ante anti anon
all fall hall call ball small

b: **Stroking Exercise--a, ;**

a ; aqua paper haze squaw tap puzzle; adequate prise; ozone a / quip apart zero quiet par pretzel acquaint; quiz prints / a pat; quick pip play; razz acquire paralyse; quick prime a ; map quest maze leap; buzz bouquet organize; plaque raze

c: **Number Exercise--4 7**

fr4 ju7 4rf 7uj 47 47 74 74 4 fj47 jj7j ff4f 4ffj f4j7 477 744 7 4777 fjjf fur f74 47f 4477 47 f4f j7j f4f j7j 4f4 737 47 fj jjf 4774 There were 47 men from 74 counties. Among the group, 7 had 4 children and 4 had more than 7 children in our school.

Lesson 2

a: **Phrases**  (Do not type marks between phrases)

there is ' for them ' on a ' by any ' can do ' on time ' with each ' at a ' who will ' will be ' as the ' as to ' on time ' to work ' is a ' to a' to one ' it is not ' as to ' to others ' to be ' when the ' all of ' of his ' to gain ' is also ' is not ' over the ' when the ' in a ' with every ' of the ' such as ' who is ' at a'

b: **Sentences**  (First sentence is alphabetic)

Good zealous men join quickly as new examples for the brave. Every student can do a better job with each school activity. The student who is on time to class will be on time to work. A good painter will paint the entire house in only two days.

c: **Alphabetic Paragraph**  (si 1.416)

The quiz is a part of student life which takes on a variety of meanings. To one student, the quiz is looked forward to as a method for measuring the results of study. To others, every quiz is a taxing job to be avoided by any legal means.

Lesson 3

a: **Vocabulary Preview**

typing techniques posture eye proper movement keyboard gain also habits potential ability bounce jerky damaged carriage
Typing skill will grow as the student learns to control all of his typing techniques. It is not easy to gain in typing skill when the posture is not proper, when the hands bounce up and down over the keyboard with too great a movement, or when the carriage movement is jerky. Skill is also damaged when there is eye movement to the keyboard with every other word. When all of the proper habits are developed and each is practiced to perfection in class, typing skill will grow in a steady fashion until the potential ability is obtained.

The remaining twenty-four filmstrips are similar in organization to Filmstrip No. 1, each emphasizing the review of a particular letter, plus numbers, and symbols. Table 13 in the Appendix gives the contents of each filmstrip.

As these filmstrips were designed to be used to supplement a basic textbook, it was thought necessary that classes in both the experimental and the control groups in this study use a common textbook.

Basic textbook used

The textbook used by the students participating in this study was *20th Century Typewriting, Complete Course, Seventh Edition.*² This book is planned for four semesters of typewriting instruction. Each of the four parts has seventy-five lessons. This study, however, is concerned only with the first two semesters of instruction.

In this text, the emphasis in the first semester is on the techniques of learning to typewrite; the second, on personal and office-production typewriting.

The manner in which the contents of this textbook, as well as any supplementary materials, was used was a matter of discretion of the individual teacher.

Test materials used

All the testing materials used in this study were chosen from this basic text. This selection was made primarily to conform to a basic principle adhered to throughout the study. This was that at no time would any element knowingly be introduced that would in any way lessen the authority of the classroom teacher or add unnecessarily to the work load; nor would any factor be added to a class situation that might cause tension on the part of the teacher or the students.

Since the teacher and the students were accustomed to working with the basic text, tests taken from this book would seem a normal classroom procedure. Also as the layout, print size, and the presentation of the material were all familiar to the student, the usual test-tension should be lessened.

An additional reason for selecting the testing material from the basic text was that the material was correlated with the student's daily typewriting instruction, hence it should be more appropriate for the student's particular
stage of development than material taken from another source. Also, the administration of tests taken from the textbook would cause a minimum of work for the teachers involved.

The possibility of a student's practicing any particular exercise preparatory to taking the tests was precluded by the fact that no one knew what the selection was to be until the morning of the test. As the selection could be any exercise within a span of ten class sessions, it is doubtful that practicing within this range would make any difference in the test score.

The eight tests used in the study were as follows:

First test

Do you want to learn to type? Well, you can learn if you want to learn and will work to type.

If you hit the wrong key, let it go; just keep on. Do not stop or look up from the page. Just type one word at a time.

You can do what you want to do and will work to do. A man makes his own luck, good or bad, by the kind of work he does and by his thoughts.3

Second test

It takes time for things to grow. When a man plants a seed of corn, he does not go out the next day to look for a new stalk of corn. First the blade; then the ear; and then all the grains on the ear.

It is much the same with a skill. It takes time for a skill to grow, and it takes the right kind of work, too. A seed of corn will grow corn

and not wheat or rye. From the work you do to build a skill, will come a skill of the same kind.

To type well, you must learn to type with speed to be sure; but you must learn to type with ease so that what you type will be right. Do the work in the right way; then you can be sure that both speed and ease will come at the right time. You have to work and you have to wait.4

Third test

You can knock the chip off the shoulder of most men if you will pat them on the back. Not many men can hold on to a grudge against the one who feels like giving them a cheer for a sneer—a pat for that chip they have too long kept on their shoulder.5

Fourth test

Now is the time to put zip into the work. If you want to type well, do the right amount or work at the right time and in the right way. This is the quick way to build skill in typing. It is as simple as that. Will you do it? Work to build speed, and drop back to get control.6

Fifth test

You have had speed as your goal for a time. It is now time to change the goal and learn to type with ease. Do it now as you type these words. Drop back eight words in your rate.

Slow down for a time. Type at a pace that will give a sense of ease. Hit one key at a time. Move on to the next key and hit it. See the word and type it; and move on. To type well, type this new way.

Do not loaf as you type, but do not push for speed all the time. You can tie your mind in knots if you strive for speed all the time. Know the goal for which you type; then gain the goal through the right kind of work.7

Sixth test

Make your mind reach for more speed, and you will gain it in time. It may take more than one try for you to build the speed you want to have, but be sure you can build speed if you will just reach for it with your mind.8

Seventh test (given at the end of the first semester)

Begin to type at an easy pace. Do not hurry or worry—just keep on typing. You will be amazed at how much speed you will have if you learn to keep on—learn to type without pauses between words. You do not need to make the fingers go more rapidly, but you do need to keep them moving from key to key at an even speed.

You can now type well enough to type your themes and letters and other papers. Put your skill to work for you. Decide on the form to use; then compose as you type. Think of what you want to say—not of how you are to type. Tell the fingers what they are to do. You tell them what they are to do as you think the words you want to type.9

7Ibid., "Skill Measurement 40, C," p. 60.
Follow-up test (given three weeks before the end of the second semester)

Do you remember the story of the old crow and the pitcher of water? As the story goes, the crow was so thirsty he couldn't even caw. To make matters worse, there was plenty of water in the bottom of the pitcher but try as he might the poor old crow just could not reach it. Then the crow did something all of us should do more often. He set about solving his problem. He spied some pebbles near by and they sparked the idea that was to save him from dying of thirst. One by one he began dropping the pebbles into the pitcher. With each pebble that he dropped into the pitcher, the water level rose. Well, you remember the end of the story--it wasn't long before the thirsty crow was drinking away to his heart's content.

All of us can learn many things from this ancient fable. When we are faced with a problem to be solved, we should first be sure that we understand the nature of the problem. It is then that you and I can analyze the problem and do something about it. In typing, for instance, you should start with a critical appraisal of the way you type, the way you organize your work, and the way you do the actual typing of a problem. Then, with such an appraisal as the basis for practice, you can begin a campaign against waste time and unnecessary motions in all your typing work. If you have the right goals in mind, and if you work in the right way, you will be amazed at the speed with which you can reach expert performance.10

The procedures followed in using the filmstrips with the SKILL-BUILDER Controlled Reader, and the method of conducting and evaluating the tests will be described in Chapter VII--Procedure for Conducting the Study.

CHAPTER VII

PROCEDURE FOR CONDUCTING THE STUDY

During the summer of 1960, preliminary to starting this study in the fall of the school year 1960-61, permission was obtained from the executive heads and principals of the two city high schools in Springfield, Ohio, and the six county high schools in Clark County, Ohio, to use those school systems in the study. Later, however, it was discovered that two of the county schools could not be included, as the typing textbook used in those schools was not the same edition as that used in the other schools.

After permission of the executive heads and principals was obtained, it was necessary to get the cooperation of the teachers. The teachers who were to take part in this study must be interested in research in general and willing to undertake this particular experiment; they must have had at least two years of teaching experience in elementary typewriting; and they must be acknowledged as good teachers by the administrative heads of their respective schools. A list of seven teachers who fulfilled these requirements was secured from the principals.

The four of these seven teachers who were available during the summer were interviewed, and the purpose of the
study outlined to them. The remaining three teachers were contacted as soon as they arrived for the opening of the fall school term. All seven expressed their willingness to cooperate in the study.

It was necessary to have the same teacher teach all the experimental students as only one SKILL-BUILDER Controlled Reader was available. It was decided to use a number of different teachers to teach the control students in order to decrease, insofar as possible, the teacher factor in the study.

If the variability in the competence of the teachers chosen affected this study, to that degree the results would be invalid. The researcher was compelled to rely upon the judgment of the administrative heads and her own acquaintance with these teachers to insure as much uniformity in professional skill as possible.

From this group of seven teachers, then, one teacher was chosen who was scheduled for two sections in elementary typewriting, who taught no other elementary typing classes, and who was willing to use the SKILL-BUILDER Controlled Reader.

The two classes that comprised the experimental group totaled forty-seven students. For purposes of comparison of the achievement of these students, as many as possible were
equated with an equal number of students from the eleven classes of 263 students which comprised the control group.

**Equate the experimental and the control students**

As noted in Chapter IV, research has not pinpointed any one factor by use of which success in typewriting can be predicted. A number of factors are at least more indicative than one. For this study, the factors of age, sex, class rank, average of the past two year's English grades, and intelligence quotients were used to pair the experimental and the control students.

The intelligence quotient was chosen because it has the support of some research; the average of the past two years' English grades was decided upon because English has many facets, covering as it does, grammar, spelling, punctuation, reading, and so forth. It is also a common subject in all curricula. Age and class rank were chosen to eliminate the very slow student as indicated by over-age for a particular class rank, and the very precocious as indicated by under-age for a class rank. Sex was chosen to give additional homogeneity to the groupings.

The age taken to equate the pairs was that nearest to September 1. Sex and class rank posed no problem. In averaging the English grades, however, it was necessary to convert all grades to letter grades, as the majority of
the schools used this method of grading. Those grades which appeared on the school records as percentages were converted to letter grades by means of a conversion table supplied by the schools.

It was also necessary to convert the intelligence quotients to a comparable form, as the I. Q. 's listed on the school records were not all based on the same mental ability test. This conversion was made by listing each student's I. Q. as superior, above average, average, below average, or low, according to the specific mental ability test appearing on the student's record. The information for converting these tests was obtained from the Department of Psychology at Wittenberg University.

It was possible to pair only thirty-five of the forty-seven experimental students. Such factors as over-age or under-age for class rank, too low or too high an intelligence quotient for the grades received in English, or opposite sex for students having similar equating factors made it impossible to equate six students. In addition, one student was out of school because of an extended illness, three dropped the course before the end of the term, and two moved out of the school district.

**Characteristics of the paired students**

Of the thirty-five equated students, twenty-two were in the tenth grade; eleven in the eleventh; and two in the
twelfth. Twenty-seven were girls, and eight were boys. The ages ranged from fourteen to seventeen years; and the intelligence quotients ranged from low to superior. The grades averaged in English from "A-" to "D." (See Table 2)

The formal typewriting instruction

The formal typewriting instruction for both the experimental and the control groups was the individual concern of each teacher. No attempt was made to influence the method of presentation in either group. The textbook used in all classes was 20th Century Typewriting, Complete Course, Seventh Edition. The choice of any supplementary materials used in the classes was at the discretion of the individual teacher. The only suggestions made to the teachers were concerning the specific tests given in conjunction with the study.

All instruction to the experimental group concerning the use of the SKILL-BUILDER Controlled Reader and all testing done in both groups was done entirely by the classroom teacher. This policy was followed in order not to detract from the classroom teacher's authority and not to cause tension in the students by having an outsider interfere in an established routine.

1Lessenberry, Crawford, and Erickson, op. cit.
## Table 2

Data on Students Participating in Study

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In each group: 1 superior, 12 above, 17 average, 3 below, 2 low
Use of the SKILL-BUILDER
Controlled Reader

The introduction of the SKILL-BUILDER Controlled Reader was delayed until both the experimental and control groups had completed twenty class sessions. This was done in order to give the classes an opportunity to have completed practice on all the letters on the typewriter keyboard.

On the twenty-first class session, two 3-minute straight-copy tests were given to all classes, both control and experimental. This material was taken from the basic textbook, as was all the testing material.²

After these two tests were given in the experimental classes, the SKILL-BUILDER Controlled Reader was introduced by the instructor. The reader was set up and demonstrated to the class; its purpose of developing speed and accuracy explained; and the over-all program of its use described to the class. The students then began their first work with the projector, using Filmstrip. No. 1.³

This filmstrip covers the letter "a," "i," "4," "7," phrases, sentences, an alphabetic paragraph, vocabulary preview, and a one-to-three minute timed writing. On this first day the timed writing was omitted, as the class had

³Ruegg, Filmstrip No. 1, op. cit.
just taken the two 3-minute timed writings at the beginning of the class period.

The practice on the numbers was also omitted as the class had not advanced to this point in the classroom instruction. In fact, numbers and symbols were not stressed in the work with the SKILL-BUILDER as the evaluating tests were planned not to include them. It was felt that with such a limited time for practice with the machine, more could be achieved by practice on material that lent itself to a more fluent type of rhythm.

The plan was to use the SKILL-BUILDER Controlled Reader for approximately ten minutes of each class period. On the first day, however, the time ran between fifteen and twenty minutes because there was a certain amount of delay in getting students oriented to the machine. Also, some experimentation was necessary to find the range of speeds best suited for the class at this stage of their training. This range was found to be from eighteen to thirty words a minute.

Each day thereafter, at the beginning of the period, the experimental students worked with the SKILL-BUILDER for about ten minutes. This time was extended now and then when class interest ran unusually high or the filmstrip correlated especially well with the formal class instruction.

This projected material was used both as a speed-forcing and a control-building device. During the practice
periods the speeds were adjusted to the varied abilities of the students. When the speed became too fast for the slower students they had been instructed to respond to the left side of the moving slot; that is, they typed each word or group of words (according to their ability) as the material was being covered rather than when it appeared. By thus responding to the left side of the moving slot, these slower students could keep at their top speed yet not be frustrated by the material's being projected at a rate faster than they could cope with. This method of following the copy was also used in control building for the faster students. When the speed was set at a slower rate to accommodate the slower students for speed forcing, the faster students used the slower speeds for control building. There did not seem to be any confusion caused by the varied speeds which might be below or above any particular student's ability; indeed, at some time during the practice period, each student hit his stride.

Ability grouping within the class would have made it easier to deal with individual differences, but both the administrator and the teacher in charge of the experimental classes felt that too much time would be consumed by having a number of groups working with the SKILL-BUILDER during one class period. They also felt that too much confusion might ensue when some of the students would be working with the reader while others were working from the textbook.
Integration of the formal instruction with that of the SKILL-BUILDER Controlled Reader

A teacher's manual to be used in conjunction with the filmstrips listed the contents of each filmstrip. By use of this manual, the teacher chose the filmstrips that correlated with the goals set for the period: to point up or intensify previous instruction in the textbook; to introduce the textbook instruction which was to follow the SKILL-BUILDER practice period; to do remedial work; to force for speed; or to work for control. The main purposes in using the SKILL-BUILDER Controlled Reader, however, were to force for speed, then to fall back for control.

The testing program

The evaluation of the student's achievement was made through a series of tests—seven 3-minute tests plus a follow-up of five minutes' duration. All of these tests were on material chosen from the basic text. (See Chapter VI)

As noted previously, the first of these tests was given on the twenty-first class session. The other tests were given at ten-day intervals except the one at the end of the first semester which was given eight days after the preceding test. Each three-minute test was given twice, the second test immediately following the first. These tests

were graded by the researcher in conformity with "Extracts from International Typewriting Contest Rules." These rules cover such details as line spacing, length of page, paragraphing, spacing after punctuation, transposition of letters, and so on. (See Appendix for these rules.) The better of the two scores as measured by gross words per minute was recorded as the student's achievement.

Gross words per minute represent the total number of words written in one minute. The figure is determined by dividing the total number of strokes written by five and then by the number of minutes in the timing. Five strokes are considered a word in typewriting computations. This measurement does not take into consideration the accuracy of the stroking.

In addition to scores on gross words per minute, scores were recorded on the total number of errors made in each test of record. These total errors were averaged per minute in Figure 2 in order to give a comparison of the progress of the two groups.

The follow-up test which was given three weeks before the end of the second semester was of five-minutes duration and was given twice on each of three successive days. The best of these six scores was recorded.

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The follow-up

At the end of the first semester, one of the experimental classes discontinued the use of the SKILL-BUILDER Controlled Reader and the other continued with it. This was done to give a comparison between the two experimental classes. No testing, however, was done for this study in any of the classes, either experimental or control during the second semester until three weeks before the end of the semester when the follow-up test was administered as part of the final examinations in the high schools.

The follow-up test was given to ascertain whether any advantage gained by use of the SKILL-BUILDER Controlled Reader in the first semester had been retained, increased, or lost in the second semester; and whether the experimental class that continued with the instrument training made greater gains in the second semester than did the class that discontinued its use.

Eight tests were recorded for each student—six three-minute tests given at ten day intervals, a final three-minute test at the end of the first semester, and a five-minute follow-up, three weeks before the end of the second semester. Scores of these tests were treated statistically so that conclusions could be drawn from this experiment. Chapter VIII details the results.
CHAPTER VIII

RESULTS AND INTERPRETATION OF DATA
OBTAINED FROM THE STUDY

The findings of this study were based on the results of seven 3-minute, and one 5-minute straight-copy timed writings measured on gross words per minute and total errors. The first test was given when the classes had completed twenty class sessions; the other tests followed at intervals of ten days, with the exception of the seventh and the follow-up tests. The seventh test was given at the end of the first semester and came eight days after the sixth test. The follow-up test (the eighth) was given three weeks before the end of the second semester and consisted of two tests given on three consecutive days. Each of the first seven tests was given twice, and the better of the two scores was recorded as the student's achievement. On the follow-up test, the best of the six tests was taken as the record. (See Chapter VI for testing materials.) The tests were scored by the researcher in conformity with "Extracts from International Typewriting Contest Rules." (See Appendix for these rules.)

The experimental factor in this study was the SKILL-BUILDER Controlled Reader. The experimental classes used this instrument for approximately ten minutes each class...
period starting with the twenty-first class session. The control group did not use this instrument. The progress of the experimental and control groups is given in Figures 1 and 2; and the details of the results are given in Tables 3 and 4.

**Summary of findings**

**Speed.** The experimental and the control groups had approximately the same speed when the experiment started as shown by the first test which was given before the SKILL-BUILDER Controlled Reader training began. The experimental group averaged 18.00 gross words per minute, and the control group averaged 18.085 gross words per minute.

After SKILL-BUILDER Controlled Reader training began, the experimental group surpassed the control group in speed. Even on the fourth test when the experimental group dropped back 2.848 words from the previous timing, the experimental group still held a superiority of 2.546 gross words per minute over the control group. At no time did the control group ever exceed, or even equal, the speed of the experimental group. (See Table 3 and Figure 1.) At the end of the first semester the experimental group had an average of 38.828 gross words per minute on a three-minute test as compared with the control group of 33.14. On the follow-up test, the experimental group achieved an average speed of 44.742 gross words per minute on a five-minute test; the control group, 38.742.
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<sup>a</sup>This test was given before SKILL-BUILDER Controlled Reader training began.

<sup>b</sup>This test was the final one at the end of the first semester.

<sup>c</sup>This test was the follow-up test at the end of the second semester.
FIGURE 1

AVERAGE GROSS WORDS PER MINUTE ON EIGHT STRAIGHT-COPY TIMED WRITINGS

- - - - - Experimental Group

- - - - - Control Group

Average Gross Words Per Minute

Timed Writings
The range of speed based on gross words per minute for the experimental group at the end of the first semester was from 21 to 60; for the control, 22 to 45. On the follow-up test the range for the experimental group was 31 to 61, and 26 to 55 for the control. The top score for the experimental was 61 as compared to 55 for the control; the low score was 31 for the experimental whereas the low score for the control was 26. (See Table 4 for distribution of scores.)

At the end of the first semester, 8 in the experimental group made 45 or more gross words per minute; the control, 1. The experimental group had 27 below 45; the control, 34. On the follow-up test, the experimental group had 16 with a speed of 45 or more gross words per minute; the control group had 6 in this category. The experimental group had 19 below 45 gross words per minute, whereas the control group had 29.

Thus on the tests at the end of the first semester and on the follow-up test, the highest speed score was attained by a student in the experimental group; and on the follow-up test, the lowest speed score for the experimental group was 5 words higher than the lowest score for the control group. The lowest speed score at the end of the first semester was 21 gross words per minute on a three-minute writing for the experimental group and 22 for the control.

Accuracy. In accuracy as in speed, the experimental and the control groups were approximately the same before
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<sup>a</sup>Based on three-minute tests

<sup>b</sup>Based on five-minute tests
the SKILL-BUILDER Controller Reader training started (Figure 2). At this point the experimental group averaged 5.433 total errors for the three-minute writing as compared with the control group which averaged a total of 5.0625 errors. The experimental group had more errors than the control group on every test until the seventh—the final test at the end of the first semester—and the follow-up test given three weeks before the end of the second semester. On the seventh test the experimental group averaged 6.00 total errors for a three-minute timed writing whereas the control group averaged 7.29. This gave the experimental group a superiority of 1.29 errors on this test. The experimental group surpassed the control group in accuracy by 2.06 errors on a five-minute writing on the follow-up test. The experimental group averaged a total of 5.60 errors for the five-minute timed writing as compared to 7.66 for the control group (Table 5).

The range of errors for the experimental group at the end of the first semester was from 1 to 14, and for the control group, 0 to 20. On the follow-up test, the range for the experimental group was 1 to 12 as compared to 0 to 21 for the control group.

Those in the experimental group who made 2 or fewer errors numbered 7; the control group, 4. Those in the experimental group who made more than 5 errors numbered 15; the control group, 24.
FIGURE 2
AVERAGE ERRORS PER MINUTE FOR THE EXPERIMENTAL AND THE CONTROL GROUPS ON EIGHT STRAIGHT-COPY TIMED WRITINGS

--- Experimental Group
--- Control Group

Average Errors Per Minute

Timed Writings
At the end of the first semester, the score with the greatest number of errors (three-minute test) for the experimental group was 14; the control, 20. In the second semester (five-minute test), the experimental score with the most errors was 12; the control, 2. (See Table 5 and Table 6)

The score having the fewest errors in the test given at the end of each semester was made by the control group—one perfect test in each of the tests. The experimental group's best error score was one error for each of the two semesters.

Summary on speed and accuracy

On the test given at the end of the first semester (three-minute test) as well as on the follow-up test (five-minute test) given three weeks before the end of the second semester, the average based on gross words per minute showed that the experimental group was superior to the control group in speed. Based on the average of total errors for these tests, the experimental group was also superior to the control group in accuracy.

Comparison of the two experimental classes

At the end of the first semester, one class of the two experimental classes discontinued practice with the SKILL-BUILDER Controlled Reader while the other class continued with it. As the students in these two classes were not equated,
### TABLE 5

**AVERAGE TOTAL ERRORS AND DIFFERENCES BETWEEN EXPERIMENTAL AND CONTROL GROUPS ON EIGHT STRAIGHT-COPY TIMED WRITINGS**

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<sup>a</sup>This test was given before the SKILL-BUILDER Controlled Reader Training began.

<sup>b</sup>This test was the final one at the end of the first semester (three minutes).

<sup>c</sup>This test was the follow-up given three weeks before the end of the second semester (five minutes).
TABLE 6
RANGE AND FREQUENCY OF SCORES ON TOTAL ERRORS AT THE END OF THE FIRST AND SECOND SEMESTER FOR THE EXPERIMENTAL AND THE CONTROL GROUPS

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^aBased on three-minute tests.
^bBased on five-minute tests.
it was necessary to compare the achievement of these two groups on a percentage basis.

At the time the one class discontinued the use of the reader, this class had an average of 37.428 gross words per minute with a total of 5.904 errors on a three-minute test; the class which continued with the instrument had an average of 40.928 gross words per minute with 6.071 errors. On the five-minute follow-up test given three weeks before the end of the second semester, the class which discontinued the use of the reader averaged 43.428 gross words per minute, with a total of 5.761 errors, whereas the class which continued with it averaged 46.784, with a total of 4.642 errors. The class which discontinued with the reader increased its speed by an average of 6.00 words per minute on a five-minute test; the class which continued with the instrument increased its average speed by 5.875 words per minute. This meant an increase of 16.03 per cent for the class which discontinued with the reader, and an increase of 14.31 per cent for the class which continued with it.

The class which discontinued with the reader decreased its total errors by .143 or 2.42 per cent; whereas the other class which continued with the reader decreased its errors by 1.429, or 23.53 per cent.

From a comparison of these two classes, greater accuracy was developed by the class that continued with the SKILL-BUILDER Controller Reader than was developed in the
class that discontinued its use. This accuracy was gained at very little expense to speed, the difference in per cent in speed being 1.72. The difference in accuracy between the two groups was 21.11 per cent. The statistical difference between these two groups was insignificant. (See Tables 7, 8.)

**Statistical significance of data**

The Hotelling T-Test was applied to answer the basic questions as to whether the difference between the experimental and control groups in speed and accuracy scores was statistically significant.\(^1\) The statistical basis for this computation was as follows:

Let \( x_{1a} \) be the difference, experimental subject measurement, for a matched pair \( a \) on test \( i \). If there is no difference between the experimental and control groups, the means of the \( x_{1a} \) are zero. The hypothesis to be tested is

\[
E(x_{1a}) = E(x_{2a}) = 0
\]

Mean and standard deviations for the errors and speed scores were figured for the experimental and control groups. These data are given in Table 9 (Appendix A).

\(^1\)Statistics computed by the Statistical Laboratory The Ohio State University, June 30, 1961.
Hotelling's $T^2$ (a generalization of Student's $t$) with the corresponding $F$ ratios was then used to test the hypothesis where

$$T^2 = \sum_{ij} s_{ij}^2 \bar{x}_i \bar{x}_j$$

$$F = \frac{N}{N-1} \frac{N-P}{P} T^2$$

Table 10 (See Appendix) shows the results of computations for testing the various hypotheses. These computations show that the value of $F$ is large and significant at the one per cent level in all cases tested except for the group of twenty-one tested at the end of the second semester, and there $F$ is significant at the five per cent level.

The differences between the experimental and the control groups were thus found by the application of Hotelling's $T$-Test to be highly significant (significant at the one per cent level) at the end of the first semester and at the end of the second semester. The difference between the class of fourteen experimental students who continued with the instrument training when compared with their controls at the end of the second semester was significant at the one per cent level. The difference between the class of twenty-one experimental students who did not continue with the SKILL-BUILDER Controlled Reader training and their controls was significant but at the five per cent level. This would tend to indicate that greater differences were obtained when the experimental group continued with the training.
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**EXPERIMENTAL GROUP**

(Eighth Period)\(^a\)

First Semester\(^c\) Second Semester\(^d\)

---

**EXPERIMENTAL GROUP**

(Second Period)\(^b\)

First Semester\(^c\) Second Semester\(^d\)

---

\(^a\) This class discontinued the use of the SKILL-BUILDER Controlled Reader at the end of the first semester.

\(^b\) This class continued with the SKILL-BUILDER Controlled Reader.

\(^c\) Based on three-minute tests.

\(^d\) Based on five-minute tests.
TABLE 8
RANGE AND FREQUENCY OF SCORES ON TOTAL ERRORS AT THE END
OF THE FIRST AND SECOND SEMESTERS FOR
THE TWO EXPERIMENTAL CLASSES

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aThis class discontinued the use of the SKILL-BUILDER Controlled Reader at the end of the first semester.
bThis class continued with the SKILL-BUILDER Controlled Reader.
cBased on three-minute tests.
dBased on five-minute tests.
The difference between the two experimental groups themselves (one group continuing the use of the SKILL-BUILDER Controlled Reader in the second semester and the other group discontinuing its use) was not significant—F being 1.227. Therefore, this study does not prove, nor at the same time disprove, that the continued use of the Controlled Reader beyond the first semester is instructionally beneficial.

Conclusions

On the basis of the data in this study, the following conclusions are drawn:

1. The SKILL-BUILDER Controlled Reader is an effective speed-forcing and control-building device as greater speed and accuracy can be attained by its use. This was borne out by the results of the tests given at the end of the first semester and three weeks before the end of the second semester. At the end of the first semester, the experimental group had an average of 38.83 gross words per minute on a three-minute test as compared with the control group's 33.14. On the follow-up test of five minutes duration, the experimental group averaged 44.742 gross words per minute whereas the control group averaged 38.742.

At the end of the first semester, the experimental group averaged 6.00 total errors on the three-minute timed writing and the control group averaged 7.29. At the end of the second semester, the experimental group averaged
5.60 total errors on the five-minute timed writing; the control, 7.66.

2. The SKILL-BUILDER Controlled Reader can be used without any lengthy, special training, as it is relatively simple to operate. One demonstration is sufficient to acquaint the teacher with its operation.

3. The SKILL-BUILDER Controlled Reader can be used effectively in conjunction with regular textbook materials and teacher instruction to develop and sustain basic skills after they have been taught by the teacher. The instrument is supplementary to the teacher's instruction. In this study the experiment was not started until after the letter keyboard had been taught by the teacher. The evaluation of the students' achievement was based on tests taken from the material in the regular textbook. As the filmstrips are selective, the instructor may choose the material which correlates with the daily instruction.

4. There did not appear to be any interference with regular teaching procedures because of the use of the SKILL-BUILDER Controlled Reader. Other than the short period of time when the instrument was used, the class proceeded as usual.

5. While the study does not establish the fact that the total time devoted to elementary typewriting can be appreciably shortened, it does establish the fact that more accurate and faster typewriting can be attained within the
given time of this study. The superiority of the group having the instrument training over the group not having the training was statistically shown when the Hotelling T-Test was applied to the differences in the two groups. This difference was significant at the one per cent level.

Observations

1. An even greater significance in achievement between the experimental and the control groups would, perhaps, have resulted had certain factors not developed. The larger of the two experimental classes, 31 in number, had many interruptions. The most disturbing of these developed after classes had started and after the experiment had begun. Due to an unusually large number of bus students in one section of the school district, the bus handling this section had to operate a double schedule. This meant an early dismissal for some of the students in eighth-period classes. This affected ten students in the eighth-period experimental class. These students were dismissed twenty minutes early each day. Actually, fifteen minutes of this twenty came out of the counseling period which was set aside for the last fifteen minutes of the period; however, the confusion engendered by these ten students putting away their materials, and so on, disrupted the latter part of the typing class. At least five minutes each day was lost because of this confusion.
Other interruptions occurred in this class, also. The period was sometimes shortened for assemblies. These disrupting factors were unforeseen circumstances over which the researcher had no control; in fact, she was unaware of them until it was too late to make any changes in the set-up for the experiment.

An example of the results of interruptions to this eighth-period class was shown in the results of the fourth test. This test was given at the beginning of the class period just preceding an assembly pep rally (for which the period was shortened) which in turn preceded the school's most important football game. This class did so badly in the test that it brought the average of the entire experimental group down to an average of 2.848 gross words per minute below the previous test. The instructor felt that the excitement over the rally and the game was the reason for this slump.

The control groups had no such consistent interruptions, although they undoubtedly had minor distractions at times. A factor, although it could not be called an interruption, that entered into the test results was indicated in the seventh test, the test given at the end of the first semester. Both experimental and control groups showed a decrease over the previous test in speed and an increase in errors. The instructors were unanimous in the belief that
this regression was due to the tension built up over final examinations.

2. Conversations with individual students in the experimental group as well as with the instructor indicated that the SKILL-BUILDER Controlled Reader is highly motivating. The students enjoyed working with the instrument because it was challenging. The instructor stated that it held student interest and attention. He thought this was due to the variable speeds. He thought, too, that the moving slot seemed to negate peripheral distractions and thus increased student concentration.

3. Whether the SKILL-BUILDER Controlled Reader is helpful to any particular level of ability cannot be stated as an outcome of this study as the students were not divided into ability groups for the instrument practice. The instructor was of the opinion that the instrument training had an up-grading effect at all levels. He based his opinion on the fact that fewer "D" grades were given this year than usual, and that 72 per cent of the students passed a standardized speed and accuracy test that is given yearly; whereas the average number who pass this test is usually between 25 and 30 per cent.
Recommendations

Additional experiments should be conducted with the SKILL-BUILDER Controlled Reader in both colleges and secondary schools. Experiments should be conducted with groups in advanced typewriting, as well as elementary, to establish the value of the instrument as an instructional device at the advanced level.

Experiments should be conducted with ability groups to indicate whether or not the SKILL-BUILDER Controlled Reader is of special benefit to any particular group.
### TABLE 9

**MEANS AND STANDARD DEVIATIONS FOR EACH GROUP**

**ERRORS**

**Experimental Group**

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<tr>
<th>Period</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
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**Control Group**

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<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
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**SPEED**

**Experimental Group**

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<th>Number</th>
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**Control Group**

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<th>Number</th>
<th>Mean</th>
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APPENDIX B
TABLE 10
MEANS, VARIANCES AND COVARIANCES OF DIFFERENCES FOR
VARIOUS GROUPS WITH INVERSE OF THE COVARIANCE
MATRIX AND TEST STATISTICS

First Semester
Differences: Experimental Minus Control

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\[ T^2 = 0.8865 \]
\[ F = 15.058** \]

Second Semester

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\[ T^2 = 0.8119 \]
\[ F = 13.791** \]
TABLE 10 (continued)

Second Semester

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Inverse Matrix

\[
\begin{align*}
    &0.026861 & -0.002545 \\
    &-0.002545 & 0.015888 \\
\end{align*}
\]

\[T^2 = 1.8043\]
\[F = 11.658**\]

Matrix

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Inverse Matrix

\[
\begin{align*}
    &0.058095 & -0.011574 \\
    &-0.011574 & 0.019954 \\
\end{align*}
\]

\[T^2 = 0.4623\]
\[F = 4.612*\]

Experimental Subgroups, \(n_1 = 14\), \(n_2 = 21\)

Matrix

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Inverse Matrix

\[
\begin{align*}
    &0.10876 & -0.01475 \\
    &-0.01475 & 0.02094 \\
\end{align*}
\]

\[D^2 = \sum s_{ij} (\bar{x}_{i} - \bar{x}_{j}) (\bar{x}_{i} - \bar{x}_{j})\]

\[D^2 = 0.30115\]
\[F = 1.227\] (not significant)
APPENDIX C
TABLE 11

GROSS WORDS PER MINUTES ON EIGHT STRAIGHT-COPY TIMED WRITINGS

<table>
<thead>
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<th>STUDENT</th>
<th>TEST 1</th>
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TABLE 11 (continued)
TABLE 12

TOTAL ERRORS ON EIGHT STRAIGHT-COPY TIMED WRITINGS

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Vocabulary Preview, Timed Writings, 3-5'; 5-10'. Syllabic Intensity from 1.4-1.5
A pencil mark may be used to show the contestant that he is nearing the end of the sheet, but it must be made in a way that will not interfere with the proper correction of the work. An error should be checked by a complete circle around the word in which it occurs.

Headings and titles are not to be written. If bold-face type or italics appear in the printed matter, the words should be written as though they were printed in ordinary type.

Write on only one side of the paper, unless a sufficient supply has not been provided. Every contestant must stop the instant time is called regardless of whether a word is finished or not.

1. **Line Spacing.** Work must be double-spaced—"two notches." Every line wrongly spaced is penalized one error in addition to all other errors in the same line.

2. **Length of line.** Except at the end of a paragraph, any line having fewer than 61 or more than 76 characters and spaces is penalized one error in addition to all other errors in the same line.

3. **Length of page.** With paper 8 1/2 by 13 inches, each page, except the last, must have at least 35 lines of writing; with paper 8 1/2 by 11 inches, each page, except the last, must have at least 29 lines of writing. One error is charged for a short page—not one error for each line that the page is short.

4. **Paragraphing.** Paragraphs must be indented five spaces, and only five. An error in paragraphing is penalized in addition to all errors in the same line.

5. **Spaces and Punctuation Points.** A space and a punctuation point are treated as parts of the preceding word; but if they are incorrectly made, inserted, omitted, or in any manner changed from the printed copy, an error must be charged unless the preceding word has already been penalized.

6. **Spacing after Punctuation.** If punctuation is followed by a quotation mark, the spacing follows the rule laid down for the punctuation point.
After a period used to denote abbreviation, one space is required, unless the abbreviation ends a sentence. At the end of a sentence, the final mark of punctuation is followed by two spaces.

7. **The Dash.** A dash must be written with two hyphens, without spacing before or after. If a dash is necessary at the beginning of a line, there should be no space between it and the following word.

8. **Cut Characters.** Any word written so close to the top, bottom, or side of a sheet, that a portion of any letter is cut off, must be penalized.

9. **Words Wrongly Divided.** A word wrongly divided at the end of a line must be penalized. A word hyphenated at the end of a line in the printed copy may or may not need the hyphen if it occurs medially in the contestant's work. For instance: Devilfish might be hyphenated at the end of a printed line, if it appears medially, the contestant's rendering is not wrong if it conforms to any standard dictionary.

10. **Faulty Shifting.** If only parts of the proper character appear, an error is charged. If the complete character is discernible, no error is charged.

11. **Lightly Struck Letters.** If the outline of any character is discernible, there is no error.

12. **Transposition.** Letters transposed in any word constitute an error. Words transposed are penalized one error for the transposition; additional penalties are imposed for errors in the transposed words.

13. **Rewritten Matter.** In rewritten matter every error must be penalized, whether in first or second writing, and one additional error must be charged for rewriting.

14. **Words Omitted.** (See Rule No. 23.)

15. **Words Inserted.** (See Rule No. 23.)

16. **Crowding.** No word shall occupy fewer than its proper number of spaces.

17. **Piling.** If any portion of the body of one character overlaps any portion of the body of another character, or extends into the space between words to the extent that it would overlap any portion of the body of a character were there a character there, an error must be charged.
18. **Left-Hand Margin.** Characters beginning all lines, except the first lines of paragraphs, must be struck at the same point of the scale. If one is printed to the left or right of that point, an error must be charged.

19. **Erasing.** The use of the eraser is not allowed.

20. **Errors in Printed Copy.** Errors found in the printed copy may be corrected or written as they are in the copy, but in no case shall an error be charged against such words unless they are omitted.

21. **Last Word.** An error made in the last word written, whether the word is completed or not, must be charged.

22. **One Error to a Word.** But one error shall be penalized in any one word.

23. **General Rule.** Every word omitted, inserted, misspelled, or in any manner changed from the printed copy (save in the case of transposition and rewritten matter) must be penalized. Work in which words are x-ed will not be accepted.

24. **Gross Words.** The gross number of stroked shall be reckoned from the printed copy of matter used, and shall be divided by five, the result being the number of gross words from which all deductions for errors shall be made. Strokes in rewritten matter are not to be counted in the gross. When a typist ends his test with an unfinished word, he shall be given credit for each character written.

If ten words for each error are deducted from the gross words typed, the result will be the net words a minute (nwam).  

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APPENDIX G
THE SKILL-BUILDER CONTROLLED READER
BIBLIOGRAPHY

Books


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Ruegg, Robert J. "Skill Development through Reading Instruments," EDL Reprint, No. 10 (undated).


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I, Randall Miller Kline, was born in Ashland, Kentucky, March 4, 1907. I received my secondary education in the public schools of Springfield, Ohio. My undergraduate training was obtained at Wittenberg University, Springfield, Ohio, from which I received the degree of Bachelor of Arts in 1929, and Bachelor of Science in Education in 1938. I received the Master of Arts degree at The Ohio State University in 1935.

From 1930 until 1946 I taught in Jefferson High School (Ashtabula County), Ohio. Since that time, I have taught in Wittenberg University.

From January, 1959, until June, 1960, I was enrolled in the Graduate School of The Ohio State University as a full-time student.